
FINAL

**Field Sampling Plan
Remedial Investigation at
San Fernando Valley Area 2 Superfund Site
Glendale Chromium Operable Unit**

**EPA Contract No. EP-S9-08-04
EPA Task Order No. 060-RICO-09N2
CH2M HILL Project No. 427727**

Prepared for
**United States Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105**

April 2012

CH2MHILL®

6 Hutton Centre Drive
Suite 700
Santa Ana, California 92707

FINAL

**Field Sampling Plan
Remedial Investigation at
San Fernando Valley Area 2 Superfund Site
Glendale Chromium Operable Unit**

**EPA Contract No. EP-S9-08-04
EPA Task Order No. 060-RICO-09N2
CH2M HILL Project No. 427727**

April 2012

NONDISCLOSURE STATEMENT

This document has been prepared for the United States Environmental Protection Agency under Contract No. EP-S9-08-04. The material contained herein is not to be disclosed to, discussed with, or made available to any persons for any reason without the prior expressed approval of a responsible official of the United States Environmental Protection Agency.

U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 9

Sample Plan Title: Field Sampling Plan – Remedial Investigation

Site Name: Glendale Chromium Operable Unit

Operable Unit: 04

Site Location: San Fernando Valley Area 2 Superfund Site

City/State/Zip: Glendale, Burbank, Los Angeles, California

Site EPA ID#: 09N2

Anticipated Investigation Dates: February 2012 – September 2013

Prepared By: Benjamin Lechler Date: April 2012

Agency or Firm: CH2M HILL, Inc.

Address: 6 Hutton Centre Drive, Suite 700

City/State/Zip: Santa Ana, CA 92707 Telephone: (714) 435-6283

EPA Project Manager: Lisa Hanusiak Section: SFD-7-3 Phone No. (415) 972-3152

FSP Approval Date: _____

(for EPA use)

S Received by Superfund Remedial Project Manager: _____

U Date _____

P Reviewed by: _____

E Date _____

APPROVED / NOT APPROVED

R

F

U

N

D

Expedited Review? Yes/No

Q Received by Quality Assurance Office: _____

A Date _____

O Reviewed by: _____

O Date _____

Approved: _____

Manager, Quality Assurance Office, _____

Management and Technical Services Division Date _____

Contents

Section	Page
Acronyms and Abbreviations	ix
Section 1 – Objectives	2-1
Section 2 – Site Background	2-1
2.1 Location	2-1
2.2 Geology and Hydrogeology	2-1
2.3 Ground Water	2-2
Section 3 – Rationale for Sample Locations and Laboratory Analyses	3-1
3.1 Monitoring Well Installation.....	3-1
3.2 Ground Water Sampling	3-1
3.2.1 Sampling Locations	3-1
3.2.2 Number of Samples	3-2
3.2.3 Laboratory Analyses	3-2
3.3 Aquifer Testing.....	3-2
3.4 Investigation-Derived Waste Management.....	3-3
3.4.1 Number of Samples	3-3
3.4.2 Laboratory Analyses	3-3
Section 4 – Request for Analyses	4-1
4.1 Ground Water Sampling	4-1
4.1.1 Analytical Parameters.....	4-1
4.1.2 Schedule	4-1
4.2 Investigation-Derived Waste Sampling	4-1
Section 5 – Field Methods and Procedures	5-1
5.1 Monitoring Well Installation.....	5-1
5.1.1 Borehole Utility Clearance.....	5-1
5.1.2 Borehole Drilling	5-1
5.1.3 Borehole Lithologic Logging.....	5-2
5.1.4 Well Installation and Construction	5-2
5.1.5 Monitoring Well Development.....	5-3
5.1.6 Monitoring Well Survey.....	5-3
5.2 Ground Water Sample Collection	5-3
5.2.1 Low-Flow Ground Water Sampling.....	5-3
5.2.2 Conventional Ground Water Sampling.....	5-4
5.2.3 Field Parameter Measurement.....	5-4
5.3 Decontamination	5-4
5.4 Investigation-Derived Waste Management.....	5-5
5.4.1 Drill Cuttings	5-5
5.4.2 Water Waste from Well Installation.....	5-5
5.4.3 Ground Water Sampling Purge Water.....	5-6
5.4.4 Disposable Sampling and Personal Protective Equipment.....	5-6
5.5 Sample Containers and Preservation	5-6
5.6 Field Documentation and Sample Management Procedures.....	5-6
5.6.1 Field Documentation	5-7
5.6.2 Sample Labeling.....	5-8
5.6.3 Sample Packaging and Shipment.....	5-8

Section	Page
5.7 Quality Control Sampling.....	5-9
5.7.1 Field Duplicates.....	5-9
5.7.2 Blank Samples.....	5-9
5.7.3 Laboratory QC Samples	5-9
5.7.4 Performance Evaluation Samples.....	5-10
Section 6 – Health and Safety Plan	6-1
Section 7 – References.....	7-1

Appendixes

- A Region 9 Sample Coordination Center Request Forms
- B Standard Forms
- C Health and Safety Plan

Tables

- 1-1 Key CH2M HILL Project Personnel for Remedial Investigation Field Program Implementation
- 3-1 Data Needs and Potential Monitoring Well Locations
- 3-2 Facilities Within Area 2 Being Investigated as Potential Sources of Chromium Contamination to Ground Water
- 3-3 All Metals Processing and Drilube Company Facilities – Well Construction Data
- 3-4 Ground Water Sample Collection Summary
- 3-5 Analytical Parameters and Rationale – Ground Water Sampling
- 4-1 Analyses Requested for Ground Water Samples – Routine Sampling Events
- 4-2 Analyses Requested for Ground Water Samples – Baseline Sampling New EPA Monitoring Wells
- 4-3 Analyses Requested for IDW Characterization Samples

Figures

- 1-1 Site Location Map
- 3-1 Locations of Planned Monitoring Wells for the Remedial Investigation
- 3-2 Location of Monitoring Wells and Facilities Identified as Potential Chromium Sources
- 3-3 Former Drilube Facility Location Map and Monitoring Wells
- 3-4 Former All Metals Facility
- 5-1 Typical Water Table Monitoring Well Construction Detail
- 5-2 Typical Deep Monitoring Well Construction Detail

Acronyms and Abbreviations

°C	degrees Celsius
µm	micrometer(s)
1,2,3-TCP	1,2,3-trichloropropane
ASTM	American Society for Testing and Materials
bgs	below ground surface
BOU	Burbank Operable Unit
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CLP	Contract Laboratory Program
COC	chain-of-custody
Cr(III)	trivalent chromium
Cr(VI)	hexavalent chromium
DO	dissolved oxygen
DQO	data quality objective
EC	electrical conductivity
EPA	United States Environmental Protection Agency
ERA	ecological risk assessment
FS	feasibility study
FSP	field sampling plan
ft/day	feet per day
ft/yr	feet per year
GCOU	Glendale Chromium Operable Unit
GNOU	Glendale North Operable Unit
GSOU	Glendale South Operable Unit
H ₂ SO ₄	sulfuric acid
HCl	hydrochloric acid
HHRA	human health risk assessment
HNO ₃	nitric acid
HSA	hollow-stem auger
IDW	investigation-derived waste
JMM	James M. Montgomery, Consulting Engineers, Inc.
L/min	liters per minute
LARWQCB	California Regional Water Quality Control Board, Los Angeles Region

MCL	maximum contaminant level
mg/L	milligrams per liter
mL	milliliter(s)
MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
mV	millivolt(s)
NAD83	North American Datum 1983
NAVD88	North American Vertical Datum 1988
NDMA	n-nitrosodimethylamine
NTU	nephelometric turbidity unit(s)
ORP	oxidation-reduction potential
OU	operable unit
PE	performance evaluation
PRP	potentially responsible party
PVC	polyvinyl chloride
QA	quality assurance
QAO	Quality Assurance Office
QAPP	quality assurance project plan
QC	quality control
redox	reduction/oxidation
Respondents	Glendale Chromium Operable Unit Respondents Group
RI	remedial investigation
RSCC	Regional Sample Control Center
SFV	San Fernando Valley
SOP	standard operating procedure
SOW	Statement of Work
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TPH-d	total petroleum hydrocarbon – diesel
TPH-g	total petroleum hydrocarbon – gasoline
TTLC	total threshold limit concentration
USCS	Unified Soil Classification System
VOA	volatile organic analysis
VOC	volatile organic compound

SECTION 1

Objectives

CH2M HILL prepared this field sampling plan (FSP) to support field and laboratory activities associated with the remedial investigation (RI) conducted by the United States Environmental Protection Agency (EPA) for the San Fernando Valley (SFV) Area 2 Superfund Site, Glendale Chromium Operable Unit (GCOU). The GCOU, including the Glendale North and the Glendale South operable units (OUs) (GNOU and GSOU), is located in portions of the cities of Los Angeles, Glendale, and Burbank, California. Figure 1-1 provides the location map for GCOU (note that all figures are inserted at the end of the text).

The field investigation work includes installing ground water monitoring wells, performing quarterly ground water monitoring (sampling and water level measurement), conducting aquifer testing, and managing investigation-derived waste (IDW). The RI field activities will provide additional data for evaluation of the nature and extent and fate and transport of hexavalent-chromium-contaminated ground water in GCOU. EPA will use the new RI data, along with existing data, to evaluate potential human health and ecological risks due to exposure to hexavalent chromium contaminated ground water. The Quality Assurance Project Plan (QAPP) for this work presents the data quality objectives (DQOs) for the RI field investigation (EPA, 2012a). The Work Plan provides additional background information on the GCOU and details on the objectives of the RI (EPA, 2012b).

EPA's overall objective for conducting the GCOU RI is to evaluate the extent and distribution of hexavalent chromium contamination in ground water in Area 2 and potential risks to human health and the environment posed by the contamination. If unacceptable risk exists, EPA will conduct a feasibility study (FS) to identify a preferred remedial alternative that will eliminate, reduce, or control unacceptable risks to human health and/or the environment. Specifically, the RI involves the investigation and study of hexavalent chromium contamination in ground water in Area 2 (and, to a lesser extent, soil) and the study of the effect that chromium contamination has on the existing remedy in Area 2 that addresses chlorinated volatile organic compounds (VOCs). Table 1-1 provides the key project staff for the RI field activities.

SECTION 2

Site Background

This section provides a brief description of the physical and hydrogeologic setting of the SFV Area 2 Superfund Site and the GCOU. The *Burbank and Glendale Operable Units Focused Chromium Trend Study* (CH2M HILL, 2005), the *First Five-Year Review Report for San Fernando Valley Area 2 Superfund Site* (CH2M HILL, 2008), the RI QAPP (EPA, 2012a), and the RI Work Plan (EPA, 2012b) provide additional information on site history, site investigations, and details on the chronology of significant events in the GCOU.

2.1 Location

The San Fernando Basin, located within the Upper Los Angeles River Area, includes the Los Angeles River and its various tributaries. The San Fernando Basin covers approximately 122,800 acres. The basin is approximately 23 miles long in an east-west direction and up to approximately 12 miles wide in a north-south direction. The elevation of the Los Angeles River valley floor slopes from 1,100 feet above mean sea level (msl) in the northwestern portion of the valley to approximately 350 feet above msl near the southern portion of the Los Angeles Narrows. The valley is bounded on the north and northwest by the Santa Susana Mountains, on the northeast by the San Gabriel Mountains, on the west by the Simi Hills, and on the south by the Santa Monica Mountains.

The SFV Superfund Site is located in the eastern portion of SFV between the San Gabriel and Santa Monica Mountains. Four separate areas comprise the San Fernando Superfund Site:

- Area 1 (North Hollywood and Burbank)
- Area 2 (Glendale)
- Area 3 (Verdugo, delisted in 2004)
- Area 4 (Pollock)

The SFV Area 2 Superfund Site is located in the southeast portion of the San Fernando Basin, where the Los Angeles River turns southward from its west-to-east course (Figure 1-1). The GNOU is located at the north end of the Los Angeles River Narrows; the GSOU is located within the Narrows itself.

2.2 Geology and Hydrogeology

The San Fernando Valley is an important source of drinking water for the Los Angeles metropolitan area, the cities of Glendale, Burbank, and San Fernando, La Cañada -Flintridge, and the unincorporated area of La Crescenta.

The uplands surrounding the SFV consist of crystalline and sedimentary rocks. Quaternary alluvium up to 2,000 feet thick was derived by erosion of the surrounding uplands (California Regional Water Quality Control Board, Los Angeles Region [LARWQCB], 2002). Lateral zonation is present due to the changes in the pattern of deposition of the Tujunga fan at the northeast corner of SFV.

Ground water in the eastern SFV occurs primarily in alluvial valley fill deposits of Quaternary age eroded from the adjacent San Gabriel and Verdugo Mountains. The valley fill, estimated to be approximately 1,200 feet thick in places, is bounded to the east and at depth by granitic and metamorphic bedrock of low permeability. The valley fill deposits of the eastern SFV are relatively permeable and have been subdivided into four distinct lithologic/aquifer zones as follows (James M. Montgomery, Consulting Engineers, Inc. [JMM], 1992):

1. **Upper Zone** – consists of layers and lenses of silt, sand, and gravel from land surface to a depth of approximately 250 feet below ground surface (bgs). According to aquifer tests conducted during the SFV RI in the North Hollywood and Crystal Springs Study Areas, hydraulic conductivities in the Upper Zone range from about 30 to 360 feet per day (ft/day).

2. **Middle Zone** – contains increased proportions of fine-grained sand and silt compared to the other zones and is approximately 50 feet thick. Because of the fine-grained nature and anticipated poor yield characteristics, few production wells have been completed in this zone. The Middle Zone appears to grade to coarser-grained deposits in the GSOU, where the Upper and Middle Zones become difficult to distinguish lithologically.
3. **Lower Zone** – consists of interbedded sand, silt, and gravel with cobbles in the upper portion. The thickness of this zone is approximately 200 to 250 feet, and hydraulic conductivity ranges from 130 to 900 ft/day. Most of the ground water pumped from the eastern SFV is pumped from this highly productive zone.
4. **Deep Zone** – consists mainly of fine-grained, relatively low-permeability sediments, including silt and clay, where encountered during drilling. Few wells have penetrated this zone; therefore, the thickness and hydraulic characteristics of this zone are poorly understood.

Depths to ground water measured recently at monitoring wells in the eastern SFV range from approximately 30 to 200 feet bgs (CH2M HILL, 2005). Therefore, ground water is typically first encountered in the Upper Zone. The Middle, Lower, and Deep Zones are likely to be fully saturated through most of the study area. The water table or potentiometric surface typically occurs within the Upper or Middle Zones of the regional aquifer. Ground water levels at these monitoring wells have commonly declined approximately 30 feet since the mid-1990s, resulting from several factors, including:

- Large-scale ground water withdrawals
- Less-than-average precipitation during the past decade
- An approximate 70 percent reduction in the amount of ground water recharged through spreading facilities

Horizontal hydraulic gradients in GCOU and the SFV Area 1 Burbank OU (BOU) are generally southeast toward the Los Angeles River Narrows, where essentially all ground water and surface water outflow from the SFV occurs. Localized deviations to this pattern occur near pumping wells at several locations in the study area, and a large cone of depression occurs in BOU.

The Watermaster estimates ground water flow velocities in eastern SFV to range from approximately 300 to 1,300 feet per year (ft/yr), depending on location (Upper Los Angeles River Area Watermaster, 2002). The Watermaster estimates that ground water flow velocities generally are highest in GSOU and the Los Angeles River Narrows area.

Vertical hydraulic gradients in the eastern SFV generally are smaller than horizontal gradients, and are strongly influenced by ground water withdrawals near the wellfields (JMM, 1992). Most of the GCOU and BOU extraction wells are screened in the lower portion of the Upper Zone, and for this reason, upward gradients from the Middle and Lower Zones are assumed to occur near these wellfields.

However, the SFV RI concluded that the relatively fine-grained, low-permeability nature of the Middle Zone impedes movement of ground water between the Upper and Lower Zones through much of eastern SFV. Deposits, comprising the Middle Zone, become coarser in GSOU and the Los Angeles River Narrows, making the Middle Zone less distinct hydraulically from the Upper and Lower Zones. In this area, the Middle Zone probably does not substantially impede vertical ground water movement.

2.3 Ground Water

Under normal natural conditions in water, chromium can occur in two valence states: trivalent chromium (Cr(III)) and hexavalent chromium (Cr(VI)). Both can exist simultaneously, although typically one state has a much greater concentration than the other state. The *Burbank and Glendale Operable Units Chromium Trend Study* evaluated available redox-sensitive parameters to assess chromium mobility and the potential for chromium transport (CH2M HILL, 2005).

Concentrations of dissolved iron and manganese in the study area are below or near analytical detection limits. In addition, dissolved oxygen is generally present in ground water samples (where it is measured), suggesting an oxidizing environment. Elevated nitrate concentrations are found in most wells in the GCOU area of the SFV,

suggesting that this more-oxidized form of nitrogen is stable in ground water. The presence of dissolved oxygen and nitrate, combined with the absence of dissolved iron and manganese in ground water, indicates an oxidizing redox environment that is likely to favor hexavalent chromium over trivalent chromium. These reduction/oxidation (redox) parameters lend supporting evidence to the hypothesis that hexavalent chromium is the dominant chromium species and is not being chemically reduced in the ground water of GCOU.

SECTION 3

Rationale for Sample Locations and Laboratory Analyses

EPA is conducting the GCOU RI to fill remaining data gaps and provide data for evaluation of the nature and extent of hexavalent chromium contamination in ground water (both laterally and vertically). These data will support a baseline human health risk assessment (HHRA) and an ecological risk assessment (ERA). EPA's field investigation will include the following key investigation activities:

- Monitoring well installation
- Ground water sampling
- Aquifer testing
- IDW management

EPA will use the methods and procedures outlined in subsequent sections for the key investigation activities.

3.1 Monitoring Well Installation

Figure 3-1 shows the seven key areas (A through G) identified by EPA where additional investigation of chromium in ground water may be warranted. The Glendale Chromium Operable Unit Respondents Group (Respondents), a group of potentially responsible parties (PRPs), plans to install 12 new monitoring wells as part of their RI activities; EPA plans to install 17 new monitoring wells at 15 different locations. Table 3-1 presents the data needs associated with each new EPA RI monitoring well location. EPA's RI Work Plan provides additional discussion of these key areas, the associated data gaps, and the rationale for the new EPA monitoring wells (EPA, 2012b).

EPA will install the monitoring wells in two phases, with 6 monitoring wells (5 locations) installed in the first phase of work and 11 wells installed during the second phase. EPA will use the results of ground water samples from Phase 1 monitoring wells and the Respondents RI activities to refine the Phase 2 well locations.

3.2 Ground Water Sampling

EPA will collect ground water samples from new monitoring wells and existing facility monitoring wells as part of the RI field activities. EPA will use results of ground water sampling activities to:

- Assess the nature, extent, fate, and transport of hexavalent-chromium-contaminated ground water in GCOU.
- Conduct the baseline HHRA and ERA.
- Provide additional data on the general ground water chemistry and distribution of VOCs and emerging compounds (1,4-dioxane, n-nitrosodimethylamine [NDMA], perchlorate, and 1,2,3-trichloropropane [1,2,3-TCP]) in the GCOU.

EPA has tentatively scheduled quarterly ground water sampling between July 2012 and July 2013. Baseline sampling of Phase 1 EPA monitoring wells and additional existing monitoring wells is tentatively scheduled for May 2012. The following subsections describe the ground water sampling locations.

3.2.1 Sampling Locations

Existing Monitoring Wells. EPA will collect ground water samples on a semiannual basis from the following existing monitoring wells associated with the Drilube Company and All Metals facilities:

- Drilube Company Monitoring Wells: V13DRMW1, V13DRMW2, V13DRMW3, V13DRMW4, V13DRMW5, V13DWBW1, and V13DWBW3
- All Metals Monitoring Wells: AMPW1 and AMPW3

EPA proposes to collect ground water samples quarterly from up to six additional existing monitoring wells. Figure 3-2 shows the locations of the Drilube Company and All Metals facilities, and other facilities identified as active chromium sites. Table 3-2 identifies the facility name and site status corresponding to the facility numbers on Figure 3-2. Figures 3-3 and 3-4 show the locations of existing monitoring wells at the Drilube Company and All Metals facilities, respectively. Table 3-3 presents the construction details for the Drilube Company and All Metals facility ground water monitoring wells.

New Monitoring Wells. Sample collection from the new monitoring wells will occur quarterly upon installation. Figure 3-1 shows the proposed locations for new monitoring wells.

3.2.2 Number of Samples

Table 3-4 summarizes the number and proposed locations of samples for each ground water sampling event. In addition to the ground water samples collected from each monitoring well, EPA will collect field quality assurance/quality control (QA/QC) samples in the form of field duplicates, equipment blanks (or field blanks), and matrix spike/matrix spike duplicate (MS/MSD) double-volume samples. The QAPP provides the rationale for QA/QC sampling.

EPA will collect 1 field duplicate for every 10 monitoring wells sampled, or from at least 1 monitoring well per sample collection activity. EPA will collect duplicate samples from a moderately contaminated well for all analytes included with the request for analyses.

EPA will collect field blank samples to check for possible cross-contamination of ground water samples from the point of sample collection to the analysis of the samples by the laboratory. EPA will collect equipment (rinsate) blank samples, after decontamination, during days where common equipment (for example, a portable pump) is used to collect samples from a number of different wells in a given day. If no reusable or decontaminated equipment is used on any day, then EPA will collect one field blank sample per day for all analytes.

EPA will collect one MS/MSD sample, consisting of twice the normal sample volume, for every 20 samples collected, or from at least one monitoring well per sample collection activity.

3.2.3 Laboratory Analyses

EPA will analyze the ground water samples for total chromium and hexavalent chromium. EPA will use the data to evaluate the nature and extent of chromium contamination and to perform the baseline HHRA and ERA. The analyses will include filtered and unfiltered total and hexavalent chromium samples during initial ground water sampling events. EPA will evaluate the need for analyzing both filtered and unfiltered samples for total and hexavalent chromium after the first four rounds of sampling.

In addition, EPA will collect baseline data from new EPA monitoring wells for dissolved metals, general chemistry parameters, VOCs, and emerging compounds. EPA will collect additional ground water samples for VOCs and/or emerging compounds, as necessary, to assist ongoing evaluations of interim treatment options. Table 3-5 presents the rationale for the analytical parameters collected during the GCOU ground water sampling events.

3.3 Aquifer Testing

EPA may perform pumping tests to assess aquifer properties (hydraulic conductivity) in the GCOU. EPA will collect drawdown data from new monitoring wells during development activities to evaluate the specific capacity (i.e., drawdown as a function of pumping rate) of each monitoring well. Specific capacity data will be used to evaluate the usefulness of pumping test data from the new monitoring wells. If EPA determines pumping test data from the monitoring wells would be useful in RI evaluations an addendum to this FSP will be submitted to describe pumping test rationale, procedures, and data analysis.

3.4 Investigation-Derived Waste Management

IDW generated during monitoring well installation, aquifer testing, and ground water sampling will consist of drill cuttings, purge water, and decontamination rinsate. EPA will manage the IDW generated during drilling, monitoring well development, and aquifer testing by properly containing and temporarily storing the IDW at the drill site or a dedicated waste staging area while awaiting analytical results. Once EPA receives the IDW analytical results, the subcontractor will profile and dispose the IDW at an appropriate disposal facility. EPA assumes that the volume of waste generated during ground water sampling will be minimal and disposal will be at the SFV BOU Treatment Plant.

3.4.1 Number of Samples

EPA will collect waste characterization samples from IDW generated during drilling, well development, and aquifer testing as outlined below:

- Collect 1 IDW composite soil sample from each roll-off bin, or 1 per 10 55-gallon drums at every drilling location.
- Collect 1 IDW water (purge water and decontamination rinsate) grab sample from each tank, or 1 per monitoring well when water is contained in 55-gallon drums.

3.4.2 Laboratory Analyses

Based on similar SFV monitoring well installation activities, EPA will analyze the drill cuttings for the following contaminants, in accordance with typical disposal facility requirements:

- Hexavalent chromium
- VOCs
- California Code of Regulations (CCR) Title 22 metals
- Total petroleum hydrocarbons – diesel (TPH-d)
- Total petroleum hydrocarbons – gasoline (TPH-g)
- pH

The QAPP provides the rationale for the chemical analyses listed above, based on experience with local disposal facilities and review of regulatory levels. EPA will request an expedited turnaround time (5 days) for characterization and disposal of drill cuttings and fluids to avoid additional costs associated with long-term storage and handling of the wastes.

SECTION 4

Request for Analyses

This section presents the requests for analyses for ground water and IDW sampling that will occur during the GCOU RI field activities. The EPA Region 9 Laboratory and EPA Contract Laboratory Program (CLP) will provide the laboratory analyses based on Statement of Work (SOW) SOM01.X. The QAPP provides summaries of the analytical parameters, target reporting limits, and regulatory goals for the samples.

4.1 Ground Water Sampling

EPA will conduct six different types of ground water monitoring events for the GCOU RI:

- Sampling of nine existing monitoring wells (1 event) (Table 4-1)
- Baseline sampling of newly installed Phase 1 EPA monitoring wells (1 event) (Table 4-2)
- Sampling of EPA Phase 1 wells and Respondents wells (23 wells), and 6 existing wells (1 event) (Table 4-1)
- Baseline sampling of newly installed Phase 2 EPA monitoring wells (1 event) (Table 4-2)
- Sampling of all new wells (29 wells), and 15 existing wells (2 events) (Table 4-1)
- Sampling of all new wells (29 wells), and 6 existing wells (2 events) (Table 4-1)

4.1.1 Analytical Parameters

Tables 4-1 and 4-2 summarize the analytical parameters and test methods for the ground water samples and associated QC samples for each sampling event. The QAPP provides the technical specifications for modifications to the analytical methods. Appendix A presents the RSCC Forms provided for planning purposes.

4.1.2 Schedule

EPA will coordinate each sampling event with the PRP, if applicable, to obtain site access and site-specific monitoring well information. EPA will also coordinate sampling events with ongoing EPA RI monitoring well activities to the extent possible to minimize mobilization and IDW transportation. EPA will provide direction regarding the preparation and submittal of the request for analyses for each sampling event, for communications related to PRP coordination, and for field preparations.

The proposed schedule for the above sampling events includes the following:

- Baseline sampling of the newly installed Phase 1 and Phase 2 EPA monitoring wells will occur approximately 1 month following the completion of each phase of well installations. Baseline sampling for the EPA monitoring wells is tentatively scheduled for late May and early September 2012, for Phase 1 and Phase 2, respectively.
- All other sampling events include existing wells or a combination of new and existing wells. These sampling events will take place on a quarterly basis in January, April, July, and October. Quarterly sampling will take place between July 2012 and July 2013. Some existing wells may be sampled in May 2012 during baseline sampling of Phase 1 EPA monitoring wells.

4.2 Investigation-Derived Waste Sampling

EPA will collect samples to characterize IDW for proper handling and disposal. IDW includes drilling cuttings, ground water generated during development and aquifer testing, decontamination rinsate, and purge water from ground water sampling. EPA will use the analytical results of IDW generated during ground water sampling to characterize purge water from sampling. EPA will collect IDW samples for all other types of IDW immediately

following installation and development of each monitoring well. EPA will analyze samples for the following constituents:

- Hexavalent chromium
- VOCs
- CCR Title 22 metals
- TPH-d
- TPH-g
- pH

Table 4-3 summarizes the specific analyses requested, preservatives, container requirements, and holding times for IDW samples. Appendix A presents the RSCC Forms provided for planning purposes. EPA will collect IDW samples throughout Phase 1 and Phase 2 of the well installations, which are tentatively scheduled to take place between April and August 2012.

SECTION 5

Field Methods and Procedures

This section provides information on the methods and procedures used in the GCOU RI. EPA's field investigation will include the following key investigation activities:

- Monitoring well installation
- Aquifer testing
- Ground water sample collection
- Decontamination
- IDW management
- Sample management procedures and documentation
- QC sampling

5.1 Monitoring Well Installation

EPA plans to install 17 new monitoring wells (15 water table monitoring wells and 2 deeper monitoring wells) at 15 different locations. For planning purposes, EPA assumes that the water table wells will be approximately 100 feet deep, and the deeper wells approximately 200 feet deep. EPA may modify the number and locations of new wells based on the initial RI field program results. The following sections outline the procedures for the monitoring well installation.

5.1.1 Borehole Utility Clearance

EPA will notify Underground Service Alert (Dig Alert) prior to breaking ground at each drilling location. Dig Alert will notify the appropriate member companies to mark utilities that may conflict with the proposed boring and monitoring well locations. In addition, after Dig Alert members have marked utilities, an independent utility-locating survey will identify other potential subsurface obstructions that may impact the proposed drilling location. If a proposed boring location conflicts with a marked utility or a suspected subsurface anomaly, EPA will mark an alternative (nearby) location and clear it for subsurface utilities. Prior to advancing the borehole using a drill rig, EPA will clear each location to the full borehole diameter to a depth between 5 and 10 feet using a combination of compressed air and vacuum.

5.1.2 Borehole Drilling

EPA will install 15 water table monitoring wells using hollow-stem auger (HSA) drilling methods and 2 deeper monitoring wells using air rotary drilling methods. A field hydrogeologist will log the soil samples or core collected during drilling to describe the lithology. Following completion of the boring, the field hydrogeologist will dispose of samples used for lithologic logging and soil cores with the drill cuttings. Due to the relatively shallow nature of the investigation and the selected drilling methods, EPA will not perform geophysical logging on the boreholes. Specific considerations for each drilling method are described below:

- **HSA Drilling:** Advancement of a 10-inch-diameter borehole to the total borehole depth, either in a single pass or with smaller-diameter augers and reamed to the full diameter. EPA anticipates that the total depth for HAS borings will extend approximately 20 to 30 feet into the saturated zone. EPA will collect soil samples using a modified-California split-spoon sampler approximately every 5 feet above the water table, and continuously from the water table to total depth for lithologic logging.
- **Air Rotary Drilling:** Each deeper monitoring well installed by air rotary will have an adjacent water table monitoring well installed by HSA (cluster well). At cluster well locations, completion of the shallower of the two boreholes first will allow evaluation of lithology down to the water table and determination of the screen interval for the water table well. While drilling the deeper boring, EPA will collect samples for lithologic logging during advancement of a 10-inch-diameter outer casing to the total borehole depth. It is assumed that

the deeper borehole at each cluster well location will extend approximately 100 feet below the water table. A field hydrogeologist will inspect soil cuttings from the deeper borehole for any significant changes in lithology above the water table between the two locations.

Section 5.6 presents the procedures for containment and disposal of fluids and drill cuttings produced during the drilling operation.

5.1.3 Borehole Lithologic Logging

The field hydrogeologist will maintain a log of the conditions encountered during drilling of the boreholes for the monitoring wells. The log will include lithologic and hydrogeologic descriptions along with notations on drilling activities and conditions encountered during drilling. An experienced field hydrogeologist will conduct lithologic logging under the direction of a California Professional Geologist. Appendix B provides the standard boring log used for recording lithologic observations.

The field hydrogeologist will describe unconsolidated materials using the Unified Soil Classification System (USCS) in accordance with American Society for Testing and Materials (ASTM) D 2488-84 (Appendix B). The format and order for soil descriptions will include:

1. USCS soil name with appropriate modifiers
2. Group symbol
3. Color (name and Munsell Chart code)
4. Moisture content
5. Relative density or consistency
6. Grain sizes and their relative percentages (e.g., 40 percent medium sand, 30 percent fine sand, 30 percent silt)
7. Angularity, mineralogy, degree of weathering, or other descriptors
8. Odor if present (e.g., hydrocarbon, hydrogen sulfide, or other chemical odor)

If sedimentary bedrock is encountered during drilling, the field hydrogeologist will note on the boring log the color, rock type (sandstone, shale, etc.), grain size distribution, mineralogy (if discernable by standard logging techniques), degree of weathering, and other descriptors.

5.1.4 Well Installation and Construction

The field hydrogeologist will direct construction of the monitoring wells through the auger flights or drill casing to prevent borehole collapse. Shallow monitoring wells will be completed with 30-foot screen intervals 10 feet above and 20 feet below the saturated zone encountered during drilling. Deep monitoring wells will be completed with 20-foot screen intervals. Figures 5-1 and 5-2 show typical well completion details for shallow and deep monitoring wells, respectively.

Once the well is in place, the driller will remove the augers or drive casing while simultaneously placing the filter pack around the screened interval; the filter pack will extend approximately 5 feet above the well screen. The driller will place a bentonite seal (minimum 5 feet thick) above the filter pack. The driller will place a cement-bentonite sanitary seal from the top of the bentonite seal to 2 feet bgs. The driller will set a flush-mounted well vault approximately 2 inches above existing grade. The locking riser will extend approximately 24 inches below grade. The driller will use a tremie pipe to install annular materials for deep monitoring wells. The well construction materials are outlined below.

- Well casing: flush-threaded 4-inch Schedule 80 polyvinyl chloride (PVC) blank well casing
- Well screen: flush-threaded 4-inch 0.020-inch slot Schedule 80 PVC well screen with a threaded PVC end cap
- Filter pack: Number 3 gradation, clean kiln-dried Monterey sand
- Bentonite seal: coated bentonite pellets
- Cement-bentonite sanitary seal: Type I or II Portland cement mixed with up to 5 percent (dry weight) bentonite

Section 5.6 presents the procedures for containing and disposing of the fluids and drill cuttings produced during the drilling operation.

5.1.5 Monitoring Well Development

After completion of well construction, a field hydrogeologist will develop the monitoring wells using a combination of bailing, swabbing, and pumping. Initial well development will consist of bailing residual solids from the well, followed by a combination of swabbing with a surge block and bailing of additional solids produced. Swabbing and bailing will continue until the well no longer produces settleable solids. After swabbing and bailing, EPA will place a submersible pump in the well to completely develop the screened interval. The pump will periodically cycle between on and off to induce backwashing of the water into the gravel pack and aquifer. During pump development, the field hydrogeologist will record drawdown and pumping rate to evaluate the specific capacity (drawdown as a function of pumping rate) of each monitoring well. Specific capacity information collected during development will be used to evaluate wells for additional pumping tests.

A field hydrogeologist will use a water quality meter (Horiba U-10 or equivalent) and turbidity meter (Hach 2100p or equivalent) to monitor field parameters (electric conductivity [EC], pH, temperature measured in degrees Celsius [°C], and turbidity) during well development. Development will continue until field parameters stabilize (e.g., ± 10 percent EC, ± 0.05 pH unit, ± 0.5 °C) after a minimum of three consecutive measurements, and discharge is less than 10 nephelometric turbidity units (NTU) or visually free of suspended solids as determined by the field hydrogeologist. The subcontractor will containerize and handle the development water in accordance with the IDW management procedures outlined in this FSP.

5.1.6 Monitoring Well Survey

After the monitoring wells are installed, a licensed professional land surveyor will survey the locations and elevations of all new monitoring wells. The survey will include ground surface elevation, well casing elevation, and monument elevation to the nearest 0.01 foot relative to msl. The land surveyor will provide the data in both latitude and longitude (to 7 decimal places) and state plane coordinates (California Zone 5) to the closest foot. The land surveyor will base the positions on North American Datum 1983 (NAD83) US Survey Feet; the elevations will be based on North American Vertical Datum 1988 (NAVD88). The land surveyor will provide the survey results in electronic format for upload into the SFV database.

5.2 Ground Water Sample Collection

EPA plans to sample existing and new monitoring wells during the GCOU RI. EPA will sample monitoring wells with dedicated electric submersible pumps using conventional (three-well-volume purge) ground water sampling procedures. EPA will use a portable low-flow sampling pump to sample wells that do not have dedicated sampling equipment. The following subsections describe ground water sample collection procedures for low-flow and conventional well sampling.

5.2.1 Low-Flow Ground Water Sampling

EPA will conduct low-flow ground water sampling at monitoring wells that do not have permanent pumps. The field hydrogeologist will place a 2-inch-diameter submersible pump with variable flow-rate control, as low as the 100-milliliter (mL) minimum rate recommended by EPA, in the middle of the screened interval. The field hydrogeologist will base the proper flow rate for each well on the ability to establish a low-flow rate at an acceptable level of drawdown (0.2 to 0.3 foot), with minimum fluctuations of the water level during pumping. To achieve this, the field hydrogeologist will initially operate the pump at the minimum flow capacity of the pump, and then increase the flow rate gradually until some initial drawdown is observed. The field hydrogeologist will then slightly reduce the flow rate to achieve a stabilized purge rate for the well (anticipated flow rates = 0.1 to 0.5 liters per minute [L/min]). However, the flow rate will not exceed 1.0 L/min in any circumstance.

The field hydrogeologist will use careful, continuous measurement of field parameters including turbidity, temperature, EC, dissolved oxygen (DO), oxidation-reduction potential (ORP), and pH to assess when purged water has reached equilibrium. The time interval between readings is dictated by the stabilized pumping rate for each well (typically between 1 and 3 minutes). An initial change in the measurements typically indicates that water is being drawn from a different source (“active” versus “stagnant” water). Stabilization of these parameters

would indicate that the water is coming from a steady-state source (the formation immediately surrounding the well screen near the pump intake). Equilibrium conditions are sometimes achieved after extraction of less than 10 liters, with 4 to 8 liters being the average reported in published studies.

5.2.2 Conventional Ground Water Sampling

Pumping of wells with dedicated sampling equipment will continue until field parameters (temperature, pH, turbidity, DO, ORP, and EC) have stabilized over three successive readings (+/- 1 degree in temperature, +/- 0.1 pH unit, +/- 10 percent turbidity, +/- 0.1 milligrams per liter [mg/L] DO, +/- 10 millivolts [mV] ORP, and +/- 3 percent EC), and a minimum of three casing volumes has been removed from the well before collecting samples. The field hydrogeologist will calculate the casing volume by multiplying the head of water in the casing (well depth minus depth to water) by the cross-sectional area of the casing (πr^2). The field hydrogeologist will base the casing volume determination on measurements of the depth to water at the time of sampling. The field hydrogeologist will record the volume of water pumped when measuring field parameters. If any of the parameter readings fall outside the calibration limits of the field instruments, the field hydrogeologist will recalibrate the instruments to a range that encompasses the observed values.

5.2.3 Field Parameter Measurement

The field hydrogeologist will use a Horiba U-22 equipped with a flow-cell, or equivalent, for field measurements of pH, EC, DO, ORP, and temperature. The field hydrogeologist will measure turbidity using a HACH 2100p turbidimeter, or equivalent. The flow-cell will allow for continuous monitoring of field parameters during low-flow ground water sampling. The field hydrogeologist will record field parameters on a ground water sampling purge form (Appendix B) or in the field notebook at a minimum of every 10 minutes while purging. The field hydrogeologist will thoroughly rinse the probes with distilled water between monitoring wells.

The field hydrogeologist will maintain and calibrate the equipment used to measure field parameters according to manufacturer specifications. The field hydrogeologist will calibrate the instruments at the start of each day and will record the data in the field logbook along with equipment serial number. As noted above, if field parameter readings fall outside the range of values used in calibration, the field hydrogeologist will recalibrate the instruments to a range that encompasses the observed values.

5.3 Decontamination

Decontamination of drilling, ground water sampling, water level measuring, and sample preparation equipment will occur prior to and after each use to prevent the introduction of contaminants from one location to the next. Decontamination will consist of combinations of steam cleaning and/or detergent wash, water rinse, and repeated distilled water rinse. The personnel conducting decontamination operations will wear Level D protective equipment. The subcontractor will containerize decontamination rinsate in accordance with the IDW management procedures outlined in the FSP. EPA will follow decontamination procedures outlined below for different types of equipment used during the field program.

- Downhole Drilling Equipment: Steam-clean all downhole equipment including augers, air rotary drive casing, and drill pipe prior to use on the project and between each drilling location.
- Water Level Indicator: Decontaminate the portion of the water level indicator cord that is inserted into a well as follows before and after use in each well:
 - Scrub the cord in an Alconox solution wash.
 - Wash and rinse the cord with potable tap water.
 - Rinse the cord with deionized/distilled water.
 - Air dry.
- Submersible Pump and Non-Dedicated Tubing: If possible, sample wells in an order progressing from least to highest contamination to prevent cross-contamination of wells with minimal or undetectable hexavalent chromium, chromium, and/or VOC concentrations. As an alternative to the decontamination procedure

described below, use new disposable discharge tubing at each well, with the pump mechanism decontaminated by submersion and pumping in detergent, potable water, and deionized water baths, consecutively.

Use the following procedure to decontaminate the pump and any reused discharge tubing between wells when a mobile submersible pump is used to sample wells without dedicated pumps:

- Submerge the pump and full length of discharge tubing in a nonphosphate detergent bath.
- Operate the pump while submerged to circulate detergent through the pump mechanism and discharge tubing. Operate pump long enough to allow a minimum of five tubing volumes to pass through the pump and discharge tubing.
- Remove the pump and tubing from the detergent bath, and pump any remaining detergent back into the detergent bath or to waste. Submerge the pump and the full length of discharge tubing in a potable water bath.
- Operate the pump while submerged to circulate potable water through the pump mechanism and discharge tubing, and flush out remaining detergent. Operate pump long enough to allow a minimum of five tubing volumes to pass through the pump and discharge tubing.
- Remove the pump and tubing from the potable water bath and pump any remaining rinse water into the potable water bath or to waste. Submerge the pump and the full length of discharge tubing in a deionized water bath.
- Operate the pump while submerged to circulate deionized water through the pump mechanism and discharge tubing, and flush out remaining potable water. Operate pump long enough to allow a minimum of five tubing volumes to pass through the pump and discharge tubing.
- Remove the pump and tubing from the deionized water bath, and pump any remaining deionized water into the deionized water bath.

5.4 Investigation-Derived Waste Management

Types of wastes generated during the field investigation activities include drill cuttings, water waste from well installation (development water, water produced during aquifer testing, and decontamination rinsate), ground water sampling purge water, used personal protective equipment, and disposable sampling equipment.

5.4.1 Drill Cuttings

The subcontractor will containerize drill cuttings in roll-off bins, 55-gallon drums, or a hopper and temporarily stage the containers at the drill site. Following drilling and well installation at each location, the subcontractor will transport soil cuttings to the Glendale Treatment Plant and transfer cuttings to roll off bins for temporary storage pending results from IDW sampling. The field hydrogeologist will collect composite soil samples bins and submit for laboratory analyses. The field hydrogeologist will collect composite soil samples by mixing approximately 1 liter of soil from the four corners of each roll-off bin in a stainless steel bowl. Based on the IDW analytical results and waste profiling, the subcontractor will transport wastes from the temporary storage area for disposal at an appropriately classified waste facility approved to receive wastes as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Off-Site Rule.

5.4.2 Water Waste from Well Installation

The subcontractor will containerize development water, water produced during aquifer testing, and decontamination rinsate in 55-gallon drums or tanks and temporarily store the containers at each drill site. At the end of each day, IDW water will be transported to the Glendale Treatment Plant and transferred to a tank for storage pending results from IDW sampling. When IDW water accumulation is complete, the sampler will collect a grab sample using a new disposable bailer at a rate of one per tank.

5.4.3 Ground Water Sampling Purge Water

The subcontractor will containerize ground water generated during monitoring well sampling and temporarily store the containers at the SFV staging area until the end of each individual sampling event. The subcontractor will use the volume of water purged from each monitoring well, calculated during sampling, and the analytical results from the monitoring well to profile the waste. EPA assumes that the minimum volume of waste generated during ground water sampling will be disposed at the SFV BOU Treatment Plant.

5.4.4 Disposable Sampling and Personal Protective Equipment

The field hydrogeologist will clean off, bag, and place the disposable sampling and personal protective equipment generated during the performance of the work in a dumpster for disposal as municipal refuse.

5.5 Sample Containers and Preservation

Tables 4-1 through 4-3 summarize the sample container requirements and preservation methods for each analysis. The field hydrogeologist will use pre-preserved containers for samples requiring chemical preservatives. The field hydrogeologist will purchase the sample containers with certificates of cleanliness from approved laboratory product suppliers. Special considerations for certain analyses or preservation methods include the following:

- Filtered samples: Samples requiring field filtration will be passed through a 0.45-micrometer (μm) filter immediately after collection. Disposable 0.45- μm inline filters will be used where wellhead samples are collected.
- Chemical preserved samples: Select samples will be collected in containers pre-preserved with hydrochloric acid (HCl), nitric acid (HNO_3) and sulfuric acid (H_2SO_4) to lower the sample pH to less than 2. The field hydrogeologist will exercise care when filling these bottles to not spill preservatives and to keep containers downwind to avoid chemical fumes. Samples will be periodically tested to ensure sufficient preservatives have been added (for example, a test bottle or vial). Test bottles will be filled and checked to determine if sufficient preservatives have been added using the following steps (or similar):
 - Add preservative to test sample vial.
 - Fill the pre-preserved test bottle, cap, and invert to ensure mixing.
 - Test pH to determine if less than 2 is achieved. If the desired pH is achieved, discard test container and collect sample.
 - If the sample container does measure less than 2, an increased amount of preservative will be required.
- Volatile organic analyses (VOA): Water samples to be analyzed for VOA (VOCs, TPH-g, and 1,2,3-TCP) will be collected in three 40-milliliter (mL) glass VOA vials. A sufficient amount of 1:1 HCl will be placed inside the vials to lower the sample pH to less than 2. The vials will be filled so that no head space is present after sample collection. Filled containers will be checked by inverting the vial and tapping to reveal any air bubbles. If air bubbles are present, containers will be emptied, re-acidified, and refilled. If air bubbles remain after several attempts at sample collection, the sample will be described in the field logbook as an “aerated sample.” The field hydrogeologist will place the VOA vials in a cooler at 4°C and store away from sunlight prior to shipping.

5.6 Field Documentation and Sample Management Procedures

The following section discusses field documentation and various sample management procedures implemented during field activities. Included below are procedures for field documentation, sample labeling, sample packaging, and sampling shipping.

5.6.1 Field Documentation

Field Logbooks

The field hydrogeologist will record all daily activities during well installation and ground water sampling events in bound and numbered logbooks. Information in the logbooks will include, at a minimum, the following:

- Name and title of the recorder
- Date and time of entry
- General description of weather conditions
- General description of personnel involved with the activities
- Photographic log, if appropriate
- Names of visitors, their associations, and purpose of visit
- Approximate duration and purpose for downtime, if applicable
- Unusual activities such as departures from planned procedures
- References to important telephone calls

Additional information recorded during ground water sampling includes:

- Sampling location and description
- Location of duplicate and QC samples, date and time of collection, analyses, sample and blank identification numbers, and collection of split samples (if applicable and, if so, for whom)
- Condition of well being sampled
- Serial number and calibration of field instruments
- Parameter values obtained during purging
- Odor (if any) noted in purge water (e.g., hydrocarbon, hydrogen sulfide, or other chemical odor)
- Time of sampling
- Sample description

The recorder will complete, sign, and date all logs in waterproof ink. The recorder will make any corrections by crossing out the error with a single horizontal line, initialing the correction, and entering the correct information. Crossed-out information shall be readable.

Chain-of-Custody Forms

Chain-of-custody (COC) procedures will document sample collection and possession. Forms II Lite or Scribe COC procedures will be used for samples shipped to CLP laboratories and traditional paper/carbon copy COCs will be used when shipping samples to the Region 9 Laboratory. The original record (field printout for Forms II Lite/Scribe and white copy for Region 9) accompanies the shipment to the laboratory, and the SM retains a copy (duplicate printout for Forms II Lite/Scribe and pink copy for Region 9). The sampling team member will sign and date all COC forms and custody seals. The QAPP contains additional information on COC procedures.

The sampling team member will send completed field QA/QC summary forms to the RSCC at the EPA Region 9 Quality Assurance Office (QAO) at the conclusion of each sampling event.

5.6.2 Sample Labeling

Each sample container label will include the following information written with a permanent marker and covered with clear plastic tape:

- Sample location number and CLP sample number (if used)
- Case number (if applicable)
- Type of analysis requested
- Preservative used
- Date and time collected

For example, the identification of sample 12-EPAGW-07-05-01-XXX is defined as follows:

12 = the year in which the sample was collected

EPAGW = EPA ground water monitoring well

07-05 = Location 7 at 5 feet bgs

01 = primary sample; 02 = duplicate; 03 = blank; 04 = performance evaluation (PE) sample

XXX = a unique sequential number to ensure unique sample identity

Immediately following sample collection, the field hydrogeologist will close the filled sample containers with completed labels, place custody seals on the container's lid/cap, place in resealable plastic bags, and place in a cooler containing ice. The field hydrogeologist will wrap the VOA vials (three vials per sample) together in bubble wrap; secure with tape; and place into labeled, resealable plastic bags. The field hydrogeologist will wrap all other glass bottles in bubble wrap and place into labeled, resealable plastic bags.

5.6.3 Sample Packaging and Shipment

Preparation of Sample Coolers

1. Remove all previous labels used on the cooler.
2. Seal all drain plugs with tape (inside and outside).
3. Place a cushioning layer of recyclable cornstarch popcorn or bubble wrap at the bottom of the cooler.
4. Line the cooler with a large plastic bag to contain samples.
5. Double-bag all ice in resealable plastic bags and seal.

Packing Samples in Coolers

1. Place custody seals on closed sample containers with completed labels, place in labeled resealable plastic bags, and place in a cooler containing ice. Wrap glass bottles in bubble wrap and place into labeled, resealable plastic bags.
2. Place custody seals over the lids of each sample container. Place custody seals on the VOA vials around the lid to prevent covering the septum.
3. Place the COC form in a resealable plastic bag and tape to the underside of the cooler lid.
4. Make sure that all glass sample containers are packaged in bubble wrap and secured with clear mailing tape.
5. Place samples in an upright position in the cooler.
6. Place ice on top of and between the samples.
7. Fill the remaining voids with recyclable cornstarch popcorn or double-bagged ice.
8. Place a custody seal on large plastic bag containing samples and packing material.

Closing and Shipping of Cooler

Secure coolers with packing tape and custody seals as described below.

1. Tape the cooler lid with strapping tape, encircling the cooler several times.
2. Place COC seals on two sides of the lid (one in front and one on the side).
3. Place "This Side Up" arrows on the sides of the cooler.

Ship the coolers to the appropriate laboratory by overnight courier the day of sample collection. The field hydrogeologist will report the sample shipment for each day to the EPA Region 9 RSCC Coordinator. For Friday shipments, contact the RSCC prior to 12:00 p.m. to coordinate with laboratories that will receive sample shipments on Saturday. The field hydrogeologist will ship samples on Friday only if the laboratory provides assurance that analytical holding times will not be exceeded.

5.7 Quality Control Sampling

The field hydrogeologist will collect QC samples to assist in determining data reliability. QC samples include field duplicates, blanks, and laboratory QC samples (for MS/MSD) and are normally collected from locations that are suspected of moderate contamination. The field hydrogeologist will collect QC samples concurrent with, and using the same procedures as, the collection of the target environmental samples. QC samples will not be collected or prepared in association with IDW sampling.

5.7.1 Field Duplicates

A field duplicate is an independent sample collected as close as possible to the original sample from the same source and is used to document sampling precision. The field hydrogeologist will label and package field duplicates in the same manner as other samples so that the laboratory cannot distinguish between samples and duplicates. The field hydrogeologist will collect field duplicates by alternately filling sample and duplicate containers at a location of known or suspected contamination. Each duplicate will be taken using the same sampling and preservation method as other samples. The field hydrogeologist will collect field duplicates at a minimum frequency of 1 for every 10 samples.

5.7.2 Blank Samples

The field hydrogeologist will submit one blank sample each day that sampling is conducted. Blank samples are collected to verify that contamination is not introduced to samples during collection, handling, or shipping of the samples. The field hydrogeologist will use reagent-grade deionized water for organic and inorganic analyses. The field hydrogeologist will prepare and label blanks in the same manner as the field samples, and send "blind" to the laboratory. The field hydrogeologist will collect equipment blanks when sampling equipment is decontaminated and reused in the field (for example, a temporary pump). Otherwise, the field hydrogeologist will collect a field blank (also called a field bottle blank).

Equipment Blank

The field hydrogeologist will collect equipment blanks by pouring the appropriate water into the decontaminated sampling equipment or vessel, then transferring the water to the sample bottles. The field hydrogeologist will use the same preservation methods, packaging, and sealing procedures as used during collection of normal samples.

Field Blank

The field hydrogeologist will collect a field blank by pouring the appropriate blank water directly into the sample bottles at the sample location. The field hydrogeologist will use the same preservation methods, packaging, and sealing procedures as used during collection of normal samples.

5.7.3 Laboratory QC Samples

The field hydrogeologist will collect laboratory QC samples to perform MS/MSD analyses. An MS is an aliquot of a sample spiked with a known concentration of the target analyte(s) and provides a measure of accuracy. The

MSD is a laboratory split sample of the MS and is used to determine the precision of the method. The field hydrogeologist will collect twice the normal water volume in the field for laboratory QC samples. Laboratory QC samples will be labeled as such on sample bottles and paperwork. The field hydrogeologist will collect the MS/MSDs at the discretion of the field sampling team, at a frequency of 1 for every 20 consecutively collected samples.

5.7.4 Performance Evaluation Samples

EPA plans to submit a performance evaluation (PE) sample to be sent to the laboratory for hexavalent chromium analysis. The PE sample will only be prepared for hexavalent chromium because the RI will focus primarily on chromium contamination in ground water and associated potential risks to human health and the environment.

The PE sample will be prepared by an outside laboratory and provided to the sample team by the EPA Region 9 QAO. The PE sample will be handled, labeled, and packaged using the same procedures outlined in the FSP for other ground water samples.

SECTION 6

Health and Safety Plan

The Health and Safety Plan for this project is included in Appendix C of this FSP.

SECTION 7

References

California Regional Water Quality Control Board, Los Angeles Region (LARWQCB). 2002. *Final Chromium VI Investigation Report, San Fernando Valley, Phase I Inspections*. August 28.

CH2M HILL. 2005. *Final Burbank and Glendale Operable Units Focused Chromium Trend Study*. Prepared and submitted to EPA Region 9. June.

———. 2007. *2006 Report - San Fernando Valley Basin Ground Water Monitoring Program, San Fernando Valley*, Los Angeles, California. December.

———. 2008. *First Five-Year Review Report for San Fernando Valley Area 2 Superfund Site, Los Angeles County, California*. September.

James M. Montgomery, Consulting Engineers, Inc. (JMM). 1992. *Remedial Investigation of Ground Water Contamination in the San Fernando Valley, Remedial Investigation Report*. December.

United States Environmental Protection Agency (EPA). 2012a. *Revised Draft Quality Assurance Project Plan, Remedial Investigation San Fernando Valley Area 2 Superfund Site Glendale Chromium Operable Unit*. Prepared by CH2M HILL. March.

United States Environmental Protection Agency (EPA). 2012b. *Revised Draft Work Plan, Remedial Investigation San Fernando Valley Area 2 Superfund Site Glendale Chromium Operable Unit*. Prepared by CH2M HILL. March.

Upper Los Angeles River Area Watermaster. 2002. *Watermaster Service in the Upper Los Angeles River Area, Los Angeles County: 200-2001 Water Year, October 1, 2000 – September 30, 2001*. May.

Tables

TABLE 1-1
 Key CH2M HILL Project Personnel for Remedial Investigation Field Program Implementation
San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Personnel	Title	Project Role	Phone Number
David Towell	Senior Project Manager	Project Management	(213) 228-8285
Kimberly Waite	Project Manager	Senior Review	(714) 435-6073
Rick Cavil	Regional Health and Safety Manager	Health and Safety Management	(408) 896-0140
BJ Lechler	RI Manager	RI Management	(714) 435-6283
Artemis Antipas	Quality Assurance Manager	Data Quality Assurance	(425) 453-5005 x5051
TBD	Field Team Leader	Drilling and Aquifer Testing	TBD
Mike Ladeau	Field Team Leader	Ground Water Sampling and Monitoring Well Development	(714) 227-3324
Mike Palm	Field Team Member	Ground Water Sampling	(714) 388-7594

TBD = to be determined

TABLE 3-1

Data Needs and Potential Monitoring Well Locations

San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Data Gap Area ¹	Data Need	Well ID	Notes/Justification for New EPA Monitoring Well	Considerations for Placement of Phase 2 EPA Monitoring Wells
A ²	Insufficient hexavalent chromium and ground water level data are available in this area to delineate the extent of contamination and to assess ground water flow directions and contaminant transport rates from the Burbank OU into the northern part of the Glendale Chromium OU (GCOU).	None	All required RI monitoring wells in Area A will be installed by the GCOU Respondents.	
B	Insufficient hexavalent chromium and ground water level data are available in this area to delineate the extent of contamination and provide data to assess ground water flow directions and contaminant transport rates from the North Hollywood OU into the western part of the GCOU. The area of particular concern is an undefined area of contamination in the western part of the GCOU that contains hexavalent chromium concentrations exceeding 5 µg/L. In addition, there is potential migration of lower level hexavalent chromium contamination from the southwestern portion of the Burbank OU into the western portion of the GCOU.	1	Two well cluster is intended to: - Evaluate the lateral and vertical extent of hexavalent chromium contamination detected at Basinwide RI monitoring wells NH-C06-160 and NH-C06-285.	
		2	- Provide additional information to evaluate ground water flow direction and horizontal and vertical gradients in western GCOU.	
		12	Well is intended to further delineate the lateral extent of the contamination detected in NH-C06.	Well location will be based on water quality results from Wells #1/2 and #5 and an updated review of flow directions based on new ground water elevation data: - For example, may move northeast if ground water flow is more easterly and concentrations in Wells #1/2 are low - May move southeast if ground water flow is to the southeast and Wells #1/2 or #5 contain elevated concentrations
		13	Well is intended to further delineate the lateral extent of the contamination detected in NH-C06.	Well location will be based on water quality results from Wells #1/2 and # 5 and an updated review of flow directions based on new ground water elevation data: - For example, may move southeast if ground water flow is southeasterly and concentrations in Wells #1/2 or Well #5 are elevated. - May move a considerable distance northeast if ground water flow is to the east and concentrations in Wells #1/2 are low.
C ²	The eastern extent of hexavalent chromium contamination in this area (east of the merging, intermingled plumes that parallel Interstate 5) is incompletely delineated. In addition, ground water with elevated hexavalent chromium concentrations may be bypassing the GNOU extraction wells to the northeast.	3	Well is intended to evaluate hexavalent chromium concentrations along the eastern edge of the primary hexavalent chromium contamination that parallels Interstate 5 and in the vicinity of a plating facility that is not currently monitored.	Well location could be moved or the well eliminated pending results from the Respondents Well 9P: - If Well 9P contains hexavalent chromium; install well either at planned location or further to the north. - If Well 9P does not contain hexavalent chromium; Well #3 may not be needed or may be specifically focused on the plating facility.
		4	Well is intended to evaluate hexavalent chromium concentrations between the GNOU extraction wells and CS-VPB-09.	Well may move or no longer be needed pending results from GRG Well GN-P10: - If Well GN-P10 contains elevated hexavalent chromium; install well generally as planned or move south/southeast - If Well GN-P10 hexavalent chromium concentration is low/non-detect; Well #4 may not be needed or may be moved southeast near the leading edge of contamination.
D	Insufficient hexavalent chromium and ground water level data are available in the southwestern part of the Glendale OU to delineate the extent of contamination and provide data to assess ground water flow directions and contaminant transport rates in this area. Areas of particular concern include an incompletely delineated plume near the former All Metals Processing facility that contains chromium concentrations exceeding 50 µg/L and an area of sparse data far to the west.	5	Well is intended to: - Provide additional data to evaluate hexavalent chromium concentrations ground water flow directions in western GCOU. - Assist in characterizing an anomalous upgradient total chromium detection noted during recent site investigation activities.	
		14	Well is intended to evaluate conditions north of the Los Angeles River in an area of historic ground water recharge	This is a lower priority location because of the limited number of potential sources in this vicinity. Location could be moved to the north if Well #5 contains elevated hexavalent chromium.
		None	The required monitoring downgradient of the former All Metals Processing facility will be provided by two Area D wells to be installed by the GCOU Respondents.	
E ²	Insufficient hexavalent chromium data are available along the Los Angeles River corridor and south/southeast of the GNOU extraction wellfield to indicate whether hexavalent chromium contamination is present in this area and migrating into the GSOU or along the river corridor.	6	Well is intended to: - Provide data on chromium concentrations and ground water flow conditions south/southwest of the GNOU extraction wells - Improve the conceptual model regarding surface water and ground water interaction along the Los Angeles River in this area.	Well may move or no longer be needed pending results from GRG Well GN-P11 and Respondents Well 7P: - If Well GN-P11 contains hexavalent chromium and the Well 7P concentration is low/non-detect; well likely to be installed as planned. - If Well 7P contains hexavalent chromium and Well GN-P11 concentration is low/ND; well may be moved east of Well 7P. - If Well GN-P11 and 7P chromium concentrations are both non-detect; well may not be needed in this area. Conversely, if both wells have elevated hexavalent chromium, additional wells may be needed in the western portion of Area E.

TABLE 3-1

Data Needs and Potential Monitoring Well Locations

San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Data Gap Area ¹	Data Need	Well ID	Notes/Justification for New EPA Monitoring Well	Considerations for Placement of Phase 2 EPA Monitoring Wells	
F ²	Insufficient hexavalent chromium data are available in the Los Angeles River Narrows area to delineate the eastern and western margins of contamination in the GSOU and between known hexavalent chromium source areas upgradient from the GSOU extraction wells.	7	Two well cluster is intended to: - Evaluate the lateral and vertical extent of chromium between upgradient sources and the GSOU extraction wells.	Well may move pending results from Respondents Wells 6P/12P and existing well sampling (Well of Opportunity and GNOU monitoring wells): - If 6P/12P both contain high levels of hexavalent chromium; Well cluster #7/8 will likely be shifted west, using the existing well results as a guide. - If both the existing shallow well sampling and Well 6P contain high levels of chromium; Well #7, the planned EPA shallow well, may not be needed.	
		8	- Provide data to more accurately predict future hexavalent chromium concentrations and arrival times at the GSOU extraction wells		
		15	Well is intended to: - Evaluate hexavalent chromium concentrations downgradient of PRC-Desoto and cross gradient of the former Drilube Facility - Improve understanding of impacts from the Los Angeles River on ground water conditions in the area.		Well may move pending results from Respondents Well 7P and Respondents existing well sampling in the area: - If 7P contains elevated hexavalent chromium; Well #15 may be moved west closer to the river. - If Well 7P and the existing well sampling in this vicinity are non-detect for hexavalent chromium; Well #15 may not be needed.
		16	Well is intended to evaluate hexavalent chromium concentrations between the upgradient former Drilube Facility and the downgradient former Excello Plating facility/GSOU extraction wells.		Well may move or no longer be needed pending results from Respondents Wells 6P/12P: - If 6P/12P contains elevated hexavalent chromium; Well #16 location will remain generally unchanged. - If Wells 6P/12P contain low or non-detect levels of hexavalent chromium; Well #16 will not likely be needed.
G ²	Insufficient hexavalent chromium data are available to (1) delineate the extent of contamination downgradient (south) of the GSOU extraction wellfield where contamination migrated either prior to construction of the extraction wells or due to incomplete hydraulic control and (2) assess hydraulic gradients between the GSOU and LADWP's Pollock water supply wellfield.	9	Well is intended to: - Characterize conditions downgradient of the GSOU extraction wells. - Improve understanding of impacts from the Los Angeles River on ground water conditions in the area.		
		10	Well is intended to characterize conditions downgradient of the GSOU extraction wells and upgradient of the Pollock wellfield.		
		11	Well is intended to characterize conditions downgradient of the GSOU extraction wells and upgradient of the Pollock wellfield. An active facility has nearby monitoring wells that may be used to supplement information in this area. The facility well closest to Well #11 extends greater than 50 feet beneath the water table and is not adequate for RI evaluations.		
		17	Well is intended to evaluate ground water conditions at the southern end of the GCOU upgradient of the Pollock wellfield.	Well may move or no longer be needed pending results from EPA Phase Wells #9-11: - If all three new Phase 1 wells contain hexavalent chromium; Well #17 may move farther south and would be placed downgradient of the highest concentrations - If all three wells contain low or non-detect levels of hexavalent chromium; Well #17 is no longer needed.	

Orange shading - Priority well to be installed during in Phase 1 of the EPA RI (6 wells).

Yellow shading - Well to be installed in EPA RI Phase 2 (up to 11 wells); final locations to be determined based on Phase 1 EPA and Respondents results and data from the GOU FFS fieldwork.

¹ Areas for additional chromium investigation were originally identified in the 2005 Burbank and Glendale Operable Units Focused Chromium Trend Study (CH2M HILL, 2005). This was followed by the 2007 Priority Ranking of Potential Well Sites for Chromium Monitoring Technical Memorandum (TM) (CH2M HILL, 2007). The current areas were developed by CH2M HILL in early 2009 following evaluation of hexavalent chromium data generated during the 2008 sampling of wells identified in the 2007 TM and other updated water quality data. The areas represent fairly broad, generalized areas where data gaps remain. The proposed RI well locations shown in Figure 3-1 were placed in focused, higher-priority areas within the bounds of the larger investigation areas.

² The investigation areas shown on Figure 3-1 extend well to the east of any of the currently planned monitoring locations. However, based on our current understanding of ground water flow conditions, the documented extent of hexavalent chromium contamination and potential hexavalent chromium source locations, additional investigation further to the east does not appear to be warranted at this time.

TABLE 3-2

Facilities Within Area 2 Being Investigated as Potential Sources of Chromium Contamination to Ground Water
San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Facility Name or Type	Site Number	Site Status
Sites Having Received General Notice Letters from EPA		
All Metals Processing	6	Removal action completed. Additional remediation on hold
Drilube Company - Wilson	2	Initial removal action completed. Additional remediation pending.
Automation Plating Corp.	7	Limited soil investigation completed.
Excello Plating Co., Inc.	1	Work started on implementation of the Remedial Action Plan.
ITT Aerospace Controls (Home Depot)	8	Remedial Action Plan in place; starting implementation of the final phase of remediation.
Menasco Division (Goodrich Corporation)	11	Remedial Action Plan in place; planning underway for additional remedial action steps.
PRC-Desoto International	4	Remedial Action Plan in place; final round of in-situ remediation under way and cleanup confirmation sampling being planned.
Sites Being Investigated by the RWQCB*		
Former metal finishing facility	13	Initial soil investigation conducted.
Former industrial wastewater discharger	5	Initial soil investigation completed.
Former metal finishing facility	12	Shallow soil remedial action completed. Potential deep soil remediation on hold.
Former metal finishing facility	10	Planning underway for initial soil investigation.
Former heavy metal processes	14	Initial soil investigation conducted.
Former metal finishing facility	16	Planning underway of initial soil investigation.
Sites Being Investigated by DTSC		
Former metal finishing facility	17	Soil characterization complete.
*The sites listed are, in general, those where active soil investigation or remediation is being overseen by the RWQCB. Numerous additional sites are also under consideration as potential sources of chromium contamination.		

TABLE 3-3

All Metals Processing and Drilube Company Facilities – Well Construction Data
San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Well Name	Installation Date	Total Depth (feet bgs)	Surface Elevation (msl)	Casing Diameter (inches)	Top Screen (feet bgs)	Bottom Screen (feet bgs)
All Metals Processing						
AMP-W1	09/01/1995	75	504	4	45	75
AMP-W3	06/08/2009	75	504	4	55	75
Drilube Company						
DRC-MW1	06/09/1994	75	475	4	45	70
DRC-MW2	07/28/1994	79	477	4	50	75
DRC-MW3	08/17/1994	75	475	4	45	70
DRC-MW4	--	--	--	4	--	--
DRC-MW5	--	--	--	4	--	--
DWB-W1	12/21/1993	80	476	4	45	75
DWB-W3	12/22/1993	80	476	4	46	76

TABLE 3-4
 Ground Water Sample Collection Summary
San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Sampling Event	Sample Locations	Field Duplicate Samples	Blank Samples	Total Samples (per event)	MS/MSD Samples
9 Drilube/All Metals Monitoring Wells Only (1 event)	9	1	3	13	1
Baseline New Phase 1 EPA Monitoring Wells (1 event)	6	1	2	9	1
18 New (6 EPA and 12 Respondents) + 6 Existing (TBD) Monitoring Wells (1 event)	24	3	4	31	2
Baseline New Phase 2 EPA Monitoring Wells (1 event)	11	2	4	17	1
29 New (17 EPA +12 Respondents) + 15 Existing (9 Drilube/All Metals + 6 TBD) Monitoring Wells (2 events)	44	5	7	56	3
29 New (17 EPA +12 Respondents) + 6 Existing (TBD) Monitoring Wells (2 events)	35	4	5	44	3

TABLE 3-5
 Analytical Parameters and Rationale – Ground Water Sampling
 San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Analytical Parameter	Frequency	Rationale
Hexavalent Chromium Total Chromium	Each Event	Monitor hexavalent and total chromium that is a contaminant of concern and has been detected across Area 2.
Dissolved Metals/Cations (field filtered) ¹	Baseline Event at New EPA Wells	Monitor metals that have been detected at other locations above maximum contaminant levels (MCLs) and are potential contaminants of concern across Area 2; indicator of ground water quality.
VOCs	Baseline Event at New EPA Wells	Monitor VOCs that have been detected above MCLs and are contaminants of concern across Area 2; indicator for ground water contamination. Provide additional analytical data for focused feasibility studies in GNOU and GSOU.
Emerging Compounds: 1,2,3-TCP, 1,4-dioxane, NDMA, and perchlorate	Baseline Event at New EPA Wells ²	Monitor emerging compounds that are potential contaminants of concern across Area 2; indicator for ground water contamination. Provide additional analytical data for focused feasibility studies in GNOU and GSOU.
Ammonia, Major Anions, Nitrate, Nitrite, Sulfide, Total Kjeldahl Nitrogen, and Total Alkalinity	Baseline Event at New EPA Wells	Indicator for ground water contamination; useful for assisting with evaluation of interim treatment remedies.
Dissolved Oxygen, Total Dissolved Solids (TDS), and Total Organic Carbon	Baseline Event at New EPA Wells	Indicator for ground water contamination; useful for assisting with evaluation of interim treatment remedies.

¹ Samples will be filtered in field using a 0.45-micrometer (μm) filter.

² Emerging compounds will be sampled during the initial baseline sampling event at new EPA monitoring wells. Ground water samples may be analyzed for select emerging compounds during subsequent sampling events pending the baseline results.

TABLE 4-1
 Analyses Requested for Ground Water Samples – Routine Sampling Events
 San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested	Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered)
Analysis Method	EPA 218.6	EPA 218.6	CLP or EPA 6000/7000 Series	CLP or EPA 6000/7000 Series
Preservatives	Cool to 4° C	0.45-µm filter, Cool to 4° C	HNO ₃ to pH <2, cool to 4°C	0.45-µm filter, HNO ₃ to pH <2, cool to 4°C
Analytical Holding Time	< 24 Hours	< 24 Hours	< 6 months	< 6 months
Number of Containers	1 x 250-mL poly bottle	1 x 250-mL poly bottle	1 x 1-liter poly bottle	1 x 1-liter poly bottle

Sample Locations	Sample Type	Sample Day	Conc.	Number of Samples			
Sampling of 15 existing monitoring wells							
DRC-MW4 (B)	Blank	1	Low	1	1	1	1
DRC-MW4		1	“	1	1	1	1
DWB-W3		1	Med	1	1	1	1
DWB-W3 (D)	Dup 1	1	“	1	1	1	1
DRC-MW2		1	“	1	1	1	1
DWB-W1 (B)	Blank	2	High	1	1	1	1
DWB-W1		2	“	1	1	1	1
DRC-MW3		2	“	1	1	1	1
DRC-MW5		2	“	1	1	1	1
DRC-MW1		2	“	1	1	1	1
AMP-W1 (B)	Blank	3	“	1	1	1	1
AMP-W1		3	“	1	1	1	1
AMP-W3 (L)	Lab QC	3	“	1	1	1	1
Subtotal				13	13	13	13
Sampling of EPA Phase 1 wells and Respondents wells (18 wells), and 6 existing wells							
Location 1 (B)	Blank	1	TBD	1	1	1	1
Location 1		1	“	1	1	1	1
Location 2		1	“	1	1	1	1
Location 2 (D)	Dup 1	1	“	1	1	1	1
Location 5 (L)	Lab QC	1	“	1	1	1	1
Location 9		1	“	1	1	1	1
Location 10		1	“	1	1	1	1
Location 11		1	“	1	1	1	1

TABLE 4-1
 Analyses Requested for Ground Water Samples – Routine Sampling Events
 San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested				Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered)
Sample Locations	Sample Type	Sample Day	Conc.	Number of Samples			
Respondents 1P (B)	Blank	2	“	1	1	1	1
Respondents 1P		2	“	1	1	1	1
Respondents 2P		2	“	1	1	1	1
Respondents 3P		2	“	1	1	1	1
Respondents 4P		2	“	1	1	1	1
Respondents 4P (D)	Dup 1	2	“	1	1	1	1
Respondents 5P		2	“	1	1	1	1
Respondents 6 P		2	“	1	1	1	1
Respondents 7P (B)	Blank	3	“	1	1	1	1
Respondents 7P		3	“	1	1	1	1
Respondents 8P		3	“	1	1	1	1
Respondents 9P		3	“	1	1	1	1
Respondents 10P		3	“	1	1	1	1
Respondents 12P		3	“	1	1	1	1
Respondents 13C		3	“	1	1	1	1
TBD #1 (B)	Blank	4	“	1	1	1	1
TBD #1		4		1	1	1	1
TBD #2		4	“	1	1	1	1
TBD #3		4	“	1	1	1	1
TBD #4		4	“	1	1	1	1
TBD #4 (D)	Dup 1	4	“	1	1	1	1
TBD #5		4	“	1	1	1	1
TBD #6 (L)	Lab QC	4	“	1	1	1	1
Subtotal				31	31	31	31
Sampling of all new EPA and Respondents wells (29 wells), and 15 existing wells							
Location 1 (B)	Blank	1	TBD	1	1	1	1
Location 1		1	“	1	1	1	1
Location 2		1	“	1	1	1	1
Location 2 (D)	Dup 1	1	“	1	1	1	1
Location 3		1	“	1	1	1	1
Location 4		1	“	1	1	1	1
Location 5		1	“	1	1	1	1

TABLE 4-1
 Analyses Requested for Ground Water Samples – Routine Sampling Events
San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested				Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered)
Sample Locations	Sample Type	Sample Day	Conc.	Number of Samples			
Location 6 (L)	Lab QC	1	“	1	1	1	1
Location 7 (B)	Blank	2	“	1	1	1	1
Location 7		2	“	1	1	1	1
Location 8		2	“	1	1	1	1
Location 9		2	“	1	1	1	1
Location 10		2	“	1	1	1	1
Location 11		2	“	1	1	1	1
Location 12 (B)	Blank	3	“	1	1	1	1
Location 12		3	“	1	1	1	1
Location 13		3	“	1	1	1	1
Location 14		3	“	1	1	1	1
Location 15		3	“	1	1	1	1
Location 15 (D)	Dup 1	3	“	1	1	1	1
Location 16		3	“	1	1	1	1
Location 17		3	“	1	1	1	1
Respondents 1P		4	“	1	1	1	1
Respondents 2P		4	“	1	1	1	1
Respondents 3P		4	“	1	1	1	1
Respondents 4P		4	“	1	1	1	1
Respondents 4P (D)	Dup 1	4	“	1	1	1	1
Respondents 5P		4	“	1	1	1	1
Respondents 6P		4	“	1	1	1	1
Respondents 7P (B)	Blank	5	“	1	1	1	1
Respondents 7P		5	“	1	1	1	1
Respondents 8P		5	“	1	1	1	1
Respondents 9P		5	“	1	1	1	1
Respondents 10P		5	“	1	1	1	1
Respondents 12P		5	“	1	1	1	1
Respondents 13C		5	“	1	1	1	1
DRC-MW4 (B)	Blank	6	Low	1	1	1	1
DRC-MW4		6	“	1	1	1	1
DWB-W3		6	Med	1	1	1	1
DWB-W3 (D)	Dup 1	6	“	1	1	1	1

TABLE 4-1
 Analyses Requested for Ground Water Samples – Routine Sampling Events
San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested				Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered)
Sample Locations	Sample Type	Sample Day	Conc.	Number of Samples			
DRC-MW2		6	“	1	1	1	1
DWB-W1		6	High	1	1	1	1
DRC-MW3		6	“	1	1	1	1
DRC-MW5		6	“	1	1	1	1
DRC-MW1		6	“	1	1	1	1
AMP-W1		6	“	1	1	1	1
AMP-W3		6	“	1	1	1	1
TBD #1 (B)	Blank	7	TBD	1	1	1	1
TBD #1		7	“	1	1	1	1
TBD #2		7	“	1	1	1	1
TBD #3		7	“	1	1	1	1
TBD #4		7	“	1	1	1	1
TBD #5		7	“	1	1	1	1
TBD #5 (D)	Dup 1	7	“	1	1	1	1
TBD #6 (L)	Lab QC	7	“	1	1	1	1
Subtotal				56	56	56	56
Sampling of all new EPA and Respondents wells (29 wells), and 6 existing wells							
Location 1 (B)	Blank	1	TBD	1	1	1	1
Location 1		1	“	1	1	1	1
Location 2		1	“	1	1	1	1
Location 2 (D)	Dup 1	1	“	1	1	1	1
Location 3		1	“	1	1	1	1
Location 4		1	“	1	1	1	1
Location 5		1	“	1	1	1	1
Location 6 (L)	Lab QC	1	“	1	1	1	1
Location 7		1	“	1	1	1	1
Location 8 (B)	Blank	2	“	1	1	1	1
Location 8		2	“	1	1	1	1
Location 9		2	“	1	1	1	1
Location 10		2	“	1	1	1	1
Location 11		2	“	1	1	1	1
Location 12		2	“	1	1	1	1

TABLE 4-1
 Analyses Requested for Ground Water Samples – Routine Sampling Events
 San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested				Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered)
Sample Locations	Sample Type	Sample Day	Conc.	Number of Samples			
Location 13		2	“	1	1	1	1
Location 14		2	“	1	1	1	1
Location 15 (B)	Blank	3	“	1	1	1	1
Location 15		3	“	1	1	1	1
Location 15 (D)	Dup 1	3	“	1	1	1	1
Location 16		3	“	1	1	1	1
Location 17		3	“	1	1	1	1
Respondents 1P		3	“	1	1	1	1
Respondents 2P		3	“	1	1	1	1
Respondents 3P		3	“	1	1	1	1
Respondents 4P		3	“	1	1	1	1
Respondents 4P (D)	Dup 1	3	“	1	1	1	1
Respondents 5P (B)	Blank	4	“	1	1	1	1
Respondents 5P		4	“	1	1	1	1
Respondents 6P		4	“	1	1	1	1
Respondents 7P		4	“	1	1	1	1
Respondents 8P		4	“	1	1	1	1
Respondents 9P		4	“	1	1	1	1
Respondents 10P		4	“	1	1	1	1
Respondents 12P		4	“	1	1	1	1
Respondents 13C		4	“	1	1	1	1
TBD #1 (B)	Blank	5	“	1	1	1	1
TBD #1		5	“	1	1	1	1
TBD #2		5	“	1	1	1	1
TBD #3		5	“	1	1	1	1
TBD #4		5	“	1	1	1	1
TBD #5		5	“	1	1	1	1
TBD #5 (D)	Dup 1	5	“	1	1	1	1
TBD #6 (L)	Lab QC	5	“	1	1	1	1
Subtotal				44	44	44	44

TABLE 4-1
 Analyses Requested for Ground Water Samples – Routine Sampling Events
San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested				Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered)
Sample Locations	Sample Type	Sample Day	Conc.	Number of Samples			
Sampling of all new EPA and Respondents wells (29 wells), and 15 existing wells							
Location 1 (B)	Blank	1	TBD	1	1	1	1
Location 1		1	“	1	1	1	1
Location 2		1	“	1	1	1	1
Location 2 (D)	Dup 1	1	“	1	1	1	1
Location 3		1	“	1	1	1	1
Location 4		1	“	1	1	1	1
Location 5		1	“	1	1	1	1
Location 6 (L)	Lab QC	1	“	1	1	1	1
Location 7 (B)	Blank	2	“	1	1	1	1
Location 7		2	“	1	1	1	1
Location 8		2	“	1	1	1	1
Location 9		2	“	1	1	1	1
Location 10		2	“	1	1	1	1
Location 11		2	“	1	1	1	1
Location 12 (B)	Blank	3	“	1	1	1	1
Location 12		3	“	1	1	1	1
Location 13		3	“	1	1	1	1
Location 14		3	“	1	1	1	1
Location 15		3	“	1	1	1	1
Location 15 (D)	Dup 1	3	“	1	1	1	1
Location 16		3	“	1	1	1	1
Location 17		3	“	1	1	1	1
Respondents 1P (B)	Blank	4	“	1	1	1	1
Respondents 1P		4	“	1	1	1	1
Respondents 2P		4	“	1	1	1	1
Respondents 3P		4	“	1	1	1	1
Respondents 4P		4	“	1	1	1	1
Respondents 4P (D)	Dup 1	4	“	1	1	1	1
Respondents 5P		4	“	1	1	1	1
Respondents 6P		4	“	1	1	1	1
Respondents 7P (B)	Blank	5	“	1	1	1	1
Respondents 7P		5	“	1	1	1	1

TABLE 4-1
 Analyses Requested for Ground Water Samples – Routine Sampling Events
San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested				Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered)
Sample Locations	Sample Type	Sample Day	Conc.	Number of Samples			
Respondents 8P		5	“	1	1	1	1
Respondents 9P		5	“	1	1	1	1
Respondents 10P		5	“	1	1	1	1
Respondents 12P		5	“	1	1	1	1
Respondents 13C		5	“	1	1	1	1
DRC-MW4 (B)	Blank	6	Low	1	1	1	1
DRC-MW4		6	“	1	1	1	1
DWB-W3		6	Med	1	1	1	1
DWB-W3 (D)	Dup 1	6	“	1	1	1	1
DRC-MW2		6	“	1	1	1	1
DWB-W1		6	High	1	1	1	1
DRC-MW3		6	“	1	1	1	1
DRC-MW5		6	“	1	1	1	1
DRC-MW1		6	“	1	1	1	1
AMP-W1		6	“	1	1	1	1
AMP-W3		6	“	1	1	1	1
TBD #1 (B)	Blank	7	TBD	1	1	1	1
TBD #1		7	“	1	1	1	1
TBD #2		7	“	1	1	1	1
TBD #3		7	“	1	1	1	1
TBD #4		7	“	1	1	1	1
TBD #5		7	“	1	1	1	1
TBD #5 (D)	Dup 1	7	“	1	1	1	1
TBD #6 (L)	Lab QC	7	“	1	1	1	1
Subtotal				56	56	56	56
Sampling of all new EPA and Respondents wells (29 wells), and 6 existing wells							
Location 1 (B)	Blank	1	TBD	1	1	1	1
Location 1		1	“	1	1	1	1
Location 2		1	“	1	1	1	1
Location 2 (D)	Dup 1	1	“	1	1	1	1
Location 3		1	“	1	1	1	1
Location 4		1	“	1	1	1	1
Location 5		1	“	1	1	1	1

TABLE 4-1
 Analyses Requested for Ground Water Samples – Routine Sampling Events
 San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested				Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered)
Sample Locations	Sample Type	Sample Day	Conc.	Number of Samples			
Location 6 (L)	Lab QC	1	"	1	1	1	1
Location 7		1	"	1	1	1	1
Location 8 (B)	Blank	2	"	1	1	1	1
Location 8		2	"	1	1	1	1
Location 9		2	"	1	1	1	1
Location 10		2	"	1	1	1	1
Location 11		2	"	1	1	1	1
Location 12		2	"	1	1	1	1
Location 13		2	"	1	1	1	1
Location 14		2	"	1	1	1	1
Location 15 (B)	Blank	3	"	1	1	1	1
Location 15		3	"	1	1	1	1
Location 15 (D)	Dup 1	3	"	1	1	1	1
Location 16		3	"	1	1	1	1
Location 17		3	"	1	1	1	1
Respondents 1P		3	"	1	1	1	1
Respondents 2P		3	"	1	1	1	1
Respondents 3P		3	"	1	1	1	1
Respondents 4P		3	"	1	1	1	1
Respondents 4P (D)	Dup 1	3	"	1	1	1	1
Respondents 5P (B)	Blank	4	"	1	1	1	1
Respondents 5P		4	"	1	1	1	1
Respondents 6P		4	"	1	1	1	1
Respondents 7P		4	"	1	1	1	1
Respondents 8P		4	"	1	1	1	1
Respondents 9P		4	"	1	1	1	1
Respondents 10P		4	"	1	1	1	1
Respondents 12P		4	"	1	1	1	1
Respondents 13C		4	"	1	1	1	1
TBD #1 (B)	Blank	5	"	1	1	1	1
TBD #1		5	"	1	1	1	1
TBD #2		5	"	1	1	1	1
TBD #3		5	"	1	1	1	1
TBD #5		5	"	1	1	1	1

TABLE 4-1
 Analyses Requested for Ground Water Samples – Routine Sampling Events
San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested				Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered)
Sample Locations	Sample Type	Sample Day	Conc.	Number of Samples			
TBD #4		5	“	1	1	1	1
TBD #5 (D)	Dup 1	5	“	1	1	1	1
TBD #6 (L)	Lab QC	5	“	1	1	1	1
Subtotal				44	44	44	44
Total Samples				244	244	244	244

Notes:

B = Field Blank sample – collected at first sample location each day for all parameters

D = Field Duplicate sample – collected once for each 10 samples for all parameters, normal volume with two subsequent sample IDs

L = Laboratory QC Sample – collected once for every 20 samples for all parameters, double volume with one sample ID

TBD = (sampling location) to be determined

¹ Sample location names refer to the numbered proposed locations for new EPA monitoring wells (see Figure 3-1).

TABLE 4-2
 Analyses Requested for Ground Water Samples – Baseline Sampling New EPA Monitoring Wells
 San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested	Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered) + Dissolved Metals/ Cations	Anions, Sulfide, Nitrate/ Nitrite, Alkalinity, TDS	Total Kjeldahl Nitrogen	Total Organic Carbon	VOCs	1,2,3-Trichloropropane	1,4-Dioxane	NDMA	Perchlorate
Analysis Method	EPA 218.6	EPA 218.6	CLP or EPA 6000/7000 Series	CLP or EPA 6000/7000 Series	EPA 300c (Anions), SM2320Bd (Alkalinity), SM2340 (Hardness), EPA 160.1 (TDS)	EPA 351c	EPA 415c	CLP or EPA 8260c	CLP, 8260 SIM or 524 SIM	EPA 8260 SIM or EPA 8270 SIM	EPA 1625	EPA 314
Preservatives	Cool to 4° C	0.45-µm filter, cool to 4° C	HNO ₃ to pH <2, cool to 4°C	0.45-µm filter, HNO ₃ to pH <2, cool to 4°C	Cool to 4° C	H ₂ SO ₄ to pH <2, cool to 4°C	HCl or H ₂ SO ₄ to pH <2, cool to 4°C	HCl – pH <2; cool to 4° C; No headspace	HCl – pH <2; cool to 4° C; No headspace	Cool to 4° C	Cool to 4° C	Cool to 4° C
Analytical Holding Time	< 24 Hours	< 24 Hours	< 6 months	< 6 months	< 7 Days	< 28 days	< 28 days	< 14 Days	< 14 Days	< 7 Days prior to extraction < 40 days after extraction	< 7 Days prior to extraction < 40 days after extraction	<28 Days
Number of Containers	1 x 250-mL poly bottle	1 x 250-mL poly bottle	1 x 1-liter poly bottle	1 x 1-liter poly bottle	1 x 500-mL poly bottle	1 x 500-mL poly bottle	1 x 500-mL poly bottle	3 x 40-mL glass vials	3 x 40-mL glass vials	1 x 1-liter amber glass	1 x 1-liter amber glass	1 x 125-mL poly bottle
Sample Locations ¹	Sample Type	Sample Day	Conc.	Number of Samples								
Phase 1 Monitoring Wells												
Location 1 (B)	Blank	1	TBD	1	1	1	1	1	1	1	1	1
Location 1		1	“	1	1	1	1	1	1	1	1	1
Location 2		1	“	1	1	1	1	1	1	1	1	1
Location 2 (D)	Dup 1	1	“	1	1	1	1	1	1	1	1	1
Location 5		1	“	1	1	1	1	1	1	1	1	1
Location 9 (B)	Blank	2	“	1	1	1	1	1	1	1	1	1
Location 9		2	“	1	1	1	1	1	1	1	1	1
Location 10		2	“	1	1	1	1	1	1	1	1	1
Location 11 (L)	Lab QC	2	“	1	1	1	1	1	1	1	1	1
Phase 2 Monitoring Wells												
Location 3 (B)	Blank	1	TBD	1	1	1	1	1	1	1	1	1
Location 3		1	“	1	1	1	1	1	1	1	1	1
Location 4		1	“	1	1	1	1	1	1	1	1	1
Location 4 (D)	Dup 1	1	“	1	1	1	1	1	1	1	1	1
Location 6		1	“	1	1	1	1	1	1	1	1	1

TABLE 4-2
 Analyses Requested for Ground Water Samples – Baseline Sampling New EPA Monitoring Wells
 San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested				Hexavalent Chromium (unfiltered)	Hexavalent Chromium (filtered)	Total Chromium (unfiltered)	Total Chromium (filtered) + Dissolved Metals/ Cations	Anions, Sulfide, Nitrate/ Nitrite, Alkalinity, TDS	Total Kjeldahl Nitrogen	Total Organic Carbon	VOCs	1,2,3-Trichloropropane	1,4-Dioxane	NDMA	Perchlorate
Sample Locations ¹	Sample Type	Sample Day	Conc.	Number of Samples											
Location 7 (B)	Blank	2	“	1	1	1	1	1	1	1	1	1	1	1	1
Location 8		2	“	1	1	1	1	1	1	1	1	1	1	1	1
Location 8 (B)		2	”	1	1	1	1	1	1	1	1	1	1	1	1
Location 12		2	“	1	1	1	1	1	1	1	1	1	1	1	1
Location 13		3	“	1	1	1	1	1	1	1	1	1	1	1	1
Location 14 (B)	Blank	3	“	1	1	1	1	1	1	1	1	1	1	1	1
Location 14		3	“	1	1	1	1	1	1	1	1	1	1	1	1
Location 15		3	“	1	1	1	1	1	1	1	1	1	1	1	1
Location 15 (D)	Dup 1	3	“	1	1	1	1	1	1	1	1	1	1	1	1
Location 16 (B)	Blank	4	“	1	1	1	1	1	1	1	1	1	1	1	1
Location 16		4	“	1	1	1	1	1	1	1	1	1	1	1	1
Location 17 (L)	Lab QC	4	“	1	1	1	1	1	1	1	1	1	1	1	1
Total Samples				26	26	26	26	26	26	26	26	26	26	26	26

Notes:

B = Field Blank sample – collected at first sample location each day for all parameters

D = Field Duplicate sample – collected once for each 10 samples for all parameters, normal volume with two subsequent sample IDs

L = Laboratory QC Sample – collected once for every 20 samples for all parameters, double volume with one sample ID

¹ Sample location names refer to the proposed locations for new EPA monitoring wells (see Figure 3-1).

HNO₃ – nitric acid

H₂SO₄ – sulfuric acid

HCl – hydrochloric acid

TABLE 4-3
 Analyses Requested for IDW Characterization Samples
 San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested	Hexavalent Chromium	VOCs	Metals	pH	TPH-g	TPH-d
Analysis Method	SW7196A	TTLIC, TCLP' EPA 1311/ CLP or EPA 8260	TTLIC, TCLP EPA 1311/ CLP or EPA 6000/7000 series	SW9040B/ SW9045C	EPA 8015m	EPA 8015m
Preservatives	Cool to 4°C	HCl to pH <2; chill to 4°C; no headspace	Cool to 4°C	Cool to 4°C	Cool to 4°C	Cool to 4°C
Analytical Holding Time	24 hours (water); 30 days until extraction and 4 days after extraction (soil)	<14 days	<6 months	Analyze immediately	<48 hours	<14 days
Number of Containers (solids)	1 x 8-oz. jar	1 x 4-oz. jar	1 x 4-oz. jar	1 x 4-oz. jar	1 x 4-oz. jar	1 x 4-oz. jar
Number of Containers (liquids)	1 x 500-mL poly bottle	2 x 40-mL glass vials	1 x 250-mL poly bottle	1 x 125-mL poly bottle	2 x 40-mL glass vials	1 x 1-liter amber glass bottle

Sample Locations ¹	Sample Type	Number of Samples					
Locations 1 and 2	Roll-off bin – solids composite	1	1	1	1	1	1
Locations 1 and 2	Tank - liquids	1	1	1	1	1	1
Location 3	Drums - solids composite	1	1	1	1	1	1
Location 3	Drums - liquids	1	1	1	1	1	1
Location 4	Drums - solids composite	1	1	1	1	1	1
Location 4	Drums - liquids	1	1	1	1	1	1
Location 5	Drums - solids composite	1	1	1	1	1	1
Location 5	Drums - liquids	1	1	1	1	1	1
Locations 6	Drums - solids composite	1	1	1	1	1	1
Locations 6	Drums - liquids	1	1	1	1	1	1
Location 7 and 8	Roll-off bin – solids composite	1	1	1	1	1	1
Location 7 and 8	Tank - liquids	1	1	1	1	1	1
Location 9	Drums - solids composite	1	1	1	1	1	1

TABLE 4-3
 Analyses Requested for IDW Characterization Samples
 San Fernando Valley Area 2 Superfund Site, Glendale Chromium Operable Unit

Specific Analysis Requested		Hexavalent Chromium	VOCs	Metals	pH	TPH-g	TPH-d
Sample Locations ¹	Sample Type	Number of Samples					
Location 9	Drums - liquids	1	1	1	1	1	1
Location 10	Drums - solids composite	1	1	1	1	1	1
Location 10	Drums - liquids	1	1	1	1	1	1
Location 11	Drums - solids composite	1	1	1	1	1	1
Location 11	Drums - liquids	1	1	1	1	1	1
Location 12	Drums - solids composite	1	1	1	1	1	1
Location 12	Drums - liquids	1	1	1	1	1	1
Location 13	Drums - solids composite	1	1	1	1	1	1
Location 13	Drums - liquids	1	1	1	1	1	1
Location 14	Drums - solids composite	1	1	1	1	1	1
Location 14	Drums - liquids	1	1	1	1	1	1
Location 15	Drums - solids composite	1	1	1	1	1	1
Location 15	Drums - liquids	1	1	1	1	1	1
Location 16	Drums - solids composite	1	1	1	1	1	1
Location 16	Drums - liquids	1	1	1	1	1	1
Location 17	Drums - solids composite	1	1	1	1	1	1
Location 17	Drums - liquids	1	1	1	1	1	1
Total Solids Samples		15	15	15	15	15	15
Total Liquids Samples		15	15	15	15	15	15

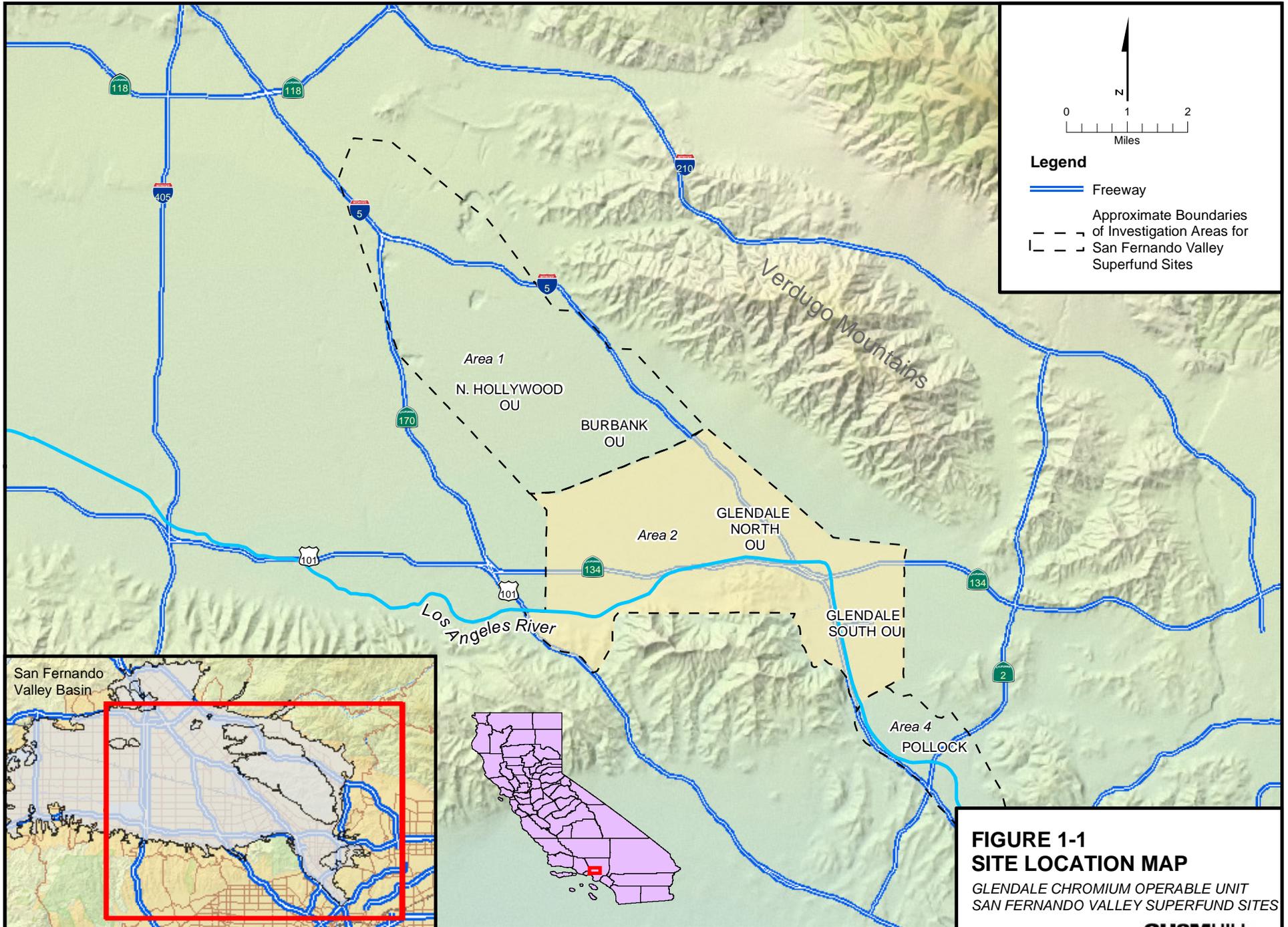
Notes:

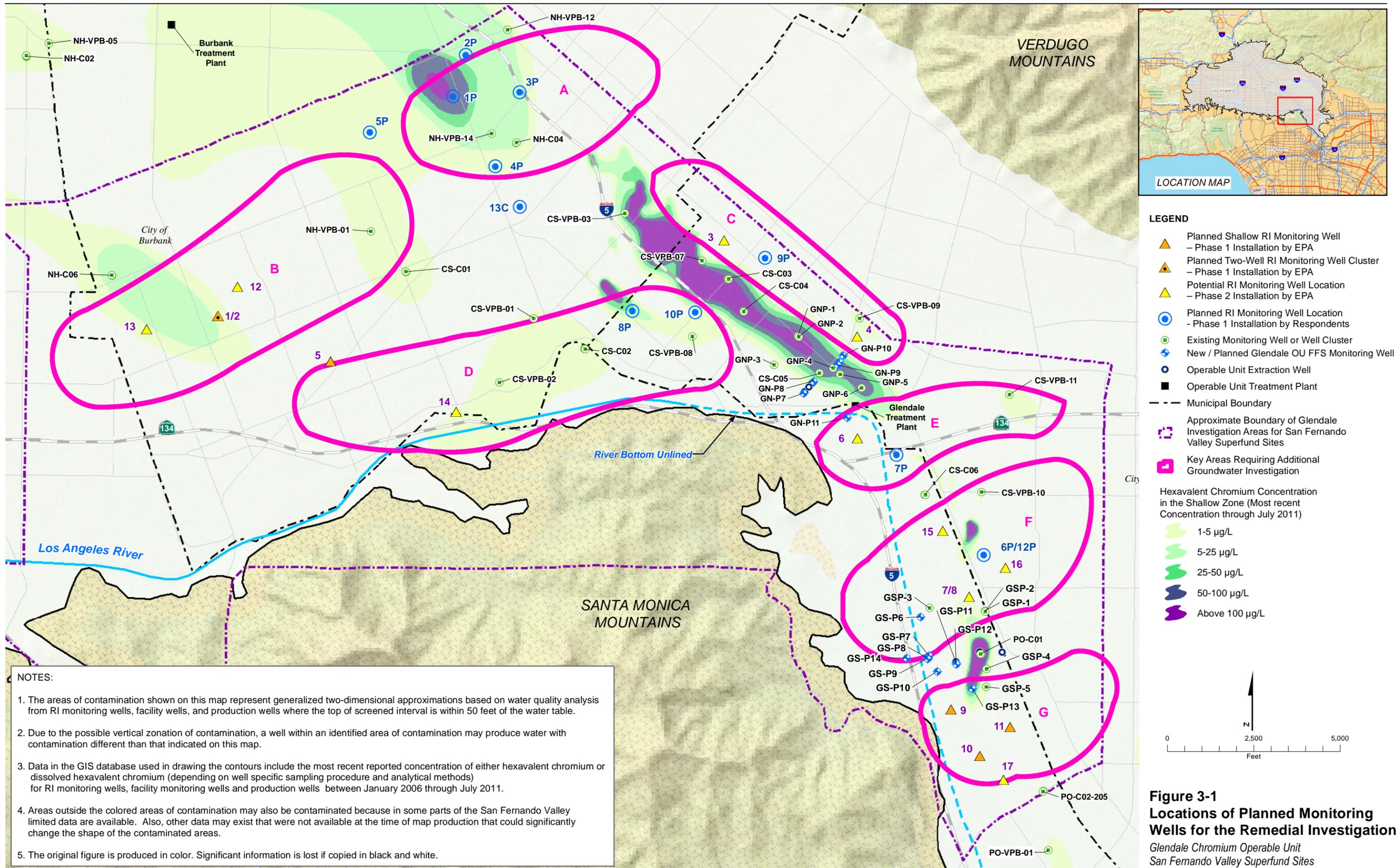
¹ Sample location names refer to the numbered proposed locations for new EPA monitoring wells (see Figure 3-1).

TTLC – total threshold limit concentration

TCLP – toxicity characteristic leaching procedure

Figures



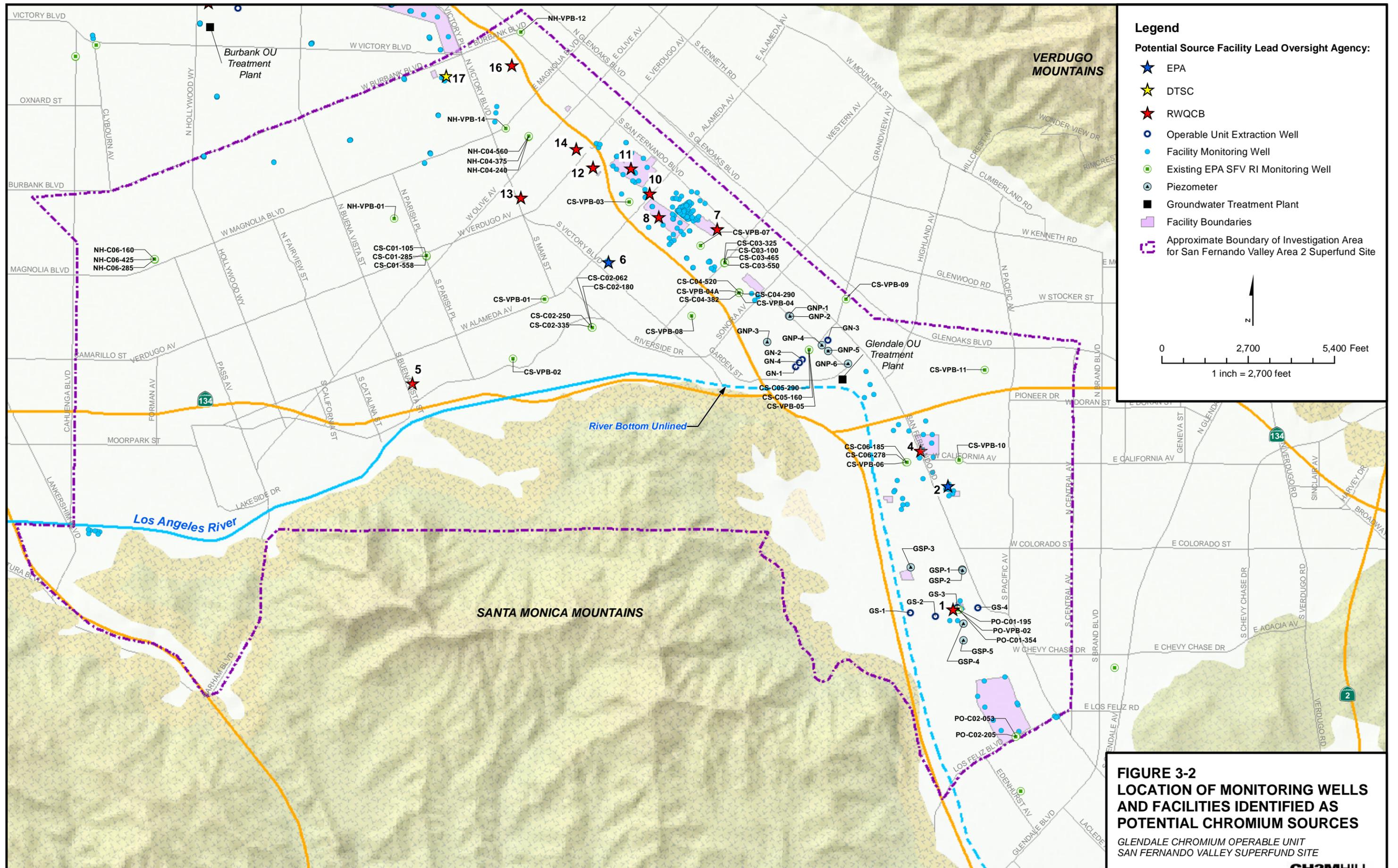


NOTES:

1. The areas of contamination shown on this map represent generalized two-dimensional approximations based on water quality analysis from RI monitoring wells, facility wells, and production wells where the top of screened interval is within 50 feet of the water table.
2. Due to the possible vertical zonation of contamination, a well within an identified area of contamination may produce water with contamination different than that indicated on this map.
3. Data in the GIS database used in drawing the contours include the most recent reported concentration of either hexavalent chromium or dissolved hexavalent chromium (depending on well specific sampling procedure and analytical methods) for RI monitoring wells, facility monitoring wells and production wells between January 2006 through July 2011.
4. Areas outside the colored areas of contamination may also be contaminated because in some parts of the San Fernando Valley limited data are available. Also, other data may exist that were not available at the time of map production that could significantly change the shape of the contaminated areas.
5. The original figure is produced in color. Significant information is lost if copied in black and white.

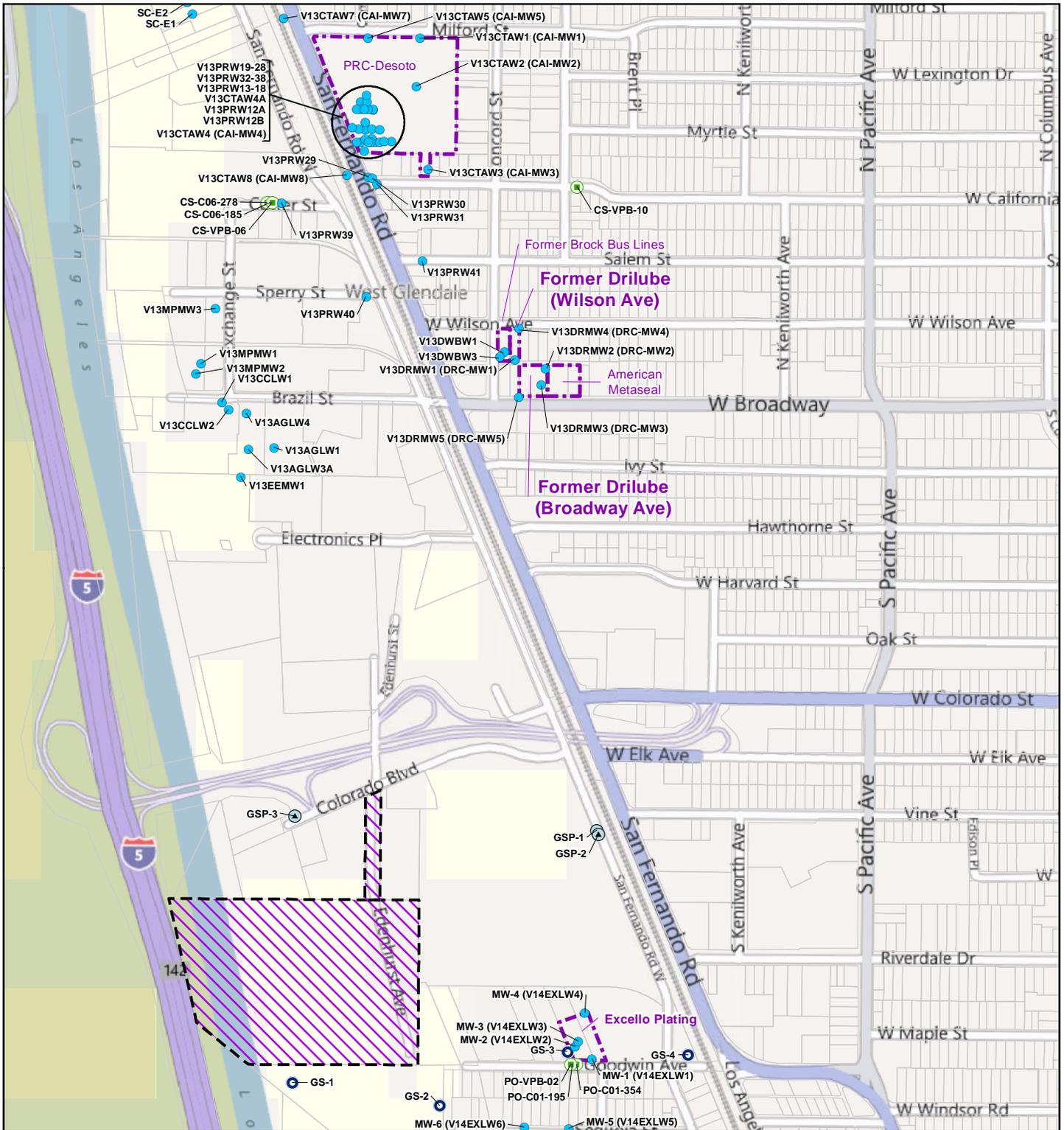
- LEGEND**
- ▲ Planned Shallow RI Monitoring Well – Phase 1 Installation by EPA
 - ▲ Planned Two-Well RI Monitoring Well Cluster – Phase 1 Installation by EPA
 - ▲ Potential RI Monitoring Well Location – Phase 2 Installation by EPA
 - Planned RI Monitoring Well Location - Phase 1 Installation by Respondents
 - Existing Monitoring Well or Well Cluster
 - New / Planned Glendale OU FFS Monitoring Well
 - Operable Unit Extraction Well
 - Operable Unit Treatment Plant
 - - - Municipal Boundary
 - Approximate Boundary of Glendale Investigation Areas for San Fernando Valley Superfund Sites
 - Key Areas Requiring Additional Groundwater Investigation
- Hexavalent Chromium Concentration in the Shallow Zone (Most recent Concentration through July 2011)
- 1-5 µg/L
 - 5-25 µg/L
 - 25-50 µg/L
 - 50-100 µg/L
 - Above 100 µg/L

Figure 3-1
Locations of Planned Monitoring Wells for the Remedial Investigation
 Glendale Chromium Operable Unit
 San Fernando Valley Superfund Sites



**FIGURE 3-2
LOCATION OF MONITORING WELLS
AND FACILITIES IDENTIFIED AS
POTENTIAL CHROMIUM SOURCES**

GLENDALE CHROMIUM OPERABLE UNIT
SAN FERNANDO VALLEY SUPERFUND SITE



LEGEND

- Operable Unit Extraction Well
- Facility Well
- RI Well
- ⊕ Piezometer
- Unknown
- LA / Glendale Water Treatment Plant
- Parcels
- Active Chromium Investigation Sites

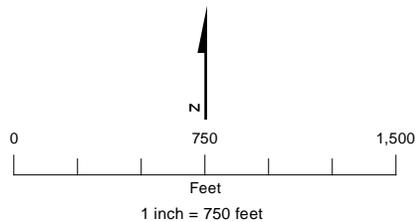


FIGURE 3-3
 Former Drilube Facility Location
 Map and Monitoring Wells
*Glendale Chromium Operable Unit
 San Fernando Valley Superfund Sites*



Burbank Western Channel

W. Spazier Ave

AMPW1

AMPW3



0 75

Approximate scale in feet

⊙ = Onsite Monitoring Wells

— = Property Fenced Area

FIGURE 3-4
 Former All Metals Facility
 Glendale Chromium Operable Unit
 San Fernando Valley Superfund Sites

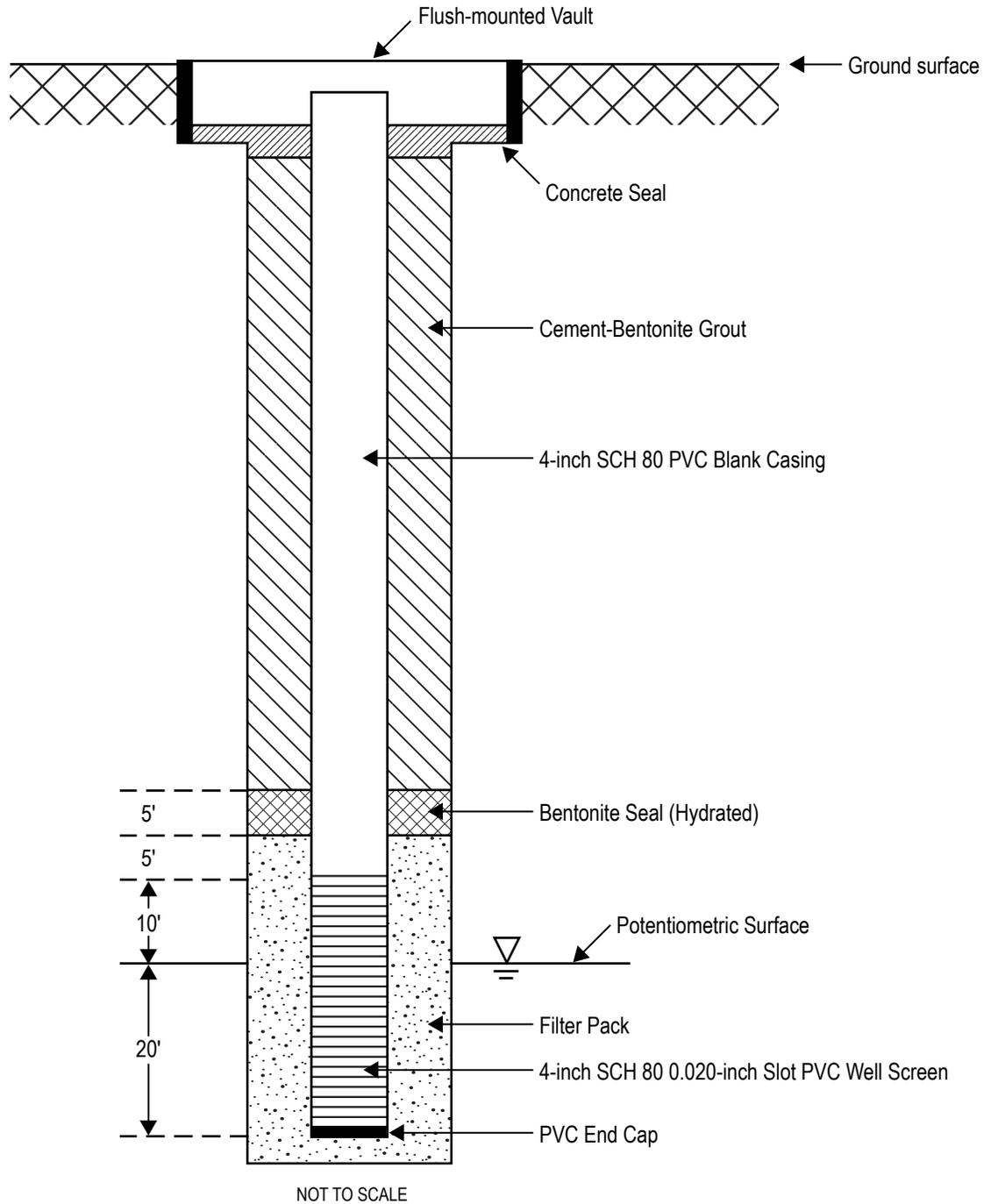
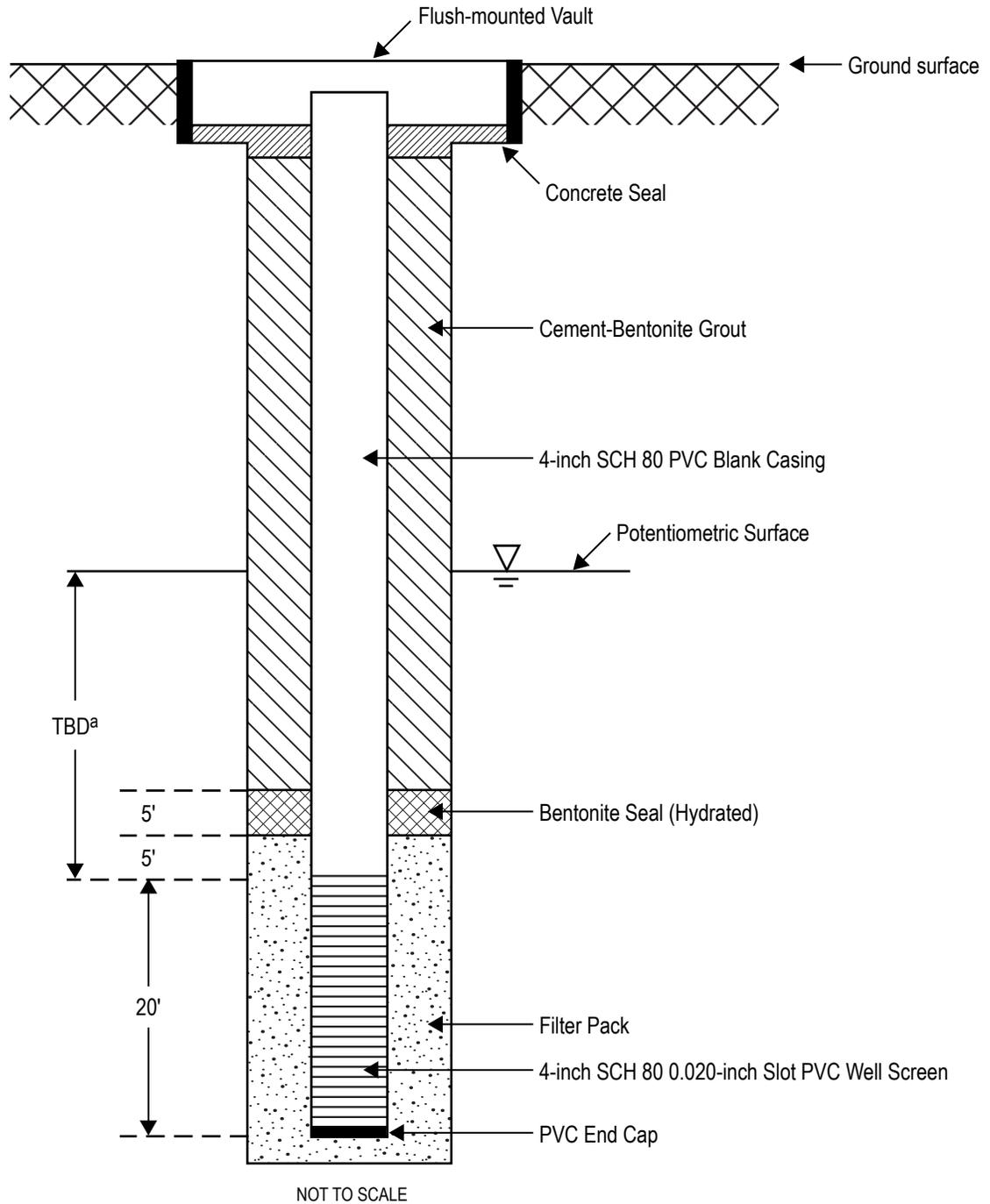


FIGURE 5-1
 Typical Water Table Monitoring
 Well Construction Detail
 San Fernando Valley Superfund Site
 Glendale Chromium Operable Unit



Note:

a) Depth of deeper well screens to be determined (TBD) based on the observed lithology in the pilot borehole and information from surrounding monitoring wells (well depths and analytical results). It is anticipated that deeper monitoring wells will be completed approximately 75 to 100-feet below the potentiometric surface.

FIGURE 5-2
 Typical Deep Monitoring
 Well Construction Detail
 San Fernando Valley Superfund Site
 Glendale Chromium Operable Unit

Appendix A
Region 9 Sample Coordination Center
Request Forms

REGION 9 SAMPLE COORDINATION CENTER (RSCC)
SUPERFUND ANALYTICAL REQUEST FORM

Section 1

Sampling Event Name: Glendale Chromium Operable Unit Remedial Investigation			
Site Name: San Fernando Valley Area 2 Superfund Site – Glendale Chromium OU		Sampling Dates: April 2012 through September 2013	
<input checked="" type="checkbox"/> RI/FS <input type="checkbox"/> RA <input type="checkbox"/> Enforcement <input type="checkbox"/> PA/SI <input type="checkbox"/> Emergency Resp. <input type="checkbox"/> Fed. Facilities			
Site Spill ID: N2	OU: Glendale Chromium	CERCLIS ID:	
EPA Project Manager: Lisa Hanusiak		Phone: 415-972-3152	Mail Code: SFD-7-1

Section 2

Sampling Organization (if other than above):	
Mailing Address: 1000 Wilshire Blvd, 21 st Floor, Los Angeles, CA 90017	
Project Manager: David Towell	E-mail: dtowell@ch2m.com
Office Phone: 213-228-8285	Office Fax: 213-538-1399
Sampler (if different from above): Mike Ladeau	E-mail: mike.ladeau@ch2m.com
Office Phone:	Mobile Phone: 714-227-3324

Section 3

Title of QA plan or addendum to existing plan under which this sampling event will occur: Field Sampling Plan for Remedial Investigation at San Fernando Valley Area 2 Superfund Site Glendale Chromium Operable Unit (March 2012)
EPA Quality Assurance Office DCN:

In compliance with EPA Order 5360.1, the EPA Region 9 Quality Management Plan, Section 1.1.2, states that, “An appropriate QA planning document ... will be developed and approved for each environmental data collection activity prior to the initiation of data collection.”

Section 4

Type of Data Deliverable	Data Distribution (include e-mail address if appropriate)
Hard copy report	1. Sara Lopez slopez1@ch2m.com
Electronic report copy	1. Sumant Gupta skg@CFEST.com 2. David Towell dtowell@ch2m.com 3. Sara Lopez slopez1@ch2m.com 4. BJ Lechler blechler@ch2m.com
Electronic Data Deliverable (EDD) for R9 Lab Results*	1. Sumant Gupta skg@CFEST.com 2. Sara Lopez slopez1@ch2m.com 3. BJ Lechler blechler@ch2m.com

* Excel table. Other EDD formats may be available upon request

Section 5

(Fill in table or attach copy of analytical description from Sampling and Analysis Plan)

Analysis (method, CLP SOW number, or R9 Lab SOP number)	Matrix	No. of Samples	TAT*
Hexavalent Chromium (unfiltered), EPA 218.6	Water	270	30 days
Hexavalent Chromium (filtered), EPA 218.6	Water	270	30 days
Total Chromium (unfiltered), CLP or EPA 6000/7000 series	Water	270	30 days
Total Chromium (filtered), CLP or EPA 6000/7000 series	Water	244	30 days
Dissolved Metals including Total Chromium, CLP or EPA 6000/7000 series	Water	26	30 days
Anions (NO ₃ , NO ₂ , SO ₄ , Cl, F, orthophosphate), EPA 300	Water	26	30 days
Sulfide, EPA 376	Water	26	30 days
Ammonia, EPA 350	Water	26	30 days
Total Kjeldahl Nitrogen, EPA 351	Water	26	30 days
Total Alkalinity, SM 2320B	Water	26	30 days

Analysis (method, CLP SOW number, or R9 Lab SOP number)	Matrix	No. of Samples	TAT*
Total Dissolved Solids, EPA 160.1	Water	26	30 days
Total Organic Carbon, EPA 415	Water	26	30 days
VOCs, CLP or EPA 8260c	Water	26	30 days
1,4-dioxane, EPA 8260SIM or 8270SIM	Water	26	30 days
NDMA, EPA 1625	Water	26	30 days
Perchlorate, EPA 314	Water	26	30 days
1,2,3-trichloropropane, CLP, 8260 SIM or 524 SIM	Water	26	30 days
Metals including Hexavalent Chromium, TTLC, TCLP, EPA 1311/CLP, or EPA 6000/7000 series	IDW Soil	15	5 days
VOCs, TTLC, TCLP, EPA 1311/CLP, or EPA 8260	IDW Soil	15	5 days
TPH-diesel, EPA 8015M	IDW Soil	15	5 days
TPH-gasoline, EPA 8015M	IDW Soil	15	5 days
pH	IDW Soil	15	5 days
Metals including Hexavalent Chromium, TTLC, TCLP, EPA 1311/CLP, or EPA 6000/7000 series	IDW Water	15	5 days
VOCs, TTLC, TCLP, EPA 1311/CLP, or EPA 8260	IDW Water	15	5 days
TPH-diesel, EPA 8015M	IDW Water	15	5 days
TPH-gasoline, EPA 8015M	IDW Water	15	5 days
pH	IDW Water	15	5 days

* See instructions

For CLP VOCs and/or SVOCs, are matrix spike/matrix spike duplicate (MS/MSD) required for this project? Yes No

Section 6

Include (or attach separately) any discussion of expanded or reduced analyte lists, required reporting limits, specialized preparation or analytical procedures, etc.

Needed specific analytes and detection limits:

1- GROUNDWATER

Parameter	Method	Lowest Project Criteria (µg/L)	Reporting Limit/Target Detection Limit ^a (µg/L)
Dissolved metals/cations:	CLP ^b or EPA 6000/7000 series ^c		
Aluminum		50	200
Antimony		6	60
Arsenic		0.045	10
Barium		1,000	200
Beryllium		4	5
Cadmium		5	5
Calcium		-	5,000
Chromium (total)		50	10
Cobalt		4.7	50
Copper		620	25
Lead		15	10
Iron		300	100
Magnesium		-	5,000
Manganese		50	15
Nickel		100	40
Potassium		--	5,000
Selenium		50	35
Silica		--	CLP
Silver		71	10
Sodium		--	5,000
Thallium		0.16	25
Vanadium		78	50
Zinc		4,700	60
Chromium (hexavalent)	EPA 218.6 ^c	0.031	0.2
General chemistry parameters:			
Chloride	EPA 300c	250	1 mg/L
Fluoride	EPA 300c	1,500	0.1 mg/L
Nitrate	EPA300c	10 mg/L	0.1 mg/L
Nitrite	EPA300c	1 mg/L	0.1 mg/L
Total Kjeldahl Nitrogen	EPA351c	-	0.3 mg/L
Orthophosphate	EPA300c	-	1 mg/L
Sulfate	EPA300c	250	1 mg/L
Sulfide	EPA376c		2 mg/L
Ammonia	EPA350c	-	0.3 mg/L
Total Alkalinity	SM2320Bd	-	20 mg/L
Total Dissolved Solids	EPA160.1	500	100 mg/L
Total Organic Carbon	EPA415c	-	2 mg/L

Parameter	Method	Lowest Project Criteria (µg/L)	Reporting Limit/Target Detection Limit ^a (µg/L)
Volatile Organics	CLPb or EPA 8260c		
Acetone		12,000	5.0
Benzene		0.39	0.50
Bromodichloromethane		0.12	5.0
Carbon tetrachloride		0.39	0.50
Chloroform		0.19	5.0
1,1-Dichloroethane		2.4	0.50
1,2-Dichloroethane		0.15	5.0
1,1-Dichloroethene		6	0.50
cis-1,2-Dichloroethene		6	5.0
trans-1,2-Dichloroethene		10	0.50
1,2-Dichloropropane		0.38	5.0
trans-1,3-Dichloropropene		0.41	0.50
Methylene chloride		4.7	5.0
Tetrachloroethene		0.072	0.50
Toluene		150	5.0
1,1,1-Trichloroethane		200	0.50
1,1,2-Trichloroethane		0.24	5.0
Trichloroethene		0.44	0.50
Vinyl chloride		0.015	5.0
Emerging Compounds:			
1,4-dioxane	8260SIM or 8270SIM ^c	0.67	1
N-nitrosodimethylamine (NDMA)	EPA1625 ^c	0.003	0.002
Perchlorate	EPA314 ^c	6	4
1,2,3-trichloropropane	CLP ^b , 8260 SIM ^c or 524 SIM ^b	0.00065	1
pH			90
Turbidity			90
Dissolved oxygen			90
Oxidation reduction potential			90
Electric conductivity			90
Temperature			90

3-Investigation Derived Waste

Needed specific analytes and detection limits

Analyte	Method	Lowest Project Criteria (mg/L)	Reporting Limit/Target Detection Limit ^a (µg/L)
Metals	TTL ^c , TCLP ^a EPA 1311 ^b /CLP ^c or EPA 6000/7000 series ^b		CLP
Antimony		15	60
Arsenic		5	10
Barium		100	200
Beryllium		0.75	5
Cadmium		1	5
Chromium (total)		5	10
Chromium (hexavalent)		5	0.2
Cobalt		80	50
Copper		25	25
Lead		5	10
Mercury		0.2	0.2
Molybdenum		350	CLP
Nickel		20	40
Selenium		1	35
Silver		5	10
Thallium		7	25
Vanadium		24	50
Zinc		250	60
Volatile Organics	TTL ^c , TCLP ^a EPA1311 ^b /CLP ^c or EPA8260		
Acetone		--	5.0
Benzene		0.5	0.5
Bromodichloromethane		--	0.5
Carbon Tetrachloride		0.5	0.5
Chlorobenzene		100	0.5
Chloroform		6	0.5
1,4-Dichlorobenzene		7.5	0.5
1,1-Dichloroethane		--	0.5
1,2-Dichloroethane		0.5	0.5
1,1-Dichloroethene		0.7	0.5
Cis-1,2-Dichloroethene		--	0.5
Trans-1,2-Dichloroethene		--	0.5
1,2-Dichloropropane		--	0.5
Trans-1,3-Dichloropropene		--	0.5
Methylene Chloride		--	0.5
Methyl ethyl ketone		200	0.5

Analyte	Method	Lowest Project Criteria (mg/L)	Reporting Limit/Target Detection Limit ^a (µg/L)
1,1,1-Trichloroethane		--	0.5
1,1,2-Trichloroethane		--	0.5
Tetrachloroethene		0.7	0.5
Toluene		--	0.5
Trichloroethene		0.5	0.5
Vinyl Chloride		0.2	0.5
Total Petroleum Hydrocarbons			
TPH – diesel	EPA 8015M ^b	--	5 mg/kg
TPH – gasoline	EPA 8015M ^b	--	1 mg/kg

A full documentation package, including raw data and sample custody documentation, will be generated and kept on file at the EPA Region 9 Laboratory. If you would like to request additional review and/or validation of the data, please contact Rose Fong or Joe Eidelberg at the Region 9 Quality Assurance Office.

SUPERFUND DATA VALIDATION REQUEST FORM

Site Name: San Fernando Valley Area 2 Superfund Site – Glendale Chromium Operable Unit	
Requestor: BJ Lechler	Organization: CH2M HILL
E-mail: blechler@ch2m.com	Phone: 714-435-6283
Alternate Contact(s) (Name, Email, Phone): Artemis Antipas, aantipas@ch2m.com , 206-419-0926	

Case Number: Ground Water Samples			
Analytes	Tier	%	Supplemental Request Information
Hexavalent Chromium (unfiltered), EPA 218.6	3, 2	10,90%	
Hexavalent Chromium (filtered), EPA 218.6	3, 2	10,90%	
Total Chromium (unfiltered), CLP or EPA 6000/7000 series	3, 2	10,90%	
Total Chromium (filtered), CLP or EPA 6000/7000 series	3, 2	10,90%	
Dissolved Metals including Total Chromium, CLP or EPA 6000/7000 series	3, 2	10,90%	
Anions (NO3, NO2, SO4, Cl, F, orthophosphate), EPA 300	3, 2	10,90%	
Sulfide, EPA 376	3, 2	10,90%	
Ammonia, EPA 350	3, 2	10,90%	
Total Kjeldahl Nitrogen, EPA 351	3, 2	10,90%	
Total Alkalinity, SM 2320B	3, 2	10,90%	
Total Dissolved Solids, EPA 160.1	3,2	10,90%	
Total Organic Carbon, EPA415	3, 2	10,90%	
VOCs, CLP or EPA 8260	3, 2	10,90%	For Tier 2 CLP semiautomated level 1b validation will be used.

Case Number: Ground Water Samples			
Analytes	Tier	%	Supplemental Request Information
1,4-dioxane, EPA 8260SIM or 8270SIM	3, 2	10,90%	
NDMA, EPA 1625	3, 2	10,90%	
Perchlorate, EPA 314	3, 2	10,90%	
1,2,3-trichloropropane, CLP, 8260 SIM or 524	3, 2	10,90%	

Case Number: IDW Soil Samples			
Analytes	Tier	%	Supplemental Request Information
Metals including Hexavalent Chromium, TTLC, TCLP, EPA 1311/CLP, or EPA 6000/7000 series	3, 2	10,90%	For Tier2, CLP semi-automated validation Level 1b will be used
VOCs, TTLC, TCLP, EPA 1311/CLP, or EPA 8260	3, 2	10,90%	For Tier2, CLP semi-automated validation Level 1b will be used
TPH-diesel, EPA 8015M	3, 2	10,90%	
TPH-gasoline, EPA 8015M	3, 2	10,90%	
pH	3, 2	10,90%	

Case Number: IDW Water Samples			
Analytes	Tier	%	Supplemental Request Information
Metals including Hexavalent Chromium, TTLC, TCLP, EPA 1311/CLP, or EPA 6000/7000 series	3, 2	10,90%	For Tier2, CLP semi-automated validation Level 1b will be used
VOCs, TTLC, TCLP, EPA 1311/CLP, or EPA 8260	3, 2	10,90%	For Tier2, CLP semi-automated validation Level 1b will be used
TPH-diesel, EPA 8015M	3, 2	10,90%	

Case Number: IDW Water Samples

Analytes	Tier	%	Supplemental Request Information
TPH-gasoline, EPA 8015M	3, 2	10,90%	
pH	3, 2	10,90%	

Block-copy and paste this section for multiple case numbers. Insert rows for multiple analyte categories.

Special Analytical Requirements or Sampling Notes, if any:

QA/QC per CLP SOW if run by CLP, EPA Regional lab SOP if run by EPA Regional lab. For other analyses if any QA/QC will be detailed in project specific lab SOW.

Email the completed form to Joe Eidelberg (Eidelberg.Joseph@epa.gov) for Region 9 Laboratory data, and Rose Fong (Fong.Rose@epa.gov) for CLP and other laboratory data, with “cc” to the EPA RPM or Site Manager. For questions, contact Joe or Rose, or Eugenia McNaughton, Region 9 QA Manager (McNaughton.Eugenia@epa.gov.)

HOW TO USE THE FORM

Use this form to request data validation by the EPA Region 9 QA Office or its contractor(s).

Analyte Describe the analytes to be validated, using the most succinct grouping, such as those in the analytical summary.

Tier Indicate the level of validation requested, from the Tiers below.

Validation levels:	
Tier 1	Review of lab-reported QC results; no review of instrument printouts or calculations
Tier 2	Targeted review of specific samples, analytes, or a combination of data package elements, in between Tier 1 and 3
Tier 3	Full review of data package including chromatograms and calculation spotchecks

% Indicate the amount of data to be validated. “%” means the percent of data packages, unless otherwise defined. Other units of expression may be used.

Supplemental Request Information

If Tier 2 is selected, state how the review is to be targeted, i. e., which samples, or analytes, etc. or describe the validation approach to be followed.

Special Analytical Requirements or Sampling Notes, if any:

Provide any project information which should be considered in validation. Examples: analytes of concern, reporting limits, special preparation or analytical procedures, sampling constraints. Optionally, attach excerpt from the QA plan, special analytical request, or other document. For data from laboratories other than CLP or the Region 9 Laboratory, provide the analytical requirements from the QAPP, FSP, analytical request or other specifications given to the laboratory on analytical procedure, QC criteria, and reporting requirements.

Examples of Tiered Requests:

Case Number: 99999			
Analytes	Tier	%	Supplemental Request Information
TV	3	10%	
Translation: full validation of 1 in 10 trace volatiles SDGs			
SV	2	100%	Tier 3-level review of 1,4-dioxane
Translation: full validation of 1,4-dioxane in all SDGs in the case			
ICPMS	2	--	SDGs MYAA5 & MYAC7: verify EXES R-flags applied to samples
Translation: targeted review of samples in SDGs MYAA5 & MYAC7 that were flagged Rejected by the EXES automated review			

Appendix B Standard Forms



Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)¹

This standard is issued under the fixed designation D2488; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This practice covers procedures for the description of soils for engineering purposes.

1.2 This practice also describes a procedure for identifying soils, at the option of the user, based on the classification system described in Test Method D2487. The identification is based on visual examination and manual tests. It must be clearly stated in reporting an identification that it is based on visual-manual procedures.

1.2.1 When precise classification of soils for engineering purposes is required, the procedures prescribed in Test Method D2487 shall be used.

1.2.2 In this practice, the identification portion assigning a group symbol and name is limited to soil particles smaller than 3 in. (75 mm).

1.2.3 The identification portion of this practice is limited to naturally occurring soils (either intact or disturbed).

NOTE 1—This practice may be used as a descriptive system applied to such materials as shale, claystone, shells, crushed rock, etc. (see Appendix X2).

1.3 The descriptive information in this practice may be used with other soil classification systems or for materials other than naturally occurring soils.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. For specific precautionary statements see Section 8.*

1.6 *This practice offers a set of instructions for performing one or more specific operations. This document cannot replace*

education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "Standard" in the title of this document means only that the document has been approved through the ASTM consensus process.

2. Referenced Documents

2.1 ASTM Standards:²

- D653 Terminology Relating to Soil, Rock, and Contained Fluids
- D1452 Practice for Soil Exploration and Sampling by Auger Borings
- D1586 Test Method for Penetration Test (SPT) and Split-Barrel Sampling of Soils
- D1587 Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes
- D2113 Practice for Rock Core Drilling and Sampling of Rock for Site Investigation
- D2487 Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- D4083 Practice for Description of Frozen Soils (Visual-Manual Procedure)

3. Terminology

3.1 *Definitions*—Except as listed below, all definitions are in accordance with Terminology D653.

NOTE 2—For particles retained on a 3-in. (75-mm) US standard sieve, the following definitions are suggested:

Cobbles—particles of rock that will pass a 12-in. (300-mm) square opening and be retained on a 3-in. (75-mm) sieve, and

¹ This practice is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.07 on Identification and Classification of Soils.

Current edition approved June 15, 2009. Published July 2009. Originally approved in 1966. Last previous edition approved in 2009 as D2488 – 09. DOI: 10.1520/D2488-09A.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard.

Boulders—particles of rock that will not pass a 12-in. (300-mm) square opening.

3.1.1 **clay**—soil passing a No. 200 (75- μ m) sieve that can be made to exhibit plasticity (putty-like properties) within a range of water contents, and that exhibits considerable strength when air-dry. For classification, a clay is a fine-grained soil, or the fine-grained portion of a soil, with a plasticity index equal to or greater than 4, and the plot of plasticity index versus liquid limit falls on or above the “A” line (see Fig. 3 of Test Method D2487).

3.1.2 **gravel**—particles of rock that will pass a 3-in. (75-mm) sieve and be retained on a No. 4 (4.75-mm) sieve with the following subdivisions:

coarse—passes a 3-in. (75-mm) sieve and is retained on a 3/4-in. (19-mm) sieve.

fine—passes a 3/4-in. (19-mm) sieve and is retained on a No. 4 (4.75-mm) sieve.

3.1.3 **organic clay**—a clay with sufficient organic content to influence the soil properties. For classification, an organic clay is a soil that would be classified as a clay, except that its liquid limit value after oven drying is less than 75 % of its liquid limit value before oven drying.

3.1.4 **organic silt**—a silt with sufficient organic content to influence the soil properties. For classification, an organic silt is a soil that would be classified as a silt except that its liquid limit value after oven drying is less than 75 % of its liquid limit value before oven drying.

3.1.5 **peat**—a soil composed primarily of vegetable tissue in various stages of decomposition usually with an organic odor, a dark brown to black color, a spongy consistency, and a texture ranging from fibrous to amorphous.

3.1.6 **sand**—particles of rock that will pass a No. 4 (4.75-mm) sieve and be retained on a No. 200 (75- μ m) sieve with the following subdivisions:

coarse—passes a No. 4 (4.75-mm) sieve and is retained on a No. 10 (2.00-mm) sieve.

medium—passes a No. 10 (2.00-mm) sieve and is retained on a No. 40 (425- μ m) sieve.

fine—passes a No. 40 (425- μ m) sieve and is retained on a No. 200 (75- μ m) sieve.

3.1.7 **silt**—soil passing a No. 200 (75- μ m) sieve that is nonplastic or very slightly plastic and that exhibits little or no strength when air dry. For classification, a silt is a fine-grained soil, or the fine-grained portion of a soil, with a plasticity index less than 4, or the plot of plasticity index versus liquid limit falls below the “A” line (see Fig. 3 of Test Method D2487).

4. Summary of Practice

4.1 Using visual examination and simple manual tests, this practice gives standardized criteria and procedures for describing and identifying soils.

4.2 The soil can be given an identification by assigning a group symbol(s) and name. The flow charts, Fig. 1a and Fig. 1b for fine-grained soils, and Fig. 2, for coarse-grained soils, can be used to assign the appropriate group symbol(s) and name. If the soil has properties which do not distinctly place it into a specific group, borderline symbols may be used, see Appendix X3.

NOTE 3—It is suggested that a distinction be made between *dual symbols* and *borderline symbols*.

Dual Symbol—A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC, CL-ML used to indicate that the soil has been identified as having the properties of a classification in accordance with Test Method D2487 where two symbols are required. Two symbols are required when the soil has between 5 and 12 % fines or when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart.

Borderline Symbol—A borderline symbol is two symbols separated by a slash, for example, CL/CH, GM/SM, CL/ML. A borderline symbol should be used to indicate that the soil has been identified as having properties that do not distinctly place the soil into a specific group (see Appendix X3).

5. Significance and Use

5.1 The descriptive information required in this practice can be used to describe a soil to aid in the evaluation of its significant properties for engineering use.

5.2 The descriptive information required in this practice should be used to supplement the classification of a soil as determined by Test Method D2487.

5.3 This practice may be used in identifying soils using the classification group symbols and names as prescribed in Test Method D2487. Since the names and symbols used in this practice to identify the soils are the same as those used in Test Method D2487, it shall be clearly stated in reports and all other appropriate documents, that the classification symbol and name are based on visual-manual procedures.

5.4 This practice is to be used not only for identification of soils in the field, but also in the office, laboratory, or wherever soil samples are inspected and described.

5.5 This practice has particular value in grouping similar soil samples so that only a minimum number of laboratory tests need be run for positive soil classification.

NOTE 4—The ability to describe and identify soils correctly is learned more readily under the guidance of experienced personnel, but it may also be acquired systematically by comparing numerical laboratory test results for typical soils of each type with their visual and manual characteristics.

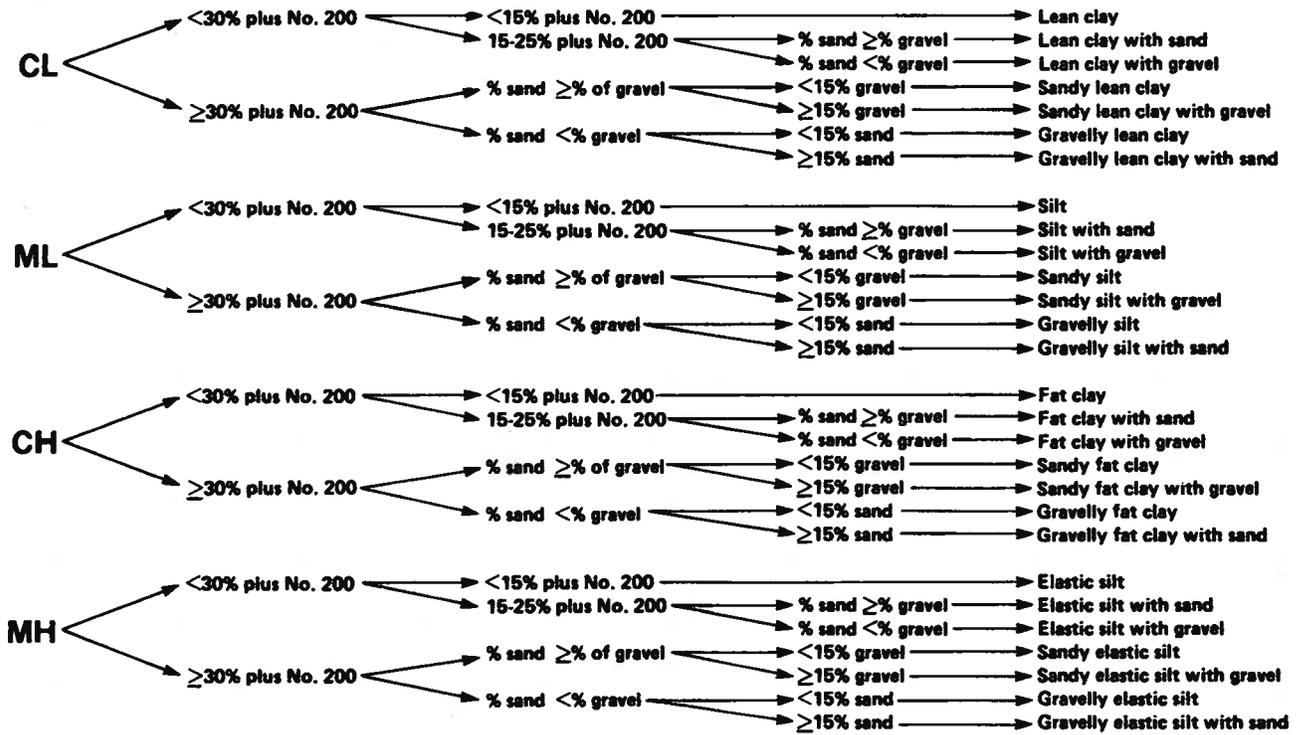
5.6 When describing and identifying soil samples from a given boring, test pit, or group of borings or pits, it is not necessary to follow all of the procedures in this practice for every sample. Soils which appear to be similar can be grouped together; one sample completely described and identified with the others referred to as similar based on performing only a few of the descriptive and identification procedures described in this practice.

5.7 This practice may be used in combination with Practice D4083 when working with frozen soils.

NOTE 5—Notwithstanding the statements on precision and bias contained in this standard: The precision of this test method is dependent on the competence of the personnel performing it and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D3740 are generally considered capable of competent and objective testing. Users of this test method are cautioned that compliance with Practice D3740 does not in itself assure reliable testing. Reliable testing depends on several factors; Practice D3740 provides a means for evaluating some of those factors.

GROUP SYMBOL

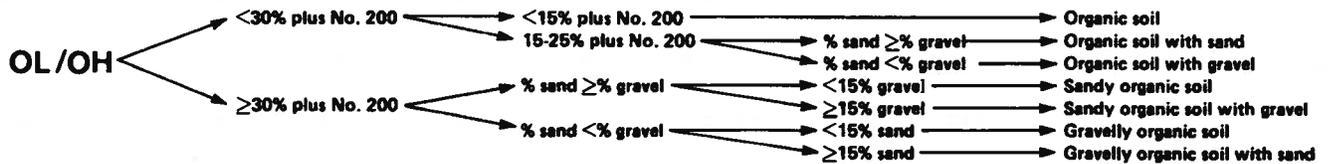
GROUP NAME



NOTE 1—Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5%.
 FIG. 1a Flow Chart for Identifying Inorganic Fine-Grained Soil (50 % or more fines)

GROUP SYMBOL

GROUP NAME



NOTE 1—Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5%.

FIG. 1 b Flow Chart for Identifying Organic Fine-Grained Soil (50 % or more fines)

6. Apparatus

6.1 *Required Apparatus:*

6.1.1 *Pocket Knife or Small Spatula.*

6.2 *Useful Auxiliary Apparatus:*

6.2.1 *Test Tube and Stopper* (or jar with a lid).

6.2.2 *Hand Lens.*

7. Reagents

7.1 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean water from a city water supply or natural source, including non-potable water.

7.2 *Hydrochloric Acid*—A small bottle of dilute hydrochloric acid, HCl, one part HCl (10 N) to three parts water (This reagent is optional for use with this practice). See Section 8.

8. Safety Precautions

8.1 When preparing the dilute HCl solution of one part concentrated hydrochloric acid (10 N) to three parts of distilled

water, slowly add acid into water following necessary safety precautions. Handle with caution and store safely. If solution comes into contact with the skin, rinse thoroughly with water.

8.2 **Caution**—Do not add water to acid.

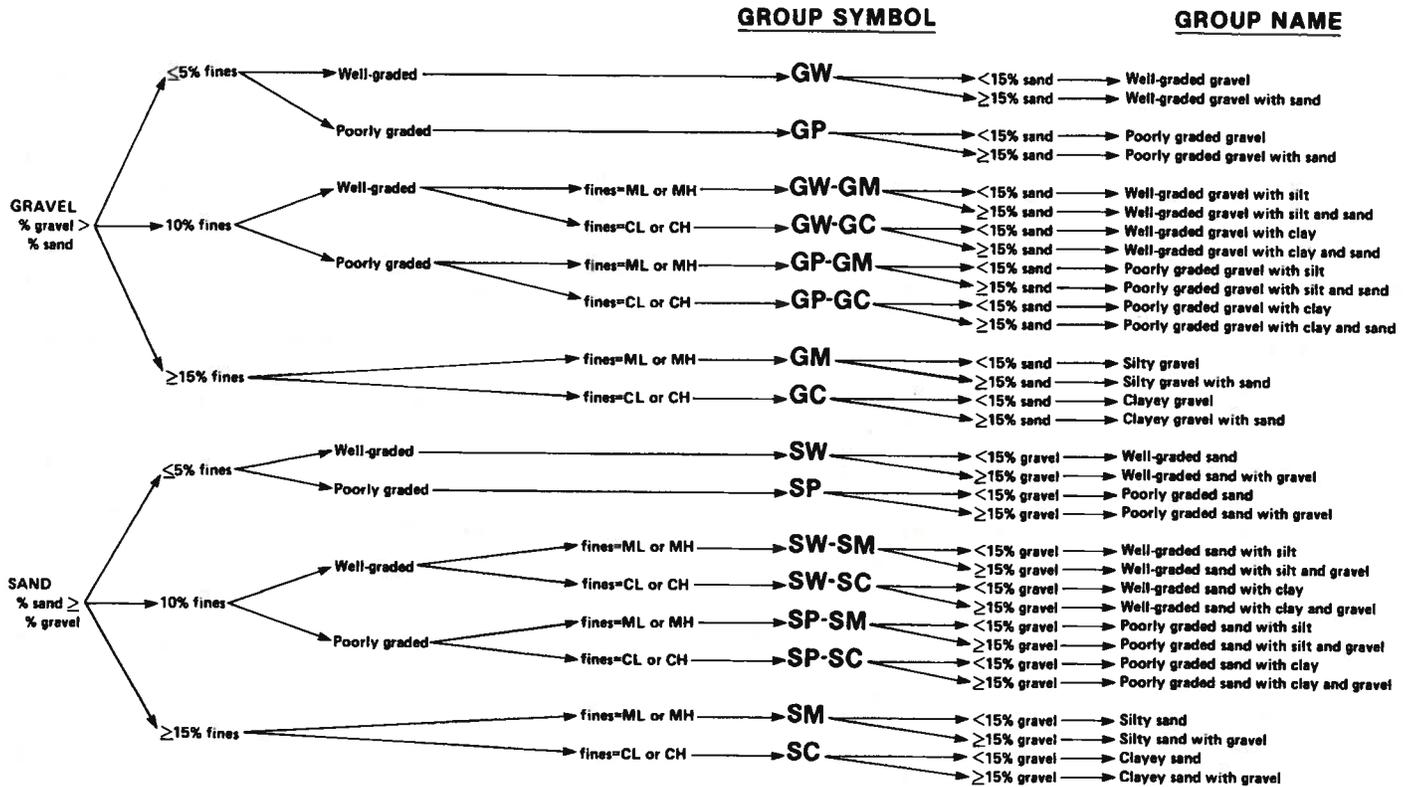
9. Sampling

9.1 The sample shall be considered to be representative of the stratum from which it was obtained by an appropriate, accepted, or standard procedure.

NOTE 6—Preferably, the sampling procedure should be identified as having been conducted in accordance with Practices D1452, D1587, or D2113, or Test Method D1586.

9.2 The sample shall be carefully identified as to origin.

NOTE 7—Remarks as to the origin may take the form of a boring number and sample number in conjunction with a job number, a geologic stratum, a pedologic horizon or a location description with respect to a permanent monument, a grid system or a station number and offset with respect to a stated centerline and a depth or elevation.



NOTE 1—Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5 %.

FIG. 2 Flow Chart for Identifying Coarse-Grained Soils (less than 50 % fines)

9.3 For accurate description and identification, the minimum amount of the specimen to be examined shall be in accordance with the following schedule:

Maximum Particle Size, Sieve Opening	Minimum Specimen Size, Dry Weight
4.75 mm (No. 4)	100 g (0.25 lb)
9.5 mm (¾ in.)	200 g (0.5 lb)
19.0 mm (¾ in.)	1.0 kg (2.2 lb)
38.1 mm (1½ in.)	8.0 kg (18 lb)
75.0 mm (3 in.)	60.0 kg (132 lb)

NOTE 8—If random isolated particles are encountered that are significantly larger than the particles in the soil matrix, the soil matrix can be accurately described and identified in accordance with the preceding schedule.

9.4 If the field sample or specimen being examined is smaller than the minimum recommended amount, the report shall include an appropriate remark.

10. Descriptive Information for Soils

10.1 *Angularity*—Describe the angularity of the sand (coarse sizes only), gravel, cobbles, and boulders, as angular, subangular, subrounded, or rounded in accordance with the criteria in Table 1 and Fig. 3. A range of angularity may be stated, such as: subrounded to rounded.

10.2 *Shape*—Describe the shape of the gravel, cobbles, and boulders as flat, elongated, or flat and elongated if they meet the criteria in Table 2 and Fig. 4. Otherwise, do not mention the shape. Indicate the fraction of the particles that have the shape, such as: one-third of the gravel particles are flat.

TABLE 1 Criteria for Describing Angularity of Coarse-Grained Particles (see Fig. 3)

Description	Criteria
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges

10.3 *Color*—Describe the color. Color is an important property in identifying organic soils, and within a given locality it may also be useful in identifying materials of similar geologic origin. If the sample contains layers or patches of varying colors, this shall be noted and all representative colors shall be described. The color shall be described for moist samples. If the color represents a dry condition, this shall be stated in the report.

10.4 *Odor*—Describe the odor if organic or unusual. Soils containing a significant amount of organic material usually have a distinctive odor of decaying vegetation. This is especially apparent in fresh samples, but if the samples are dried, the odor may often be revived by heating a moistened sample. If the odor is unusual (petroleum product, chemical, and the like), it shall be described.

10.5 *Moisture Condition*—Describe the moisture condition as dry, moist, or wet, in accordance with the criteria in Table 3.

10.6 *HCl Reaction*—Describe the reaction with HCl as none, weak, or strong, in accordance with the criteria in Table

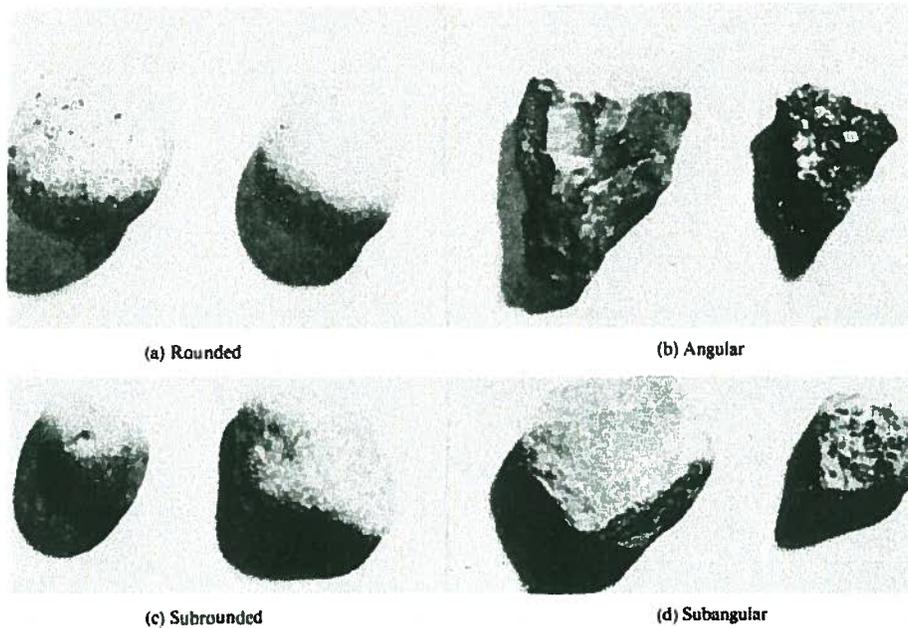


FIG. 3 Typical Angularity of Bulky Grains

TABLE 2 Criteria for Describing Particle Shape (see Fig. 4)

The particle shape shall be described as follows where length, width, and thickness refer to the greatest, intermediate, and least dimensions of a particle, respectively.

Flat	Particles with width/thickness > 3
Elongated	Particles with length/width > 3
Flat and elongated	Particles meet criteria for both flat and elongated

PARTICLE SHAPE

W = WIDTH
T = THICKNESS
L = LENGTH

4. Since calcium carbonate is a common cementing agent, a report of its presence on the basis of the reaction with dilute hydrochloric acid is important.

10.7 *Consistency*—For intact fine-grained soil, describe the consistency as very soft, soft, firm, hard, or very hard, in accordance with the criteria in Table 5. This observation is inappropriate for soils with significant amounts of gravel.

10.8 *Cementation*—Describe the cementation of intact coarse-grained soils as weak, moderate, or strong, in accordance with the criteria in Table 6.

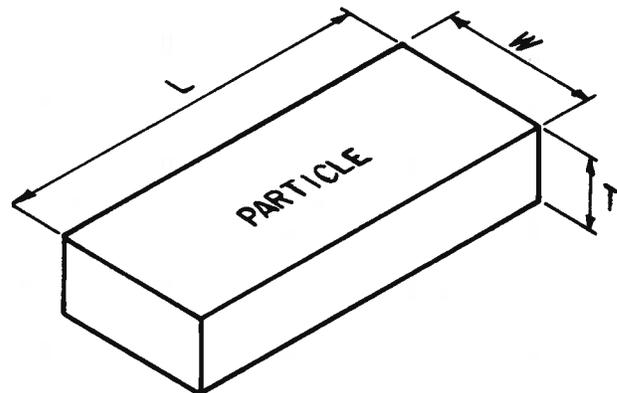
10.9 *Structure*—Describe the structure of intact soils in accordance with the criteria in Table 7.

10.10 *Range of Particle Sizes*—For gravel and sand components, describe the range of particle sizes within each component as defined in 3.1.2 and 3.1.6. For example, about 20 % fine to coarse gravel, about 40 % fine to coarse sand.

10.11 *Maximum Particle Size*—Describe the maximum particle size found in the sample in accordance with the following information:

10.11.1 *Sand Size*—If the maximum particle size is a sand size, describe as fine, medium, or coarse as defined in 3.1.6. For example: maximum particle size, medium sand.

10.11.2 *Gravel Size*—If the maximum particle size is a gravel size, describe the maximum particle size as the smallest sieve opening that the particle will pass. For example, maxi-



FLAT: $W/T > 3$
ELONGATED: $L/W > 3$
FLAT AND ELONGATED:
- meets both criteria

FIG. 4 Criteria for Particle Shape

TABLE 3 Criteria for Describing Moisture Condition

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

TABLE 4 Criteria for Describing the Reaction With HCl

Description	Criteria
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

TABLE 5 Criteria for Describing Consistency

Description	Criteria
Very soft	Thumb will penetrate soil more than 1 in. (25 mm)
Soft	Thumb will penetrate soil about 1 in. (25 mm)
Firm	Thumb will indent soil about ¼ in. (6 mm)
Hard	Thumb will not indent soil but readily indented with thumbnail
Very hard	Thumbnail will not indent soil

TABLE 6 Criteria for Describing Cementation

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

TABLE 7 Criteria for Describing Structure

Description	Criteria
Stratified	Alternating layers of varying material or color with layers at least 6 mm thick; note thickness
Laminated	Alternating layers of varying material or color with the layers less than 6 mm thick; note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

mum particle size, 1½ in. (will pass a 1½-in. square opening but not a ¾-in. square opening).

10.11.3 *Cobble or Boulder Size*—If the maximum particle size is a cobble or boulder size, describe the maximum dimension of the largest particle. For example: maximum dimension, 18 in. (450 mm).

10.12 *Hardness*—Describe the hardness of coarse sand and larger particles as hard, or state what happens when the particles are hit by a hammer, for example, gravel-size particles fracture with considerable hammer blow, some gravel-size particles crumble with hammer blow. “Hard” means particles do not crack, fracture, or crumble under a hammer blow.

10.13 Additional comments shall be noted, such as the presence of roots or root holes, difficulty in drilling or augering hole, caving of trench or hole, or the presence of mica.

10.14 A local or commercial name or a geologic interpretation of the soil, or both, may be added if identified as such.

10.15 A classification or identification of the soil in accordance with other classification systems may be added if identified as such.

11. Identification of Peat

11.1 A sample composed primarily of vegetable tissue in various stages of decomposition that has a fibrous to amorphous texture, usually a dark brown to black color, and an organic odor, shall be designated as a highly organic soil and shall be identified as peat, PT, and not subjected to the identification procedures described hereafter.

12. Preparation for Identification

12.1 The soil identification portion of this practice is based on the portion of the soil sample that will pass a 3-in. (75-mm) sieve. The larger than 3-in. (75-mm) particles must be removed, manually, for a loose sample, or mentally, for an intact sample before classifying the soil.

12.2 Estimate and note the percentage of cobbles and the percentage of boulders. Performed visually, these estimates will be on the basis of volume percentage.

NOTE 9—Since the percentages of the particle-size distribution in Test Method D2487 are by dry weight, and the estimates of percentages for gravel, sand, and fines in this practice are by dry weight, it is recommended that the report state that the percentages of cobbles and boulders are by volume.

12.3 Of the fraction of the soil smaller than 3 in. (75 mm), estimate and note the percentage, by dry weight, of the gravel, sand, and fines (see Appendix X4 for suggested procedures).

NOTE 10—Since the particle-size components appear visually on the basis of volume, considerable experience is required to estimate the percentages on the basis of dry weight. Frequent comparisons with laboratory particle-size analyses should be made.

12.3.1 The percentages shall be estimated to the closest 5 %. The percentages of gravel, sand, and fines must add up to 100 %.

12.3.2 If one of the components is present but not in sufficient quantity to be considered 5 % of the smaller than 3-in. (75-mm) portion, indicate its presence by the term *trace*, for example, trace of fines. A trace is not to be considered in the total of 100 % for the components.

13. Preliminary Identification

13.1 The soil is *fine grained* if it contains 50 % or more fines. Follow the procedures for identifying fine-grained soils of Section 14.

13.2 The soil is *coarse grained* if it contains less than 50 % fines. Follow the procedures for identifying coarse-grained soils of Section 15.

14. Procedure for Identifying Fine-Grained Soils

14.1 Select a representative sample of the material for examination. Remove particles larger than the No. 40 sieve (medium sand and larger) until a specimen equivalent to about a handful of material is available. Use this specimen for performing the dry strength, dilatancy, and toughness tests.

14.2 Dry Strength:

14.2.1 From the specimen, select enough material to mold into a ball about 1 in. (25 mm) in diameter. Mold the material until it has the consistency of putty, adding water if necessary.

14.2.2 From the molded material, make at least three test specimens. A test specimen shall be a ball of material about ½ in. (12 mm) in diameter. Allow the test specimens to dry in air, or sun, or by artificial means, as long as the temperature does not exceed 60°C.

14.2.3 If the test specimen contains natural dry lumps, those that are about ½ in. (12 mm) in diameter may be used in place of the molded balls.

NOTE 11—The process of molding and drying usually produces higher strengths than are found in natural dry lumps of soil.

14.2.4 Test the strength of the dry balls or lumps by crushing between the fingers. Note the strength as none, low, medium, high, or very high in accordance with the criteria in Table 8. If natural dry lumps are used, do not use the results of any of the lumps that are found to contain particles of coarse sand.

14.2.5 The presence of high-strength water-soluble cementing materials, such as calcium carbonate, may cause exceptionally high dry strengths. The presence of calcium carbonate can usually be detected from the intensity of the reaction with dilute hydrochloric acid (see 10.6).

14.3 Dilatancy:

14.3.1 From the specimen, select enough material to mold into a ball about ½ in. (12 mm) in diameter. Mold the material, adding water if necessary, until it has a soft, but not sticky, consistency.

14.3.2 Smooth the soil ball in the palm of one hand with the blade of a knife or small spatula. Shake horizontally, striking the side of the hand vigorously against the other hand several times. Note the reaction of water appearing on the surface of the soil. Squeeze the sample by closing the hand or pinching the soil between the fingers, and note the reaction as none, slow, or rapid in accordance with the criteria in Table 9. The reaction is the speed with which water appears while shaking, and disappears while squeezing.

14.4 Toughness:

14.4.1 Following the completion of the dilatancy test, the test specimen is shaped into an elongated pat and rolled by hand on a smooth surface or between the palms into a thread about ⅛ in. (3 mm) in diameter. (If the sample is too wet to roll easily, it should be spread into a thin layer and allowed to lose

TABLE 8 Criteria for Describing Dry Strength

Description	Criteria
None	The dry specimen crumbles into powder with mere pressure of handling
Low	The dry specimen crumbles into powder with some finger pressure
Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface
Very high	The dry specimen cannot be broken between the thumb and a hard surface

TABLE 9 Criteria for Describing Dilatancy

Description	Criteria
None	No visible change in the specimen
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing

some water by evaporation.) Fold the sample threads and reroll repeatedly until the thread crumbles at a diameter of about ⅛ in. The thread will crumble at a diameter of ⅛ in. when the soil is near the plastic limit. Note the pressure required to roll the thread near the plastic limit. Also, note the strength of the thread. After the thread crumbles, the pieces should be lumped together and kneaded until the lump crumbles. Note the toughness of the material during kneading.

14.4.2 Describe the toughness of the thread and lump as low, medium, or high in accordance with the criteria in Table 10.

14.5 Plasticity—On the basis of observations made during the toughness test, describe the plasticity of the material in accordance with the criteria given in Table 11.

14.6 Decide whether the soil is an *inorganic* or an *organic* fine-grained soil (see 14.8). If inorganic, follow the steps given in 14.7.

14.7 Identification of Inorganic Fine-Grained Soils:

14.7.1 Identify the soil as a *lean clay*, CL, if the soil has medium to high dry strength, no or slow dilatancy, and medium toughness and plasticity (see Table 12).

14.7.2 Identify the soil as a *fat clay*, CH, if the soil has high to very high dry strength, no dilatancy, and high toughness and plasticity (see Table 12).

14.7.3 Identify the soil as a *silt*, ML, if the soil has no to low dry strength, slow to rapid dilatancy, and low toughness and plasticity, or is nonplastic (see Table 12).

14.7.4 Identify the soil as an *elastic silt*, MH, if the soil has low to medium dry strength, no to slow dilatancy, and low to medium toughness and plasticity (see Table 12).

NOTE 12—These properties are similar to those for a lean clay. However, the silt will dry quickly on the hand and have a smooth, silky feel when dry. Some soils that would classify as MH in accordance with the criteria in Test Method D2487 are visually difficult to distinguish from lean clays, CL. It may be necessary to perform laboratory testing for proper identification.

14.8 Identification of Organic Fine-Grained Soils:

14.8.1 Identify the soil as an *organic soil*, OL/OH, if the soil contains enough organic particles to influence the soil properties. Organic soils usually have a dark brown to black color and

TABLE 10 Criteria for Describing Toughness

Description	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft
Medium	Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness

TABLE 11 Criteria for Describing Plasticity

Description	Criteria
Nonplastic Low	A 1/8-in. (3-mm) thread cannot be rolled at any water content. The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

TABLE 12 Identification of Inorganic Fine-Grained Soils from Manual Tests

Soil Symbol	Dry Strength	Dilatancy	Toughness and Plasticity
ML	None to low	Slow to rapid	Low or thread cannot be formed
CL	Medium to high	None to slow	Medium
MH	Low to medium	None to slow	Low to medium
CH	High to very high	None	High

may have an organic odor. Often, organic soils will change color, for example, black to brown, when exposed to the air. Some organic soils will lighten in color significantly when air dried. Organic soils normally will not have a high toughness or plasticity. The thread for the toughness test will be spongy.

NOTE 13—In some cases, through practice and experience, it may be possible to further identify the organic soils as organic silts or organic clays, OL or OH. Correlations between the dilatancy, dry strength, toughness tests, and laboratory tests can be made to identify organic soils in certain deposits of similar materials of known geologic origin.

14.9 If the soil is estimated to have 15 to 25 % sand or gravel, or both, the words “with sand” or “with gravel” (whichever is more predominant) shall be added to the group name. For example: “lean clay with sand, CL” or “silt with gravel, ML” (see Fig. 1a and Fig. 1b). If the percentage of sand is equal to the percentage of gravel, use “with sand.”

14.10 If the soil is estimated to have 30 % or more sand or gravel, or both, the words “sandy” or “gravelly” shall be added to the group name. Add the word “sandy” if there appears to be more sand than gravel. Add the word “gravelly” if there appears to be more gravel than sand. For example: “sandy lean clay, CL”, “gravelly fat clay, CH”, or “sandy silt, ML” (see Fig. 1a and Fig. 1b). If the percentage of sand is equal to the percent of gravel, use “sandy.”

15. Procedure for Identifying Coarse-Grained Soils

(Contains less than 50 % fines)

15.1 The soil is a *gravel* if the percentage of gravel is estimated to be more than the percentage of sand.

15.2 The soil is a *sand* if the percentage of gravel is estimated to be equal to or less than the percentage of sand.

15.3 The soil is a *clean gravel* or *clean sand* if the percentage of fines is estimated to be 5 % or less.

15.3.1 Identify the soil as a *well-graded gravel*, GW, or as a *well-graded sand*, SW, if it has a wide range of particle sizes and substantial amounts of the intermediate particle sizes.

15.3.2 Identify the soil as a *poorly graded gravel*, GP, or as a *poorly graded sand*, SP, if it consists predominantly of one size (uniformly graded), or it has a wide range of sizes with some intermediate sizes obviously missing (gap or skip graded).

15.4 The soil is either a *gravel with fines* or a *sand with fines* if the percentage of fines is estimated to be 15 % or more.

15.4.1 Identify the soil as a *clayey gravel*, GC, or a *clayey sand*, SC, if the fines are clayey as determined by the procedures in Section 14.

15.4.2 Identify the soil as a *silty gravel*, GM, or a *silty sand*, SM, if the fines are silty as determined by the procedures in Section 14.

15.5 If the soil is estimated to contain 10 % fines, give the soil a dual identification using two group symbols.

15.5.1 The first group symbol shall correspond to a clean gravel or sand (GW, GP, SW, SP) and the second symbol shall correspond to a gravel or sand with fines (GC, GM, SC, SM).

15.5.2 The group name shall correspond to the first group symbol plus the words “with clay” or “with silt” to indicate the plasticity characteristics of the fines. For example: “well-graded gravel with clay, GW-GC” or “poorly graded sand with silt, SP-SM” (see Fig. 2).

15.6 If the specimen is predominantly sand or gravel but contains an estimated 15 % or more of the other coarse-grained constituent, the words “with gravel” or “with sand” shall be added to the group name. For example: “poorly graded gravel with sand, GP” or “clayey sand with gravel, SC” (see Fig. 2).

15.7 If the field sample contains any cobbles or boulders, or both, the words “with cobbles” or “with cobbles and boulders” shall be added to the group name. For example: “silty gravel with cobbles, GM.”

16. Report

16.1 The report shall include the information as to origin, and the items indicated in Table 13.

NOTE 14—Example: *Clayey Gravel with Sand and Cobbles, GC*—About 50 % fine to coarse, subrounded to subangular gravel; about 30 % fine to coarse, subrounded sand; about 20 % fines with medium plasticity, high dry strength, no dilatancy, medium toughness; weak reaction with HCl; original field sample had about 5 % (by volume) subrounded cobbles, maximum dimension, 150 mm.

In-Place Conditions—Firm, homogeneous, dry, brown

Geologic Interpretation—Alluvial fan

NOTE 15—Other examples of soil descriptions and identification are given in Appendix X1 and Appendix X2.

NOTE 16—If desired, the percentages of gravel, sand, and fines may be stated in terms indicating a range of percentages, as follows:

Trace—Particles are present but estimated to be less than 5 %

Few—5 to 10 %

Little—15 to 25 %

Some—30 to 45 %

Mostly—50 to 100 %

16.2 If, in the soil description, the soil is identified using a classification group symbol and name as described in Test Method D2487, it must be distinctly and clearly stated in log forms, summary tables, reports, and the like, that the symbol and name are based on visual-manual procedures.

TABLE 13 Checklist for Description of Soils

-
1. Group name
 2. Group symbol
 3. Percent of cobbles or boulders, or both (by volume)
 4. Percent of gravel, sand, or fines, or all three (by dry weight)
 5. Particle-size range:
 - Gravel—fine, coarse
 - Sand—fine, medium, coarse
 6. Particle angularity: angular, subangular, subrounded, rounded
 7. Particle shape: (if appropriate) flat, elongated, flat and elongated
 8. Maximum particle size or dimension
 9. Hardness of coarse sand and larger particles
 10. Plasticity of fines: nonplastic, low, medium, high
 11. Dry strength: none, low, medium, high, very high
 12. Dilatancy: none, slow, rapid
 13. Toughness: low, medium, high
 14. Color (in moist condition)
 15. Odor (mention only if organic or unusual)
 16. Moisture: dry, moist, wet
 17. Reaction with HCl: none, weak, strong
- For intact samples:*
18. Consistency (fine-grained soils only): very soft, soft, firm, hard, very hard
 19. Structure: stratified, laminated, fissured, slickensided, lensed, homogeneous
 20. Cementation: weak, moderate, strong
 21. Local name
 22. Geologic interpretation
 23. Additional comments: presence of roots or root holes, presence of mica, gypsum, etc., surface coatings on coarse-grained particles, caving or sloughing of auger hole or trench sides, difficulty in augering or excavating, etc.
-

17. Precision and Bias

17.1 This practice provides qualitative information only, therefore, a precision and bias statement is not applicable.

18. Keywords

18.1 classification; clay; gravel; organic soils; sand; silt; soil classification; soil description; visual classification

APPENDIXES
(Nonmandatory Information)
X1. EXAMPLES OF VISUAL SOIL DESCRIPTIONS

X1.1 The following examples show how the information required in 16.1 can be reported. The information that is included in descriptions should be based on individual circumstances and need.

X1.1.1 *Well-Graded Gravel with Sand (GW)*—About 75 % fine to coarse, hard, subangular gravel; about 25 % fine to coarse, hard, subangular sand; trace of fines; maximum size, 75 mm, brown, dry; no reaction with HCl.

X1.1.2 *Silty Sand with Gravel (SM)*—About 60 % predominantly fine sand; about 25 % silty fines with low plasticity, low dry strength, rapid dilatancy, and low toughness; about 15 % fine, hard, subrounded gravel, a few gravel-size particles fractured with hammer blow; maximum size, 25 mm; no reaction with HCl (Note—Field sample size smaller than recommended).

In-Place Conditions—Firm, stratified and contains lenses of silt 1 to 2 in. (25 to 50 mm) thick, moist, brown to gray; in-place density 106 lb/ft³; in-place moisture 9 %.

X1.1.3 *Organic Soil (OL/OH)*—About 100 % fines with low plasticity, slow dilatancy, low dry strength, and low toughness; wet, dark brown, organic odor; weak reaction with HCl.

X1.1.4 *Silty Sand with Organic Fines (SM)*—About 75 % fine to coarse, hard, subangular reddish sand; about 25 % organic and silty dark brown nonplastic fines with no dry strength and slow dilatancy; wet; maximum size, coarse sand; weak reaction with HCl.

X1.1.5 *Poorly Graded Gravel with Silt, Sand, Cobbles and Boulders (GP-GM)*—About 75 % fine to coarse, hard, subrounded to subangular gravel; about 15 % fine, hard, subrounded to subangular sand; about 10 % silty nonplastic fines; moist, brown; no reaction with HCl; original field sample had about 5 % (by volume) hard, subrounded cobbles and a trace of hard, subrounded boulders, with a maximum dimension of 18 in. (450 mm).

X2. USING THE IDENTIFICATION PROCEDURE AS A DESCRIPTIVE SYSTEM FOR SHALE, CLAYSTONE, SHELLS, SLAG, CRUSHED ROCK, AND THE LIKE

X2.1 The identification procedure may be used as a descriptive system applied to materials that exist in-situ as shale, claystone, sandstone, siltstone, mudstone, etc., but convert to soils after field or laboratory processing (crushing, slaking, and the like).

X2.2 Materials such as shells, crushed rock, slag, and the like, should be identified as such. However, the procedures used in this practice for describing the particle size and plasticity characteristics may be used in the description of the material. If desired, an identification using a group name and symbol according to this practice may be assigned to aid in describing the material.

X2.3 The group symbol(s) and group names should be placed in quotation marks or noted with some type of distinguishing symbol. See examples.

X2.4 Examples of how group names and symbols can be incorporated into a descriptive system for materials that are not naturally occurring soils are as follows:

X2.4.1 *Shale Chunks*—Retrieved as 2 to 4-in. (50 to 100-mm) pieces of shale from power auger hole, dry, brown, no reaction with HCl. After slaking in water for 24 h, material identified as “Sandy Lean Clay (CL)”; about 60 % fines with medium plasticity, high dry strength, no dilatancy, and medium toughness; about 35 % fine to medium, hard sand; about 5 % gravel-size pieces of shale.

X2.4.2 *Crushed Sandstone*—Product of commercial crushing operation; “Poorly Graded Sand with Silt (SP-SM)”; about 90 % fine to medium sand; about 10 % nonplastic fines; dry, reddish-brown.

X2.4.3 *Broken Shells*—About 60 % uniformly graded gravel-size broken shells; about 30 % sand and sand-size shell pieces; about 10 % nonplastic fines; “Poorly Graded Gravel with Silt and Sand (GP-GM).”

X2.4.4 *Crushed Rock*—Processed from gravel and cobbles in Pit No. 7; “Poorly Graded Gravel (GP)”; about 90 % fine, hard, angular gravel-size particles; about 10 % coarse, hard, angular sand-size particles; dry, tan; no reaction with HCl.

X3. SUGGESTED PROCEDURE FOR USING A BORDERLINE SYMBOL FOR SOILS WITH TWO POSSIBLE IDENTIFICATIONS.

X3.1 Since this practice is based on estimates of particle size distribution and plasticity characteristics, it may be difficult to clearly identify the soil as belonging to one category. To indicate that the soil may fall into one of two possible basic groups, a borderline symbol may be used with the two symbols separated by a slash. For example: SC/CL or CL/CH.

X3.1.1 A borderline symbol may be used when the percentage of fines is estimated to be between 45 and 55 %. One symbol should be for a coarse-grained soil with fines and the other for a fine-grained soil. For example: GM/ML or CL/SC.

X3.1.2 A borderline symbol may be used when the percentage of sand and the percentage of gravel are estimated to be about the same. For example: GP/SP, SC/GC, GM/SM. It is practically impossible to have a soil that would have a borderline symbol of GW/SW.

X3.1.3 A borderline symbol may be used when the soil could be either well graded or poorly graded. For example: GW/GP, SW/SP.

X3.1.4 A borderline symbol may be used when the soil could either be a silt or a clay. For example: CL/ML, CH/MH, SC/SM.

X3.1.5 A borderline symbol may be used when a fine-grained soil has properties that indicate that it is at the boundary between a soil of low compressibility and a soil of high compressibility. For example: CL/CH, MH/ML.

X3.2 The order of the borderline symbols should reflect similarity to surrounding or adjacent soils. For example: soils in a borrow area have been identified as CH. One sample is considered to have a borderline symbol of CL and CH. To show similarity, the borderline symbol should be CH/CL.

X3.3 The group name for a soil with a borderline symbol should be the group name for the first symbol, except for:

CL/CH lean to fat clay
ML/CL clayey silt
CL/ML silty clay

X3.4 The use of a borderline symbol should not be used indiscriminately. Every effort shall be made to first place the soil into a single group.

X4. SUGGESTED PROCEDURES FOR ESTIMATING THE PERCENTAGES OF GRAVEL, SAND, AND FINES IN A SOIL SAMPLE

X4.1 Jar Method—The relative percentage of coarse- and fine-grained material may be estimated by thoroughly shaking a mixture of soil and water in a test tube or jar, and then allowing the mixture to settle. The coarse particles will fall to the bottom and successively finer particles will be deposited with increasing time; the sand sizes will fall out of suspension in 20 to 30 s. The relative proportions can be estimated from the relative volume of each size separate. This method should be correlated to particle-size laboratory determinations.

X4.2 Visual Method—Mentally visualize the gravel size particles placed in a sack (or other container) or sacks. Then, do the same with the sand size particles and the fines. Then, mentally compare the number of sacks to estimate the percentage of plus No. 4 sieve size and minus No. 4 sieve size present.

The percentages of sand and fines in the minus sieve size No. 4 material can then be estimated from the wash test (X4.3).

X4.3 Wash Test (for relative percentages of sand and fines)—Select and moisten enough minus No. 4 sieve size material to form a 1-in (25-mm) cube of soil. Cut the cube in half, set one-half to the side, and place the other half in a small dish. Wash and decant the fines out of the material in the dish until the wash water is clear and then compare the two samples and estimate the percentage of sand and fines. Remember that the percentage is based on weight, not volume. However, the volume comparison will provide a reasonable indication of grain size percentages.

X4.3.1 While washing, it may be necessary to break down lumps of fines with the finger to get the correct percentages.

X5. ABBREVIATED SOIL CLASSIFICATION SYMBOLS

X5.1 In some cases, because of lack of space, an abbreviated system may be useful to indicate the soil classification symbol and name. Examples of such cases would be graphical logs, databases, tables, etc.

X5.2 This abbreviated system is not a substitute for the full name and descriptive information but can be used in supplementary presentations when the complete description is referenced.

X5.3 The abbreviated system should consist of the soil classification symbol based on this standard with appropriate lower case letter prefixes and suffixes as:

Prefix:	Suffix:
s = sandy	s = with sand
g = gravelly	g = with gravel
	c = with cobbles
	b = with boulders

X5.4 The soil classification symbol is to be enclosed in parenthesis. Some examples would be:

<i>Group Symbol and Full Name</i>	<i>Abbreviated</i>
CL, Sandy lean clay	s(CL)
SP-SM, Poorly graded sand with silt and gravel	(SP-SM)g
GP, poorly graded gravel with sand, cobbles, and boulders	(GP)scb
ML, gravelly silt with sand and cobbles	g(ML)sc

SUMMARY OF CHANGES

Committee D18 has identified the location of selected changes to this standard since the last issue (D2488 – 09) that may impact the use of this standard. (Approved June 15, 2009.)

(1) Revised Section 1.2.3.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the ASTM website (www.astm.org/COPYRIGHT/).

Appendix C

Health and Safety Plan

Health and Safety Plan

**San Fernando Valley
Area 2 Superfund Site
Glendale Chromium Operable Unit
Remedial Investigation**

Prepared for
**United States Environmental Protection Agency
Region 9**

75 Hawthorne Street
San Francisco, CA 94105

January 2012



6 Hutton Centre Drive
Suite 700
Santa Ana, California 92707

Contents

1.0	INTRODUCTION.....	1-1
1.1	CH2M HILL POLICY AND COMMITMENT.....	1-2
1.1.1	<i>Safe Work Policy</i>	1-2
1.1.2	<i>Health and Safety Commitment</i>	1-2
1.1.3	<i>Project-Specific Health, Safety, and the Environment Goals</i>	1-2
2.0	APPLICABILITY	2-1
3.0	GENERAL PROJECT INFORMATION.....	3-1
3.1	PROJECT INFORMATION AND BACKGROUND.....	3-1
3.2	SITE BACKGROUND AND SETTING.....	3-1
3.3	DESCRIPTION OF TASKS.....	3-1
3.3.1	<i>HAZWOPER-Regulated Tasks</i>	3-1
3.3.2	<i>Non-HAZWOPER-Regulated Tasks</i>	3-1
4.0	PROJECT ORGANIZATION AND RESPONSIBILITIES	4-1
4.1	CLIENT.....	4-1
4.2	CH2M HILL	4-1
4.2.1	<i>Project Manager</i>	4-1
4.2.2	<i>CH2M HILL Responsible Health and Safety Manager</i>	4-2
4.2.3	<i>CH2M HILL Project Environmental Manager</i>	4-2
4.2.4	<i>CH2M HILL Safety Coordinator</i>	4-3
4.3	CH2M HILL SUBCONTRACTORS.....	4-4
4.4	EMPLOYEE RESPONSIBILITIES	4-5
4.4.1	<i>Employee Authority</i>	4-5
4.5	CLIENT CONTRACTORS.....	4-5
5.0	STANDARDS OF CONDUCT.....	5-1
5.1	STANDARDS OF CONDUCT VIOLATIONS.....	5-1
5.2	DISCIPLINARY ACTIONS.....	5-1
5.3	SUBCONTRACTOR SAFETY PERFORMANCE	5-1
5.3.1	<i>Observed Hazard Form</i>	5-2
5.3.2	<i>Stop Work Order</i>	5-2
5.4	INCENTIVE PROGRAM	5-2
5.5	REPORTING UNSAFE CONDITIONS/PRACTICES	5-2
6.0	SAFETY PLANNING AND CHANGE MANAGEMENT.....	6-1
6.1	DAILY SAFETY MEETINGS AND PRE-TASK SAFETY PLANS	6-1
6.2	CHANGE MANAGEMENT	6-1
6.3	AGENCY INSPECTION GUIDANCE	6-1
7.0	PROJECT HAZARD ANALYSIS.....	7-2
7.1	ACTIVITY HAZARD ANALYSIS	7-2
7.2	SUBCONTRACTOR ACTIVITY HAZARD ANALYSIS	7-2
8.0	GENERAL HAZARDS AND CONTROLS.....	8-1
8.1	BLOODBORNE PATHOGENS	8-1
8.2	CHEMICAL STORAGE	8-1
8.2.1	<i>Storage of Flammable/Combustible Liquids</i>	8-1
8.2.2	<i>Indoor Storage of Flammable/Combustible Liquids</i>	8-2
8.2.3	<i>Outside Storage of Flammable/Combustible Liquids</i>	8-2
8.2.4	<i>Storage of Hazardous Waste</i>	8-2

8.2.5	<i>Storage of Chemical Injection Chemicals/Materials</i>	8-2
8.3	DRIVING SAFETY	8-3
8.4	ELECTRICAL SAFETY	8-3
8.5	FIELD VEHICLES	8-4
8.6	FIRE PREVENTION.....	8-5
8.6.1	<i>Fire Extinguishers and General Fire Prevention Practices</i>	8-5
8.6.2	<i>Dispensing of Flammable/Combustible Liquids</i>	8-5
8.7	GENERAL PRACTICES AND HOUSEKEEPING.....	8-6
8.8	HAZARD COMMUNICATION.....	8-7
8.9	KNIFE USE.....	8-7
8.10	LIGHTING.....	8-7
8.11	MANUAL LIFTING	8-8
8.12	PERSONAL HYGIENE	8-8
8.13	SHIPPING AND TRANSPORTATION OF HAZARDOUS MATERIALS	8-8
8.14	SUBSTANCE ABUSE.....	8-9
9.0	PROJECT-SPECIFIC HAZARD CONTROLS.....	9-1
9.1	COMPRESSED GAS CYLINDERS	9-1
9.2	CONCRETE CORE DRILLING	9-2
9.3	CRYSTALLINE SILICA.....	9-2
9.4	DRILLING SAFETY.....	9-3
9.5	DRUM AND PORTABLE TANK HANDLING	9-4
9.6	DRUM SAMPLING SAFETY.....	9-5
9.7	FALL PROTECTION ACTIVITIES	9-5
9.8	FORKLIFT OPERATIONS.....	9-6
9.9	GROUNDWATER SAMPLING/WATER LEVEL MEASUREMENTS	9-7
9.10	HAND AND POWER TOOLS	9-8
9.11	HAUL TRUCKS	9-8
9.12	HEXAVALENT CHROMIUM (Cr VI) EXPOSURE	9-9
9.13	HOISTS.....	9-9
9.14	METHANE	9-10
9.15	METHYLENE CHLORIDE	9-11
9.16	PORTABLE GENERATOR HAZARDS.....	9-11
9.17	PRESSURE LINE/VESSEL SYSTEMS	9-12
9.18	PRESSURE WASHING OPERATIONS.....	9-12
9.19	RIGGING	9-13
9.19.1	<i>General</i>	9-13
9.19.2	<i>Equipment</i>	9-13
9.19.3	<i>Rigging Use</i>	9-14
9.20	STAIRWAYS AND LADDERS.....	9-14
9.21	TRAFFIC CONTROL.....	9-15
9.22	UTILITIES (UNDERGROUND).....	9-16
9.23	UTILITIES (OVERHEAD).....	9-18
9.24	VACUUM TRUCKS.....	9-19
9.25	WELDING AND CUTTING	9-20
9.25.1	<i>Compressed Gas Cylinders</i>	9-21
9.25.2	<i>Welding and Cutting Equipment</i>	9-21
9.25.3	<i>Arc Welding and Cutting</i>	9-21
9.25.4	<i>Toxic Fumes and Gases</i>	9-22
9.25.5	<i>Fire Prevention</i>	9-22
9.26	WORKING AROUND MATERIAL HANDLING EQUIPMENT.....	9-23
10.0	PHYSICAL HAZARDS AND CONTROLS.....	10-1
10.1	NOISE	10-1
10.2	ULTRAVIOLET RADIATION (SUN EXPOSURE)	10-1
10.3	TEMPERATURE EXTREMES	10-2
10.3.1	<i>Heat</i>	10-3
10.3.2	<i>Cold</i>	10-7
11.0	BIOLOGICAL HAZARDS AND CONTROLS	11-1

11.1	AFRICANIZED HONEY BEES	11-1
11.2	BEEES AND OTHER STINGING INSECTS	11-1
11.3	BIRD DROPPINGS	11-1
11.4	COUGARS/MOUNTAIN LIONS	11-2
11.5	COYOTES	11-2
11.6	FERAL DOGS	11-2
11.7	FIRE ANTS	11-2
11.8	HANTAVIRUS	11-3
11.9	MOSQUITO BITES	11-3
11.10	POISON IVY, POISON OAK, AND POISON SUMAC.....	11-4
11.11	POODLE DOG BUSH.....	11-5
11.12	SCORPIONS	11-6
11.13	SNAKES	11-6
11.14	SPIDERS - BROWN RECLUSE AND WIDOW	11-7
11.15	TICKS	11-8
11.16	VALLEY BLACK GNATS.....	11-9
12.0	CONTAMINANTS OF CONCERN.....	12-1
13.0	SITE MONITORING	13-1
13.1	DIRECT READING MONITORING SPECIFICATIONS.....	13-1
13.2	CALIBRATION SPECIFICATIONS	13-1
13.3	INTEGRATED PERSONAL AIR SAMPLING (NOT APPLICABLE FOR THIS PROJECT TASKS).....	13-2
14.0	PERSONAL PROTECTIVE EQUIPMENT	14-1
14.1	REQUIRED PERSONAL PROTECTIVE EQUIPMENT	14-1
14.2	RESPIRATORY PROTECTION	14-2
15.0	WORKER TRAINING AND QUALIFICATION	15-1
15.1	CH2M HILL WORKER TRAINING.....	15-1
15.1.1	<i>Hazardous Waste Operations Training.....</i>	<i>15-1</i>
15.1.2	<i>First Aid/Cardiopulmonary Resuscitation.....</i>	<i>15-2</i>
15.1.3	<i>Safety Coordinator Training</i>	<i>15-2</i>
15.1.4	<i>Site-Specific Training.....</i>	<i>15-2</i>
15.1.5	<i>Project-Specific Training Requirements.....</i>	<i>15-2</i>
16.0	MEDICAL SURVEILLANCE AND QUALIFICATION	16-1
16.1	HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE.....	16-1
16.2	JOB OR SITE-SPECIFIC MEDICAL SURVEILLANCE.....	16-1
16.3	RESPIRATOR USER QUALIFICATION.....	16-1
16.4	HEARING CONSERVATION.....	16-1
17.0	SITE-CONTROL PLAN	17-1
17.1	SITE-CONTROL PROCEDURES.....	17-1
17.2	REMEDATION WORK AREA ZONES	17-1
17.2.1	<i>Support Zone</i>	<i>17-1</i>
17.2.2	<i>Contamination Reduction Zone.....</i>	<i>17-1</i>
17.2.3	<i>Exclusion Zone</i>	<i>17-2</i>
17.2.4	<i>Other Controlled Areas.....</i>	<i>17-2</i>
18.0	DECONTAMINATION.....	18-1
18.1	CONTAMINATION PREVENTION.....	18-1
18.2	PERSONNEL AND EQUIPMENT DECONTAMINATION	18-1
18.3	DECONTAMINATION DURING MEDICAL EMERGENCIES.....	18-2
18.4	WASTE COLLECTION AND DISPOSAL	18-2
18.5	DIAGRAM OF PERSONNEL-DECONTAMINATION LINE.....	18-2
19.0	EMERGENCY RESPONSE PLAN.....	19-1
19.1	PRE-EMERGENCY PLANNING	19-1

19.2	EMERGENCY EQUIPMENT AND SUPPLIES	19-1
19.3	INCIDENT RESPONSE	19-2
19.4	EMERGENCY MEDICAL TREATMENT	19-2
19.5	EVACUATION	19-2
19.6	EVACUATION SIGNALS.....	19-3
19.7	INCLEMENT WEATHER.....	19-3
20.0	SPILL CONTAINMENT PROCEDURES	20-1
21.0	INSPECTIONS.....	21-1
21.1	PROJECT ACTIVITY SELF-ASSESSMENT CHECKLISTS	21-1
21.2	SAFE BEHAVIOR OBSERVATIONS	21-1
22.0	INCIDENT NOTIFICATION, REPORTING, AND INVESTIGATION	22-1
22.1	GENERAL INFORMATION.....	22-1
22.2	SECTION DEFINITIONS	22-1
22.3	REPORTING REQUIREMENTS	22-2
22.4	HITS SYSTEM AND INCIDENT REPORT FORM	22-2
22.5	INJURY MANAGEMENT/RETURN-TO-WORK (FOR US/PUERTO RICO BASED CH2M HILL STAFF ONLY).....	22-2
22.5.1	<i>Background</i>	22-2
22.5.2	<i>The Injury Management/Return-to-Work Notification Process:</i>	22-3
22.6	SERIOUS INCIDENT REPORTING REQUIREMENTS	22-3
22.6.1	<i>Serious Incident Determination</i>	22-3
22.6.2	<i>Serious Incident Reporting</i>	22-4
22.7	INCIDENT ROOT CAUSE ANALYSIS	22-6
22.7.1	<i>Corrective Actions</i>	22-7
23.0	RECORDS AND REPORTS.....	23-1

ATTACHMENTS

Attachment 1	Employee Signoff Form – Health and Safety Plan
Attachment 2	Chemical Inventory/Register Form
Attachment 3	Chemical-Specific Training Form
Attachment 4	Project Activity Self-Assessment Checklists/Forms/Permits
Attachment 5	Key Target Zero Program Elements
Attachment 6	Fact Sheets
Attachment 7	Observed Hazard Form
Attachment 8	Stop Work Order Form
Attachment 9	Agency Inspection Target Zero Bulletin
Attachment 10	Completed CH2M HILL AHAs
Attachment 11	Material Safety Data Sheets

Approval

This site-specific Health and Safety Plan (HSP) has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions and identified scope(s) of work and must be amended if those conditions or scope(s) of work change.

By approving this HSP, the Responsible Health and Safety Manager (RHSM) certifies that the personal protective equipment has been selected based on the project-specific hazard assessment.

Original Plan

RHSM Approval:

Date:

Field Operations Manager Approval:

Date:

Revisions

Revisions Made By:

Date:

Description of Revisions to Plan:

Revisions Approved By:

Date:

1.0 Introduction

CH2MHILL

HSSE
Target Zero
Market Lead Performance



Health, Safety, Security and Environment Policy

Protection of people and the environment is a CH2M HILL core value. It is our vision to create a culture within CH2M HILL that empowers employees to drive this value into all global operations and achieve excellence in health, safety, security and environment (HSSE) performance. CH2M HILL deploys an integrated, enterprise-wide behavior based HSSE management system to fulfill our mission and the expectations of our clients, staff, and communities based on the following principles:

- We require all management and supervisory personnel to provide the leadership and resources to inspire and empower our employees to take responsibility for their actions of their fellow employees to create a safety, healthy, secure and environmentally-responsible workplace.
- We provide value to clients by tailoring HSSE processes to customer needs and requiring all CH2M HILL employees and subcontractors to delivery projects with agility, personal service, and responsiveness and in compliance with HSSE requirements and company standards to achieve health, safety, and security and pollution prevention excellence. Our performance will aspire to influence others and continually redefine world-class HSSE excellence.
- We systematically evaluate our design engineering and physical work environment to verify safe and secure work conditions and practices are established, consistently followed, and timely corrected.
- We continually assess and improve our HSSE program to achieve and maintain world-class performance by setting and reviewing objectives and targets, reporting performance metrics, and routinely reviewing our program.
- We care about the safety and security of every CH2M HILL employee and expect all employees to embrace our culture, share our core value for the protection of people and the environment, understand their obligations, actively participate, take responsibility, and "walk the talk" on and off the job.

The undersigned pledge our leadership, commitment, and accountability for making this policy a reality at CH2M HILL.

Dated the 29th date of March, 2011.

Lee McIntire
Chief Executive Officer

John Madis
Chief Human Resources Officer

Mike Luchi
Chief Financial Officer

Margaret McLean
Chief Legal Officer

Mike McKelvy
President, Government, Environment,
& Nuclear Division

Bob Card
President, Energy & Water Division

Jacqueline Rast
President, Facilities & Infrastructure Division

Fred Brune
President, International Division

Gene Lugia
President, Delivery Excellence

Keith Christopher
Senior Vice President, Health, Safety,
Security and Environment

1.1 CH2M HILL Policy and Commitment

1.1.1 Safe Work Policy

It is the policy of CH2M HILL to perform work in the safest manner possible. Safety must never be compromised. To fulfill the requirements of this policy, an organized and effective safety program must be carried out at each location where work is performed.

CH2M HILL believes that all injuries are preventable, and we are dedicated to the goal of a safe work environment. To achieve this goal, every employee on the project must assume responsibility for safety.

Every employee is empowered to:

- Conduct their work in a safe manner;
- Stop work immediately to correct any unsafe condition that is encountered; and
- Take corrective actions so that work may proceed in a safe manner.

Safety, occupational health, and environmental protection will not be sacrificed for production. These elements are integrated into quality control, cost reduction, and job performance, and are crucial to our success.

1.1.2 Health and Safety Commitment

CH2M HILL has embraced a philosophy for health and safety excellence. The primary driving force behind this commitment to health and safety is simple: employees are CH2M HILL's most significant asset and CH2M HILL management values their safety, health, and welfare. Also, top management believes that all injuries are preventable. CH2M HILL's safety culture empowers employees at all levels to accept ownership for safety and take whatever actions are necessary to eliminate injury. Our company is committed to world-class performance in health and safety and also understands that world-class performance in health and safety is a critical element in overall business success.

CH2M HILL is committed to the prevention of personal injuries, occupational illnesses, and damage to equipment and property in all of its operations; to the protection of the general public whenever it comes in contact with the Company's work; and to the prevention of pollution and environmental degradation.

Company management, field supervisors, and employees plan safety into each work task in order to prevent occupational injuries and illnesses. The ultimate success of CH2M HILL's safety program depends on the full cooperation and participation of each employee.

CH2M HILL management extends its full commitment to health and safety excellence.

1.1.3 Project-Specific Health, Safety, and the Environment Goals

All management and employees are to strive to meet the project-specific Health, Safety, and the Environment (HSE) goals outlined below. The team will be successful only if everyone makes a concerted effort to accomplish these goals. The goals allow the project to stay focused on optimizing the health and safety of all project personnel and, therefore, making the project a great success.

The Project has established eleven specific goals and objectives:

- Create an injury-free environment;
- Have zero injuries or incidents;
- Provide management leadership for HSE by communicating performance expectations, reviewing and tracking performance, and leading by example;

- Ensure effective implementation of the HSP through education, delegation, and team work;
- Ensure 100 percent participation in HSE compliance;
- Continuously improve our safety performance;
- Maintain free and open lines of communication;
- Make a personal commitment to safety as a value;
- Focus safety improvements on high-risk groups;
- Continue strong employee involvement initiatives; and
- Achieve health and safety excellence.

2.0 Applicability

This HSP applies to:

- All CH2M HILL staff, including subcontractors and tiered subcontractors of CH2M HILL working on the site; and
- All visitors to the construction site in the custody of CH2M HILL (including visitors from the Client, the Government, the public, and other staff of any CH2M HILL company).

This HSP does not apply to the third-party contractors, their workers, their subcontractors, their visitors, or any other persons not under the direct control or custody of CH2M HILL.

This HSP defines the procedures and requirements for the health and safety of CH2M HILL staff and visitors when they are physically on the work site. The work site includes the project area (as defined by the contract documents) and the project offices, trailers, and facilities thereon.

This HSP will be kept onsite during field activities and will be reviewed as necessary. The HSP will be amended or revised as project activities or conditions change or when supplemental information becomes available. The HSP adopts, by reference, the Enterprise-wide Core Standards and Standard Operating Procedures (SOPs), as appropriate. In addition, the HSP may adopt procedures from the project Work Plan and any governing regulations. If there is a contradiction between this HSP and any governing regulation, the more stringent and protective requirement shall apply.

This HSP incorporates the regulatory requirements described in the State of California OSHA agency – Cal/OSHA Title 8 CCR, Section 3203, Injury and Illness Prevention Program (IIPP), and section 1509, Construction Injury and Illness Prevention Program. The current version of [CH2M HILL Cal/OSHA IIPP written program](#) can be accessed on the HSSE website under Programs.

All CH2M HILL staff and subcontractors must sign the employee sign-off form included in this document as Attachment 1 to acknowledge review of this document. Copies of the signature page will be maintained onsite by the Safety Coordinator (SC).

3.0 General Project Information

3.1 Project Information and Background

Project Number: 427727.FI.01

Client: United States Environmental Protection Agency (EPA) Region 9

Project/Site Name: Glendale Chromium Operable Unit

Site Address: San Fernando Valley, Los Angeles County, California

CH2M HILL Project Manager: David Towell

CH2M HILL Office: LAC

DATE HSP Prepared: January 2012

Date(s) of Site Work: February 2012 to September 2013

3.2 Site Background and Setting

The SFV Superfund Site is a large area of groundwater contamination located in Los Angeles County, California (Figure 1-1). Specific tasks to be performed are summarized in the field sampling plan (FSP).

3.3 Description of Tasks

All CH2M HILL and Subcontractor employees engaging in hazardous waste operations (HAZWOPER) or emergency response shall receive appropriate training as required by 29 CFR 1910.120 and 29 CFR 1926.65 (or if required by Subcontract). Personnel who have not met these training requirements shall not be allowed to engage in hazardous waste operations or emergency response activities. See the following tasks that fall under HAZWOPER requirements.

3.3.1 HAZWOPER-Regulated Tasks

<ul style="list-style-type: none">• Hand auguring• Air/vacuum clearing• Drilling and monitoring well installation• Groundwater Sampling• Soil sampling	<ul style="list-style-type: none">• Aquifer Testing• Water level measurement• Investigation-derived waste (IDW) sampling
--	--

3.3.2 Non-HAZWOPER-Regulated Tasks

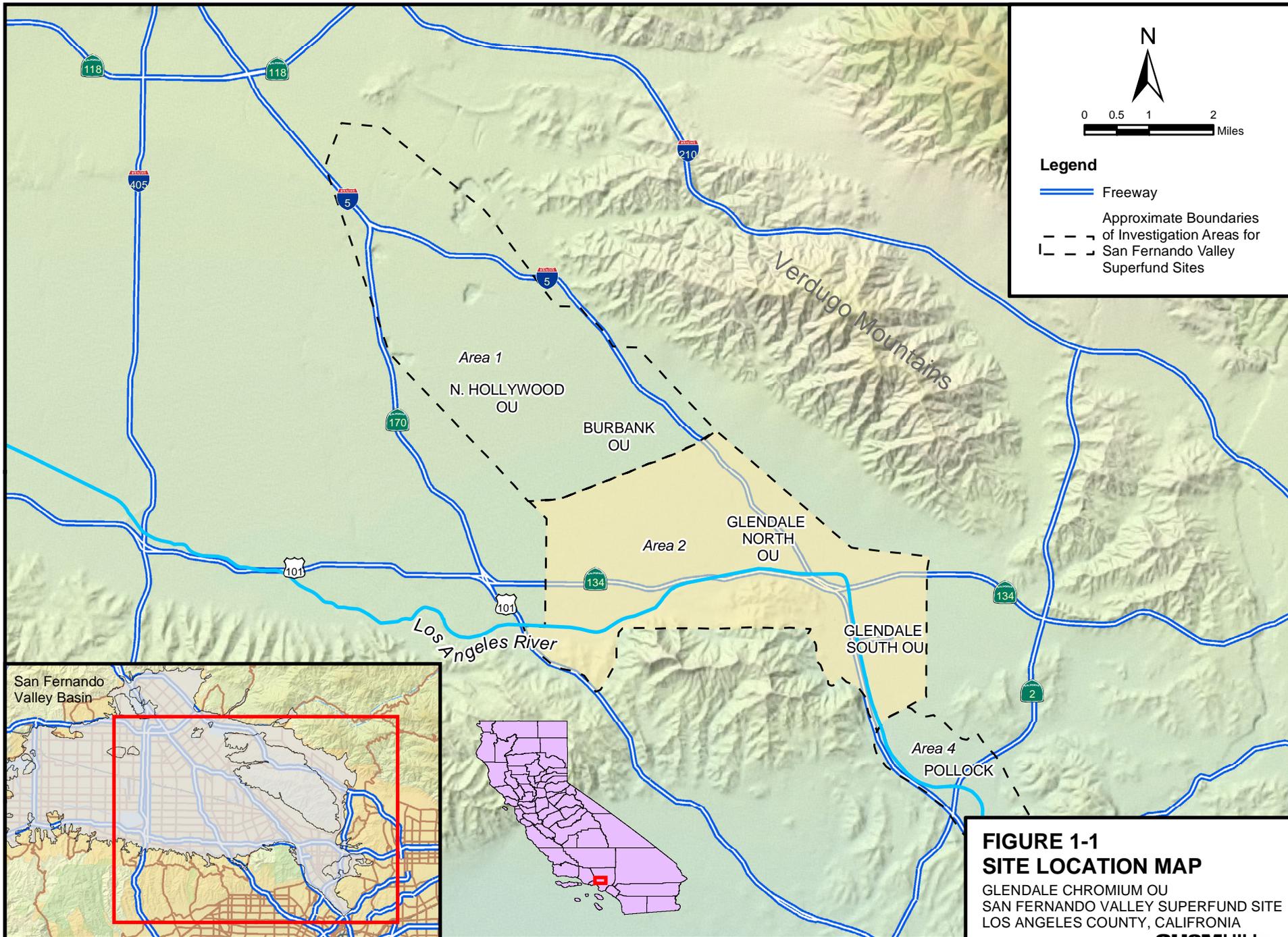
Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. The following tasks do not involve exposure to safety or health hazards associated with the hazardous waste operations. Hazwoper training or medical requirements do not apply for the tasks listed below.

TASKS

- Distribution of fact sheets
- Site reconnaissance
- Surveying

CONTROLS

- Brief on hazards, limits of access, and emergency procedures.
- Post areas of contamination as appropriate.
- Perform air sampling/monitoring as specified in this HSP.



**FIGURE 1-1
SITE LOCATION MAP**
 GLENDALE CHROMIUM OU
 SAN FERNANDO VALLEY SUPERFUND SITE
 LOS ANGELES COUNTY, CALIFORNIA

4.0 Project Organization and Responsibilities

4.1 Client

Contact Name: Lisa Hanusiak
Phone: 415-972-3152

4.2 CH2M HILL

4.2.1 Project Manager

PM Name: David Towell
CH2M HILL Office: LAC
Telephone Number: 213-228-8285
Cellular Number: 775-771-6516

The project manager (PM) is responsible for providing adequate resources (budget and staff) for project-specific implementation of the HSE management process. The PM has overall management responsibility for the tasks listed below. The PM may explicitly delegate specific tasks to other staff, as described in sections that follow, but retains ultimate responsibility for completion of the following in accordance with this document:

- Incorporate standard terms and conditions, and contract-specific HSE roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors).
- Select safe and competent subcontractors by:
 - Choosing potential subcontractors based on technical ability and HSE performance;
 - Implementing the subcontractor prequalification process;
 - Ensuring that acceptable certificates of insurance, including CH2M HILL as named additional insured, are secured as a condition of subcontract award; and
 - Ensuring HSE submittals, subcontract agreements, and appropriate site-specific safety procedures are in place and accepted prior field mobilization.
- Ensure copies of training and medical monitoring records, and site-specific safety procedures are being maintained in the project file accessible to site personnel.
- Provide oversight of subcontractor HSE practices per the site-specific safety plans and procedures.
- Manage the site and interfacing with 3rd parties in a manner consistent with the contract and subcontract agreements and the applicable standard of reasonable care.
- Ensure that the overall, job-specific, HSE goals are fully and continuously implemented.
- Provide visible support and motivation for HSE programs, rules, procedures, processes, and training, leading by example and encouraging CH2M HILL employees to take ownership of HSE issues.
- Intervene or stop work when an unsafe condition or behavior is observed, and/or when an environmentally compromising condition is encountered.
- Make available to and require CH2M HILL employees to complete required HSE training within established timelines and provide project numbers for such training.
- Consistently and even-handedly enforce HSE rules, procedures, and requirements at the office and/or on project work sites.

- Promptly report all work-related HSE incidents or near misses.
- Wear any required personal protective equipment.
- Ensure CH2M HILL employees complete required HSE training within established timelines.
- Conduct, cooperate, or assist with HSE incident investigations.
- Consult with the Human Resources Delivery Partner before taking any disciplinary action (other than verbal counseling) associated with CH2M HILL Policy 203 and/or HSE programs rules, procedures, processes and training.

4.2.2 CH2M HILL Responsible Health and Safety Manager

RHSM Name: Rick Cavil

CH2M HILL Office: BAO

Cellular Number: 408-896-0140

The RHSM is responsible for the following:

- Review and evaluate subcontractor HSE performance using the pre-qualification process;
- Approve HSP and its revisions as well as Activity Hazard Analyses (AHA);
- Review and evaluate subcontractor site-specific safety procedures for adequacy prior to start of subcontractor's field operations;
- Support the oversight (or SC's direct oversight) of subcontractor and tiered subcontractor HSE practices;
- Permit upgrades and downgrades in respiratory protection after reviewing analytical data;
- Conduct audits as determined by project schedule and coordination with PM; and
- Participate in incident investigations, lessons learned, loss and near loss reporting.

4.2.3 CH2M HILL Project Environmental Manager

PM Name: David Towell

CH2M HILL Office: LAC

Telephone Number: 213-228-8285

Cellular Number: 775-771-6516

The Project EM is responsible for the following:

- Provide environmental program support in areas such as training, auditing, planning, permit tracking, and subcontractor oversight as needed or as specified in the project environmental plan;
- Review and evaluate qualifications for subcontractors with a history of environmental non-compliance and for waste transportation and disposal subcontractors;
- Evaluate any spills, releases, or environmental permit incidents for appropriate follow-up actions, notifications, and recordkeeping requirements; and
- Provide environmental compliance and environmental management expertise and advice to the project team as needed during the course of the project.

4.2.4 CH2M HILL Safety Coordinator

SC Name: TBD

CH2M HILL Office: TBD

Telephone Number: TBD

Cellular Number: TBD

The SC is responsible for verifying that the project is conducted in a safe manner including the following specific obligations:

- Verify this HSP is current and amended when project activities or conditions change;
- Verify CH2M HILL site personnel and subcontractor personnel read the HSP and sign the Employee Sign-Off Form, prior to commencing field activities;
- Verify CH2M HILL site personnel have completed any required specialty training (for example, fall protection, confined space entry, among others) and medical surveillance as identified in this HSP;
- Verify that project files include copies of subcontractor training and medical monitoring records, and accepted site-specific safety procedures prior to start of subcontractor's field operations;
- Act as the project "Hazard Communication Coordinator" and perform the responsibilities outlined in the HSP;
- Act as the project "Emergency Response Coordinator" and perform the responsibilities outlined in the HSP;
- Post the Occupational Safety and Health Administration (OSHA) job-site poster; the poster is required at sites where project field offices, trailers, or equipment-storage boxes are established. If you work in a state with an OSHA State Plan, make sure the State Plan poster is posted, if required;
- Hold and/or verify that safety meetings are conducted and documented in the project file initially and as needed throughout the course of the project (as tasks or hazards change);
- Verify that project health and safety forms and permits are being used as outlined this HSP;
- Perform oversight and assessments of subcontractor HSE practices per the site-specific safety plan and verify that project activity self-assessment checklists are being used as outlined this HSP;
- Coordinate with the RHSM regarding CH2M HILL and subcontractor operational performance, and 3rd party interfaces;
- Verify appropriate personal protective equipment (PPE) use, availability, and training;
- Ensure that the overall, job-specific, HSE goals are fully and continuously implemented;
- Conduct accident investigations including root cause analysis;
- Calibrate and conduct air monitoring in accordance with the HSP; maintain all air monitoring records in project file;
- Maintain HSE records and documentation;
- Facilitate OSHA or other government agency inspections including accompanying inspector and providing all necessary documentation and follow-up;
- Deliver field HSE training as needed based on project-specific hazards and activities;
- Consistently and even-handedly enforce HSE rules, procedures, and requirements at the office and/or on project work sites;
- Wear any required personal protective equipment;

- Conduct, cooperate, or assist with HSE incident investigations;
- Contact the PM and RHSM when standards of conduct or CH2M HILL Policy 203 has been violated by a CH2M HILL employee;
- Contact the RHSM and PM in the event of an incident;
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, stop affected work until adequate corrective measures are implemented, and notify the PM and RHSM as appropriate; and
- Document all oral health and safety-related communications in project field logbook, daily reports, or other records.

4.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HSE-215, *Contracts and Subcontracts*)

Subcontractor: TBD

Subcontractor Contact Name: TBD

Telephone: TBD

Subcontractors must comply with the following activities, and are responsible to:

- Comply with all local, state, and federal safety standards;
- Comply with project and owner safety requirements;
- Actively participate in the project safety program and either hold or attend and participate in all required safety meetings;
- Provide a qualified safety representative to interface with CH2M HILL;
- Maintain safety equipment and PPE for their employees;
- Maintain and replace safety protection systems damaged or removed by the subcontractor's operations;
- Notify the SC of any accident, injury, or incident (including spills or releases) immediately and submit reports to CH2M HILL within 24 hours;
- Install contractually required general conditions for safety (for example, handrail, fencing, fall protection systems, floor opening covers);
- Conduct and document weekly safety inspections of project-specific tasks and associated work areas;
- Conduct site-specific and job-specific training for all subcontractor employees, including review of the CH2M HILL HSP, subcontractor HSPs, and subcontractor AHAs and sign appropriate sign-off forms; and
- Determine and implement necessary controls and corrective actions to correct unsafe conditions.

The subcontractors listed above may be required to submit their own site-specific HSP and other plans such as lead or asbestos abatement compliance plans. Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit their plans to CH2M HILL for review and acceptance before the start of field work.

Subcontractors are also required to prepare AHAs before beginning each activity posing hazards to their personnel. The AHA shall identify the principle steps of the activity, potential health and safety hazards for each step and recommended control measures for each identified hazard. In addition, a

listing of the equipment to be used to perform the activity, inspection requirements, and training requirements for the safe operation of the equipment listed must be identified.

4.4 Employee Responsibilities

All personnel are assigned responsibility for safe and healthy operations. This concept is the foundation for involving all employees in identifying hazards and providing solutions. For any operation, individuals have full authority to stop work and initiate immediate corrective action or control. In addition, each worker has a right and responsibility to report unsafe conditions or practices. This right represents a significant facet of worker empowerment and program ownership. Through shared values and a belief that all accidents are preventable, our employees accept personal responsibility for working safely.

Each employee is responsible for the following performance objectives:

- Understanding and abiding by CH2M HILL and client HSE programs, rules, procedures, processes, and training, including any that are project-specific;
- Completing all required HSE training made available and accessible within established timelines;
- Always wearing any required personal protective equipment;
- Intervening or stopping work for you or other CH2M HILL employees when an unsafe condition or behavior is encountered or observed, and/or when an environmentally compromising condition exists;
- Promptly notifying a supervisor, PM, SC, or RHSM when an unsafe condition or behavior is observed, and/or when an environmentally compromising condition exists;
- Promptly reporting a supervisor, PM, SC, or RHSM all work-related health, safety, and environmental incidents or near misses;
- Attending required project HSE pre-task briefings and meeting prior to performing work; and
- Cooperating or assisting with HSE incident investigations.

4.4.1 Employee Authority

Each employee on the project has the obligation and authority to shut down any perceived unsafe work and during employee orientation, each employee will be informed of their authority to do so.

4.5 Client Contractors

(Reference CH2M HILL SOP HSE-215, *Contracts, Subcontracts and HSE Management Practices*)

Contractor: N/A at this time

Contact Name:

Telephone:

Contractor Task(s):

Contractor:

Contact Name:

Telephone:

Contractor Task(s):

This HSP does not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for the health and safety or means and methods of the contractor's work, and we must never assume such responsibility through our actions (such as advising on health and

safety issues). In addition to these instructions, CH2M HILL team members should review contractor safety plans so that we remain aware of appropriate precautions that apply to us. Self-assessment checklists are to be used by the SC and CH2M HILL team members to review the contractor's performance only as it pertains to evaluating CH2M HILL exposure and safety. The RHSM is the only person who is authorized to comment on or approve contractor safety procedures.

Health and safety-related communications with contractors should be conducted as follows:

- Request the contractor to brief CH2M HILL team members on the precautions related to the contractor's work;
- When an apparent contractor non-compliance or unsafe condition or practice poses a risk to CH2M HILL team members:
 - Notify the contractor safety representative;
 - Request that the contractor determine and implement corrective actions;
 - If necessary, stop affected CH2M HILL work until contractor corrects the condition or practice; and
 - Notify the client, PM, and RHSM as appropriate.

If apparent contractor non-compliance or unsafe conditions or practices are observed, inform the contractor safety representative (CH2M HILL's obligation is limited strictly to informing the contractor of the observation; the contractor is solely responsible for determining and implementing necessary controls and corrective actions).

If an apparent imminent danger is observed, immediately warn the contractor employee(s) in danger and notify the contractor safety representative (CH2M HILL's obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of the observation; the contractor is solely responsible for determining and implementing necessary controls and corrective actions).

All verbal health and safety-related communications will be documented in project field logbook, daily reports, or other records.

5.0 Standards of Conduct

All individuals associated with this project must work injury-free and drug-free and must comply with the following standards of conduct, the HSP, and the safety requirements of CH2M HILL. Commonly accepted standards of conduct help maintain good relationships between people. They promote responsibility and self-development. Misunderstandings, frictions, and disciplinary action can be avoided by refraining from thoughtless or wrongful acts.

5.1 Standards of Conduct Violations

All individuals associated with this project are expected to behave in a professional manner. Violations of the standards of conduct would include, but not be limited to:

- Failure to perform work;
- Inefficient performance, incompetence, or neglect of work;
- Willful refusal to perform work as directed (insubordination);
- Negligence in observing safety regulations, poor housekeeping, or failure to report on-the-job injuries or unsafe conditions;
- Unexcused or excessive absence or tardiness;
- Unwillingness or inability to work in harmony with others;
- Discourtesy, irritation, friction, or other conduct that creates disharmony;
- Harassment or discrimination against another individual;
- Failure to be prepared for work by wearing the appropriate construction clothing or bringing the necessary tools; or
- Violation of any other commonly accepted reasonable rule of responsible personal conduct.

5.2 Disciplinary Actions

The Environmental Services (ES) business group employees, employees working on ES business group projects, and subcontractor employees are subject to disciplinary action for not following HSE rules and requirements. Potential disciplinary action is equally applicable to all employees including management and supervision. Disciplinary action may include denial of access to the worksite, warnings, reprimands, and other actions up to and including termination depending on the specific circumstances.

5.3 Subcontractor Safety Performance

CH2M HILL should continuously endeavor to observe subcontractors' safety performance and adherence to their plans and AHAs. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. CH2M HILL oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

5.3.1 Observed Hazard Form

When apparent non-compliance or unsafe conditions or practices are observed, notify the subcontractor's supervisor or safety representative verbally, and document using the Observed Hazard Form, included as an attachment to this HSP, and require corrective action.

If necessary, stop subcontractor's work using the Stop Work Order Form until corrective actions is implemented for observed serious hazards or conditions. Update the Observed Hazard Form to document corrective actions have been taken. The subcontractor is responsible for determining and implementing necessary controls and corrective actions.

5.3.2 Stop Work Order

CH2M HILL has the authority, as specified in the contract, and the responsibility to stop work in the event any CH2M HILL employee observes unsafe conditions or failure of the subcontractor to adhere to its safe-work practices, or observes a condition or practice that may result in a release or violation of an environmental requirement. This authority and action does not in any way relieve the subcontractor of its responsibilities for the means and methods of the work or, therefore, of any corrective actions. Failure to comply with safe work practices can be the basis for restriction or removal of the subcontractor staff from the job site, termination of the subcontract, restriction from future work, or all three.

When an apparent imminent danger is observed, immediately stop work and alert all affected individuals. Remove all affected CH2M HILL employees and subcontractor staff from the danger, notify the subcontractor's supervisor or safety representative, and do not allow work to resume until adequate corrective measures are implemented. Notify the PM, Contract Administrator (KA) and RHSM.

When repeated non-compliance or unsafe conditions are observed, notify the subcontractor's supervisor or safety representative and stop affected work by completing and delivering the Stop Work Order Form (attached to this HSP) until adequate corrective measures are implemented. Consult the KA to determine what the contract dictates for actions to pursue in event of subcontractor non-compliance including work stoppage, back charges, progress payments, removal of subcontractor manager, monetary penalties, or termination of subcontractor for cause.

5.4 Incentive Program

Each project is encouraged to implement a safety incentive program that rewards workers for exhibiting exemplary safety behaviors. Actions that qualify are those that go above and beyond what is expected. Actions that will be rewarded include spotting and correcting a hazard, bringing a hazard to the attention of your foreman, telling your foreman about an incident, coming up with a safer way to get the work done, or stopping a crew member from doing something unsafe. The program will operate throughout the project, covering all workers. The incentive program will be communicated to all employees during the project employee orientation and project safety meetings.

5.5 Reporting Unsafe Conditions/Practices

Responsibility for effective health and safety management extends to all levels of the project and requires good communication between employees, supervisors, and management. Accident prevention requires a pro-active policy on near misses, close calls, unsafe conditions, and unsafe practices. All personnel must report any situation, practice, or condition which might jeopardize the

safety of our projects. All unsafe conditions or unsafe practices will be corrected immediately. CH2M HILL has zero tolerance of unsafe conditions or unsafe practices.

No employee or supervisor will be disciplined for reporting unsafe conditions or practices. Individuals involved in reporting the unsafe conditions or practices will remain anonymous.

The following reporting procedures will be followed by all project employees:

- Upon detection of any unsafe condition or practice, the responsible employee will attempt to safely correct the condition;
- The unsafe condition or practice will be brought to the attention of the worker's direct supervisor, unless the unsafe condition or practice involves the employee's direct supervisor. If so, the SC needs to be notified at once by the responsible employee;
- Either the responsible employee or responsible employee's direct supervisor is responsible for immediately reporting the unsafe condition or practice to the SC;
- The SC will act promptly to correct the unsafe condition or practice; and
- Details of the incident or situation will be recorded by the SC in the field logbook or use the Observed Hazard Form if subcontractor was involved.

6.0 Safety Planning and Change Management

6.1 Daily Safety Meetings and Pre-Task Safety Plans

Daily safety meetings are to be held with all project personnel in attendance to review the hazards posed and required HSE procedures and AHAs that apply for each day's project activities. The Pre-Task Safety Plans (PTSPs) serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews.

At the start of each day's activities, the crew supervisor completes the PTSP, provided as an attachment to this HSP, with input from the work crew, during their daily safety meeting. The day's tasks, personnel, tools and equipment that will be used to perform these tasks are listed, along with the hazards posed and required HSE procedures, as identified in the HSP and AHA. The use of PTSPs promotes worker participation in the hazard recognition and control process while reinforcing the task-specific hazard and required HSE procedures with the crew each day.

6.2 Change Management

This HSP addresses all known activities and associated hazards. As work progresses, if significant changes are identified which could affect health and safety at the site, coordinate with the RHSM to determine whether a HSP update is necessary.

The following are examples of changes that may require a revision to the plan:

- Change in CH2M HILL staff;
- New subcontractor to perform work;
- New chemicals brought to site for use;
- Change in scope or addition of new tasks;
- Change in contaminants of concern (COCs) or change in concentrations of COCs; and
- New hazards or hazards not previously identified that are not addressed in this HSP.

6.3 Agency Inspection Guidance

(Reference CH2M HILL SOP HSE-201, *Agency Inspections and Communications*)

Agency inspections (e.g., OSHA, EPA, other regulatory agencies) are on the rise. CH2M HILL implements safety and environmental programs in order to ensure safety to workers, the public, and the environment. This plan addresses things like labeling containers, completing the hazard communication training using the attachments to this HSP, listing training requirements and PPE requirements, and addressing project-specific hazards. Field personnel need to contact the RHSM to update this plan if hazards are encountered that are not addressed.

[SOP HSE-201](#) addresses agency inspections in detail, and the [attached Target Zero Bulletin on Agency Inspections](#) provides a good summary of the inspection process and what to do if an agency such as OSHA or EPA shows up at the site. It is critical to make immediate notification to the RHSM if an inspector arrives (and EM if it is environmental-related); they can help facilitate and make additional notifications.

Review the Target Zero Bulletin and keep it with your Health and Safety Plan/Environmental Plan. Make it a topic at a safety meeting and keep it readily available in the event of an inspection.

7.0 Project Hazard Analysis

A health and safety risk analysis (Table 1) has been performed for each task. In the order listed below, the RHSM considers the various methods for mitigating the hazards. Employees are trained on this hierarchy of controls during their hazardous waste training and reminded of them throughout the execution of projects:

- Elimination of the hazards (use remote sampling methodology to avoid going into a confined space);
- Substitution (reduce exposure to vapors by using of a geoprobe instead of test pitting);
- Engineering controls (ventilate a confined space to improve air quality);
- Warnings (establish exclusion zones to keep untrained people away from hazardous waste work);
- Administrative controls (implement a work-rest schedule to reduce chance of heat stress); or
- Use of PPE (use of respirators when action levels are exceeded).

The hazard controls and safe work practices are summarized in the following sections of this HSP:

- General hazards and controls;
- Project-specific hazards and controls;
- Physical hazards and controls;
- Biological hazards and controls; and
- Contaminants of concern.

7.1 Activity Hazard Analysis

An AHA must be developed for each CH2M HILL job activity. The AHA shall define the work tasks required to perform each activity, along with potential HSE hazards and recommended control measures for each hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements to be performed and training requirements for the safe operation of the equipment listed must be identified. Workers are briefed on the AHA before performing the work and their input is solicited prior, during, and after the performance of work to further identify the hazards posed and control measures required. The AHA shall identify the work tasks required to perform each activity, along with potential HSE hazards and recommended control measures for each hazard.

The following hazard controls and applicable CH2M HILL core standards and SOPs should be used as a basis for preparing AHAs.

AHAs prepared for CH2M HILL activities are included as an attachment to this HSP.

7.2 Subcontractor Activity Hazard Analysis

CH2M HILL subcontractors are required to provide AHAs specific to their scope of work on the project for acceptance by CH2M HILL. Each subcontractor shall submit AHAs for their field activities, as defined in their scope of work, along with their project-specific safety plan and procedures. Additions or changes in field activities, equipment, tools, or material used to perform work or hazards not addressed in existing AHAs requires either a new AHA to be prepared or an existing AHA to be revised.

Table 1 – General Activity Hazard Analysis

Potential Hazard	Project Activity	Borehole Marking and Utility Clearance	Drilling and Monitoring Well Installation	Soil Sampling	Ground Water Sampling	Aquifer Testing	IDW Management	Surveying
Biological Hazards		X	X	X	X	X	X	X
Chemical Hazard			X	X	X	X	X	
Compressed Gas Cylinders					X			
Concrete Coring		X						
Cranes			X					
Drilling			X					
Drum Handling		X	X	X	X		X	
Drum Sampling							X	
Electrical Safety		X	X		X	X		
Excavations		X	X					
Fall Protection		X	X					
Field Vehicles		X	X	X	X	X	X	X
Fire Prevention		X	X	X	X	X	X	X
Forklifts			X					
Groundwater Sampling					X			
Hand & Power Tools		X	X	X	X	X	X	X
Hexavalent Chromium		X	X	X	X	X	X	
Hoists			X					
Manual Lifting		X	X	X	X	X	X	X
Noise		X	X	X	X	X		
Portable Generators					X	X		
Powder-Actuated Tools		X	X			X		
Pressurized Lines/Equipment		X	X					
Pressure Washing Equipment/ Decontamination			X	X	X	X		
Rigging			X					
Stairways and Ladders		X	X			X	X	
Temperature Extremes		X	X	X	X	X	X	X
Traffic Control		X	X	X	X	X	X	X
Ultraviolet Light exposure (sunburn)		X	X	X	X	X	X	X
Utilities (underground/overhead)		X	X					
Vacuum Truck/Pumping							X	

Potential Hazard	Project Activity	Borehole Marking and Utility Clearance	Drilling and Monitoring Well Installation	Soil Sampling	Ground Water Sampling	Aquifer Testing	IDW Management	Surveying	
Operations									
Welding and Cutting			X						
Working around Material Handling Equipment		X	X				X		

8.0 General Hazards and Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. It is a summarized list of requirements. Always consult the appropriate CH2M HILL SOP to ensure all requirements are implemented.

8.1 Bloodborne Pathogens

(Reference CH2M HILL SOP HSE-202, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or cardiopulmonary resuscitation (CPR), or when coming into contact with landfill waste or waste streams containing potentially infectious material (PIM).

Employees trained in first-aid/CPR or those exposed to PIM must complete CH2M HILL's 1-hour bloodborne pathogens computer-based training module annually. When performing first-aid/CPR the following shall apply:

- Observe universal precautions to prevent contact with blood or other PIMs. Where differentiation between body fluid types is difficult or impossible, consider all body fluids to be potentially infectious materials;
- Always wash your hands and face with soap and running water after contacting PIMs. If washing facilities are unavailable, use an antiseptic cleanser with clean paper towels or moist towelettes; and
- If necessary, decontaminate all potentially contaminated equipment and surfaces with chlorine bleach as soon as possible. Use one part chlorine bleach (5.25 percent sodium hypochlorite solution) diluted with 10 parts water for decontaminating equipment or surfaces after initially removing blood or other PIMs. Remove contaminated PPE as soon as possible before leaving a work area.

CH2M HILL will provide exposed employees with a confidential medical examination should an exposure to PIM occur. This examination includes the following procedures:

- Documenting the exposure;
- Testing the exposed employee's and the source individual's blood (with consent); and
- Administering post-exposure prophylaxis.

8.2 Chemical Storage

The following are general guidelines for storing chemicals and other hazardous materials:

- Keep acids away from bases;
- Keep oxidizers (nitric acid, nitrates, peroxides, chlorates) and organics away from inorganic reducing agents (metals);
- Keep flammables and corrosives in appropriate storage cabinets;
- Do not store paper or other combustibles near flammables;
- Use secondary containment and lipped shelving that is secured; and
- Have a fire suppression system available.

8.2.1 Storage of Flammable/Combustible Liquids

- Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids.

- Approved safety cans shall be used for the handling and use of flammable liquids in quantities of 5 gallons (19 liters) or less. Do not use plastic gas cans.
- For quantities of 1 gallon (3.78 liters) or less, the original container may be used for storage and use of flammable liquids.
- Flammable or combustible liquids shall not be stored in areas used for stairways or normally used for the passage of people.

8.2.2 Indoor Storage of Flammable/Combustible Liquids

- No more than 25 gallons (95 liters) of flammable or combustible liquids shall be stored in a room outside of an approved storage cabinet.
- Quantities of flammable and combustible liquids in excess of 25 gallons (95 liters) shall be stored in an acceptable or approved cabinet.
- Cabinets shall be conspicuously lettered: "FLAMMABLE: KEEP FIRE AWAY."
- Not more than 60 gallons (228 liters) of flammable or 120 gallons (456 liters) of combustible liquids shall be stored in any one storage cabinet. Not more than three such cabinets may be located in a single storage area.

8.2.3 Outside Storage of Flammable/Combustible Liquids

- Storage of containers (not more than 60 gallons [228 liters] each) shall not exceed 1,100 gallons (4180 liters) in any one area. No area shall be within 20 feet (6.1 meters) of any building.
- Storage areas shall be graded to divert spills away from buildings and surrounded by an earthen dike.
- Storage areas may not be located near a storm drain. Overflow and spills must be diverted away from storm drains or surface waters.
- Storage areas shall be free from weeds, debris, and other combustible materials.
- Outdoor portable tanks shall be provided with emergency vent devices and shall not be closer than 20 feet (6.1 meters) to any building.
- Signs indicating no smoking shall be posted around the storage area.

8.2.4 Storage of Hazardous Waste

- All facilities storing ignitable and combustible liquids and hazardous wastes must be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any release of hazardous constituents.
- Flammable wastes should be stored more than 50 feet from the property line.

8.2.5 Storage of Chemical Injection Chemicals/Materials

When chemical injection remediation technologies are being used at a site, the following storage guidelines must be followed:

- Some injection chemicals, such as strong oxidizers, may have stringent storage requirements per local or National Fire Codes. Verify that appropriate storage provisions are in place prior to starting work.

NOTE: Counties and cities may have requirements specific to storing these chemicals. Also, storage and use of certain chemicals such as potassium permanganate and hydrogen peroxide may be subject to the new Chemical Facility Anti-Terrorism Standards of the Department of Homeland Security – the applicability depends on the chemical, quantity/concentration, and type of facility.

Please contact the project Environmental Manager to determine whether chemicals are subject to these standards.

- Injection chemicals must be stored in a designated, secured area with spill prevention capabilities. Review MSDS or other information to determine potential incompatible materials. Incompatible materials shall not be stored together. Ensure all containers are labeled.

8.3 Driving Safety

Follow the guidelines below when operating a vehicle:

- Refrain from using a cellular phone while driving. Pull off the road, put the vehicle in park and turn on flashers before talking on a cellular phone;
- Never operate a personal digital assistant (PDA), or other device with e-mail, internet, or text messaging function while driving a vehicle;
- Obey speed limits; be aware of blind spots or other hazards associated with low visibility. Practice defensive driving techniques, such as leaving plenty of room between your vehicle and the one ahead of you;
- Do not drive while drowsy. Drowsiness can occur at any time, but is most likely after 18 hours or more without sleep;
- Maintain focus on driving. Eating, drinking, smoking, adjusting controls can divert attention from the road. Take the time to park and perform these tasks when parked rather than while driving; and
- Ensure vehicle drivers are familiar with the safe operation of vehicles of the type and size to be operated. Large vehicles such as full size vans and pick-ups have different vision challenges and handling characteristics than smaller vehicles.

8.4 Electrical Safety

(Reference CH2M HILL SOP HSE-206, *Electrical Safety*)

Below are the hazard controls and safe work practices to follow when using electrical tools, extension cords, and/or other electrical-powered equipment or when exposed to electrical hazards. Ensure the requirements of the referenced SOP are followed:

- Only qualified personnel are permitted to work on unprotected energized electrical systems;
- Only authorized personnel are permitted to enter high-voltage areas;
- CH2M HILL employees who might from time to time work in an environment influenced by the presence of electrical energy must complete Awareness Level Electrical Safety Training located on the CH2M HILL Virtual Office;
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented;
- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service;

- CH2M HILL has selected Ground Fault Circuit Interrupters (GFCIs) as the standard method for protecting employees from the hazards associated with electric shock;
 - GFCIs shall be used on all 120-volt, single phase 15 and 20-ampere receptacle outlets which are not part of the permanent wiring of the building or structure.
- An assured equipment grounding conductor program may be required under the following scenarios:
 - GFCIs cannot be utilized;
 - Client requires such a program to be implemented; or
 - Business group decides to implement program in addition to GFCI protection.
- Extension cords must be equipped with third-wire grounding. Cords passing through work areas must be covered, elevated or protected from damage. Cords should not be routed through doorways unless protected from pinching. Cords should not be fastened with staples, hung from nails, or suspended with wire;
- Electrical power tools and equipment must be effectively grounded or double-insulated and Underwriters Laboratory (UL) approved;
- Operate and maintain electric power tools and equipment according to manufacturers' instructions;
- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet (3 meters) from overhead power lines for voltages of 50 kV or less, and 10 feet (3 meters) plus 0.4 inches (1.0 cm) for every 1 kV over 50 kV;
- Temporary lights shall not be suspended by their electric cord unless designed for suspension. Lights shall be protected from accidental contact or breakage; and
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

8.5 Field Vehicles

- Field vehicles may be personal vehicles, rental vehicles, fleet vehicles, or project vehicles.
- Maintain a first aid kit, bloodborne pathogen kit, and fire extinguisher in the field vehicle at all times.
- Utilize a rotary beacon on vehicle if working adjacent to active roadway.
- Familiarize yourself with rental vehicle features prior to operating the vehicle:
 - Vision Fields and Blind Spots
 - Vehicle Size
 - Mirror adjustments
 - Seat adjustments
 - Cruise control features, if offered
 - Pre-program radio stations and Global Positioning System (GPS), if equipped
- Always wear seatbelt while operating vehicle.
- Adjust headrest to proper position.
- Tie down loose items if utilizing a van or pick-up truck.
- Close car doors slowly and carefully. Fingers can get pinched in doors.

- Park vehicle in a location where it can be accessed easily in the event of an emergency. If not possible, carry a phone.
- Have a designated place for storing the field vehicle keys when not in use.
- Ensure back-up alarms are functioning, if equipped. Before backing a vehicle, take a walk around the vehicle to identify obstructions or hazards. Use a spotter when necessary to back into or out of an area.
- See the Vehicle Accident Guidance attached to this HSP, if a vehicle incident is experienced in a rental or fleet vehicle.

8.6 Fire Prevention

(Reference CH2M HILL SOP HSE-403, *Hazardous Material Handling*)

Follow the fire prevention and control procedures listed below.

8.6.1 Fire Extinguishers and General Fire Prevention Practices

- Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet (30.5 meters). When 5 gallons (19 liters) or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet (15.2 meters). Extinguishers must:
 - be maintained in a fully charged and operable condition;
 - be visually inspected each month; and
 - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Post “Exit” signs over exiting doors, and post “Fire Extinguisher” signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet (3 meters) from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Keep areas neat. Housekeeping is important.

8.6.2 Dispensing of Flammable/Combustible Liquids

- Areas in which flammable or combustible liquids are dispensed in quantities greater than 5 gallons (22.7 liters) (shall be separated from other operations by at least 25 feet (7.6 meters).
- Drainage away from storm drains or surface waters or other means of containment shall be provided to control spills.
- Adequate natural or mechanical ventilation shall be provided to maintain the concentration of flammable vapor at or below 10 percent of the lower flammable limit.
- Dispensing of flammable liquids from one container to another shall be done only when containers are electrically interconnected (bonded).
- Dispensing flammable or combustible liquids by means of air pressure on the container or portable tanks is prohibited.
- Dispensing devices and nozzles for flammable liquids shall be of an approved type.

8.7 General Practices and Housekeeping

The following are general requirements applicable to all portions of the work:

- Site work should be performed during daylight hours whenever possible;
- Good housekeeping must be maintained at all times in all project work areas;
- Common paths of travel should be established and kept free from the accumulation of materials;
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions;
- Provide slip-resistant surfaces, ropes, or other devices to be used;
- Specific areas should be designated for the proper storage of materials;
- Tools, equipment, materials, and supplies shall be stored in an orderly manner;
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area;
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals;
- All spills shall be quickly cleaned up; oil and grease shall be cleaned from walking and working surfaces;
- Review the safety requirements of each job you are assigned to with your supervisor. You are not expected to perform a job that may result in injury or illness to yourself or to others;
- Familiarize yourself with, understand, and follow jobsite emergency procedures;
- Do not fight or horseplay while conducting the firm's business;
- Do not use or possess firearms or other weapons while conducting the firm's business;
- Report unsafe conditions or unsafe acts to your supervisor immediately;
- Report emergencies, occupational illnesses, injuries, vehicle accidents, and near misses immediately;
- Do not remove or make ineffective safeguards or safety devices attached to any piece of equipment;
- Report unsafe equipment, defective or frayed electrical cords, and unguarded machinery to your supervisor;
- Shut down and lock out machinery and equipment before cleaning, adjustment, or repair. Do not lubricate or repair moving parts of machinery while the parts are in motion;
- Do not run in the workplace;
- When ascending or descending stairways, use the handrail and take one step at a time;
- Do not apply compressed air to any person or clothing;
- Do not wear steel taps or shoes with metal exposed to the sole at any CH2M HILL project location;
- Do not wear finger rings, loose clothing, wristwatches, and other loose accessories when within arm's reach of moving machinery;
- Remove waste and debris from the workplace and dispose of in accordance with federal, state, and local regulations;

- Note the correct way to lift heavy objects (secure footing, firm grip, straight back, lift with legs), and get help if needed. Use mechanical lifting devices whenever possible; and
- Check the work area to determine what problems or hazards may exist.

8.8 Hazard Communication

(Reference CH2M HILL SOPs HSE-107, *Hazard Communication* and HSE-403, *Hazardous Material Handling*)

The hazard communication coordinator is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using the chemical inventory form included as an attachment to this HSP;
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available;
- Request or confirm locations of material safety data sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed;
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical and include on the chemical inventory sheet (attached to this HSP) and add the MSDS to the MSDS attachment section of this HSP;
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly;
- Give employees required chemical-specific HAZCOM training using the chemical-specific training form included as an attachment to this HSP; and
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

8.9 Knife Use

Open-bladed knives (for example, box cutters, utility knives, pocket knives, machetes, and multi-purpose tools with fixed blades such as a Leatherman™) are prohibited at worksites except where the following three conditions are met:

- The open-bladed knife is determined to be the best tool for the job;
- An approved Activity Hazard Analysis (AHA) or written procedure is in place that covers the necessary safety precautions (work practices, PPE, and training); and
- Knife users have been trained and follow the AHA.

8.10 Lighting

Lighting shall be evaluated when conducting work inside buildings, confined spaces, or other areas/instances where supplemental light may be needed (e.g., work before sunrise or after sunset). A light meter can be used to evaluate the adequacy of lighting. The following are common requirements for lighting and the conditions/type of work being performed:

- While work is in progress outside construction areas shall have at least 33 lux (lx);
- Construction work conducted inside buildings should be provided with at least 55 lux light;
- The means of egress shall be illuminated with emergency and non-emergency lighting to provide a minimum 11 lx measured at the floor. Egress illumination shall be arranged so that the failure of any single lighting unit, including the burning out of an electric bulb will not leave any area in total darkness.

8.11 Manual Lifting

(Reference CH2M HILL SOP HSE-112, *Manual Lifting*)

Back injuries are the leading cause of disabling work and most back injuries are the result of improper lifting techniques or overexertion. Use the following to mitigate the hazards associated with lifting:

- When possible, the task should be modified to minimize manual lifting hazards;
- Lifting of loads weighing more than 40 pounds (18 kilograms) shall be evaluated by the SC using the Lifting Evaluation Form contained in SOP HSE-112;
- Using mechanical lifting devices is the preferred means of lifting heavy objects such as forklifts; cranes, hoists, and rigging; hand trucks; and trolleys;
- Personnel shall seek assistance when performing manual lifting tasks that appear beyond their physical capabilities;
- In general, the following steps must be practiced when planning and performing manual lifts: Assess the situation before you lift; ensure good lifting and body positioning practices; ensure good carrying and setting down practices; and
- All CH2M HILL workers must have training in proper manual lifting training either through the New Employee Orientation or through Manual Lifting module located on the VO.

8.12 Personal Hygiene

Good hygiene is essential for personal health and to reduce the potential of cross-contamination when working on a hazardous waste site. Implement the following:

- Keep hands away from nose, mouth, and eyes during work;
- Keep areas of broken skin (chapped, burned, etc.) covered; and
- Wash hands with soap and water prior to eating, smoking, or applying cosmetics.

8.13 Shipping and Transportation of Hazardous Materials

(Reference CH2M HILL SOP HSE-417, *Hazardous Materials Transportation*)

The U.S. Department of Transportation (DOT) has specific regulations governing shipping of hazardous materials (also called dangerous goods). Chemicals brought to the site might be defined as hazardous materials by the U.S. DOT. Hazardous wastes that may be shipped offsite are also defined as hazardous materials by U.S. DOT. Other wastes may also be U.S. DOT hazardous materials. To confirm whether a material or a waste is a U.S. DOT hazardous material, check with the ESBG Waste Coordinator (Lisa Schwan/ATL), the project EM, or the CH2M HILL Dangerous Goods Shipping Coordinators (John Blasco/BAO or Rob Strehlow/MKW).

All staff who affect shipment of hazardous materials, including receiving hazardous materials, preparing profiles or manifests, packaging hazardous wastes, labeling, or transporting hazardous materials by road, are called HazMat employees (note CH2M HILL cannot transport hazardous wastes by public road). HazMat employees must receive CH2M HILL online training in shipping dangerous goods. CH2M HILL's online Dangerous Goods Shipping course can be found on the CH2M HILL HSSE website.

All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. If the material is a product that is being shipped (e.g., calibration gas), use the HazMat ShipRight tool on the CH2M HILL virtual office

(under Company Resources – Online Shipping). Contact the Dangerous Goods Shipping coordinators, the ESBG Waste Coordinator or the project EM for additional information.

49 CFR 172 requires that all hazmat employees be aware of potential transportation security concerns. Hazardous materials security is addressed in CH2M HILL’s Hazardous Materials SOP (HSE-403). The following points are provided as an overview of security measures to increase awareness of this important matter:

- It is essential that each employee understand the security risks involved with transporting hazardous materials;
- All transporters of hazardous materials must be prequalified by a Contracts Administrator who evaluate the carrier’s safety rating, security measures, and employee screening procedures;
- When shipping hazardous materials, check driver credentials and ask about shipping details;
- When receiving a hazardous materials shipment, inspect packages for signs of tampering or damage to the contents. Verify the drivers and company information on the form with the driver; and
- If there is suspicious or unusual behavior (e.g., driver without credentials, evasive answers) or any discrepancies identified, do not offer or accept the shipment, and immediately notify the project manager or the RHSM.

Employees responsible for shipping hazard materials must also review the CH2M HILL Transportation Security Plan (HSE-417 Appendix A).

8.14 Substance Abuse

(Reference CH2M HILL SOP HSE-105, *Drug-Free Workplace*)

Employees who work under the influence of controlled substances, drugs, or alcohol may prove to be dangerous or otherwise harmful to themselves, other employees, clients, the company, the company’s assets and interests, or the public. CH2M HILL does not tolerate illegal drug use, or any use of drugs, controlled substances, or alcohol that impairs an employee’s work performance or behavior.

Prohibitions onsite include:

- Use or possession of intoxicating beverages while performing CH2M HILL work;
- Abuse of prescription or nonprescription drugs;
- Use or possession of illegal drugs or drugs obtained illegally;
- Sale, purchase, or transfer of legal, illegal or illegally obtained drugs; and
- Arrival at work under the influence of legal or illegal drugs or alcohol.

Drug and/or alcohol testing is applicable under CH2M HILL Constructors, Inc. and munitions response projects performed in the United States. In addition, employees may be required to submit to drug and/or alcohol testing as required by clients. When required, this testing is performed in accordance with SOP HSE-105, Drug-Free Workplace. Employees who are enrolled in drug or alcohol testing are required to complete annual training located on the CH2M HILL Virtual Office (VO).

9.0 Project-Specific Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the work or the particular hazard. Each person onsite is required to abide by the hazard controls. Always consult the appropriate CH2M HILL SOP to ensure all requirements are implemented. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the RHSM for clarification.

9.1 Compressed Gas Cylinders

(Reference CH2M HILL SOP HSE-403, *Hazardous Materials Handling*)

Below are the hazard controls and safe work practices to follow when working around or using compressed gas cylinders. Ensure the requirements in the referenced SOP are followed.

- Cylinders and pressure-controlling apparatus shall be inspected for defects and leakage prior to use. Damaged or defective items shall not be used. If a cylinder is found to be defective, the gas distributor shall be notified and subsequent instructions followed. If a leak should develop at a fuse plug or other safety device, the cylinder shall be removed from the work area.
- Cylinders shall be labeled with the identity of the contents. Cylinders not labeled shall be sent back to the cylinder distributor. The color of the cylinder shall not be used exclusively to identify cylinder contents.
- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinders must be secured in an upright position at all times.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.
- Eye protection (safety glasses or goggles) shall be worn when using cylinders.
- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.
- Cylinders inside buildings shall be stored in dry, well-ventilated locations at least 20 feet (6.1 meters) from highly combustible materials. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage areas shall be located where cylinders will not be knocked over or damaged.
- Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials by a minimum of 20 feet (6.1 meters) or by a noncombustible barrier at least 5 feet (1.5 meters) high, having a fire resistance rating of at least 0.5 hour.
- Signs indicating no smoking shall be provided for storage areas containing flammable gas cylinders.
- Complete the self-assessment checklist for compressed gas cylinders are being used.

9.2 Concrete Core Drilling

(Reference CH2M HILL SOP HSE-204, *Drilling*)

Below are the hazard controls and safe work practices to follow when working around or performing concrete core drilling.

- Operators must read and understand the Operators Manual(s) for the equipment that will be used.
- Follow all manufacturers' operating instructions and comply with all warning labels on the equipment.
- Inspect equipment to ensure it is in proper operating condition prior to use. Equipment damage or missing parts must be corrected prior to operation.
- Follow all requirements for use of PPE. Minimum PPE includes hearing protection, safety glasses with side shields, safety toed boots. A face shield over safety glasses or liquid splash goggles may be required for wet coring.
- Inspect areas to be cored to ensure there are no obstructions, for example utilities on the opposite side of a wall to be cored through. Follow utility locate procedures for when coring slab on grade.
- Provide dust control (wet coring or local exhaust for dry coring) to avoid potential silica exposure.
- Make sure that all electrical wiring is grounded.
- The power supply line (electric cord, pneumatic or hydraulic line) must be protected from damage and routed to prevent it becoming a tripping hazard.
- When hydraulic coring equipment is used, all workers must be aware of hydraulic lines running to the coring equipment. Preparations must be made for containment/ clean up in the event of a ruptured hydraulic line.
- All workers must keep their hands and body away from the cutting saw/ cable.
- The power supply must be disconnected when changing bits or conducting other maintenance on the equipment.
- Slippery conditions may exist in wet coring operations. Water needs to be controlled during cutting and proper safety toed footwear used to minimize slip potential.
- Use the Drilling Self-Assessment checklist to evaluate coring operations.

9.3 Crystalline Silica

(Reference CH2M HILL SOP HSE-511, *Crystalline Silica*)

CH2M HILL subcontractors shall control employee exposure to crystalline silica when exposures are at or above the ACGIH TLV of 0.025 mg/m³ by submitting for review and approval a crystalline silica exposure monitoring plan. The elements of an exposure monitoring plan include, but are not limited to the following:

- A bulk sample representative of the material to be demolished must be sent with the air monitoring sample media for analysis;
- Initial monitoring and personal air sampling must be conducted to determine the potential worker exposure to respirable crystalline silica;
- Real-time particulate monitors with a 10 micron respirable size fraction attachment may be used as part of the initial and ongoing monitoring plan to evaluate the potential worker exposure. This must include an action level established by their corporate or site health and safety professional and

include actions required (e.g., implement engineering, administrative controls, respiratory protection);

Other exposure control measures include:

- Maintaining surfaces as clean as practicable to minimize accumulation of crystalline silica containing particulate material;
- Clean surfaces with a HEPA-filter vacuum or equivalent method;
- Implement dust suppression during demolition;
- Restricting access to the work area where crystalline silica exposure may exist to only those authorized to perform work or enter the area;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in these areas;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person; and

CH2M HILL personnel shall review the fact sheet **included as an attachment to this HSP.**

9.4 Drilling Safety

(Reference CH2M HILL SOP HSE-204, *Drilling*)

Below are the hazard controls and safe work practices to follow when working around or performing drilling. Ensure the requirements in the referenced SOP are followed.

- The drill rig is not to be operated in inclement weather.
- The driller is to verify that the rig is properly leveled and stabilized before raising the mast.
- Personnel should be cleared from the sides and rear of the rig before the mast is raised.
- The driller is not to drive the rig with the mast in the raised position.
- The driller must check for overhead power lines before raising the mast. Maintain a minimum distance of 10 feet (3 meters) between mast and overhead lines (<50 kV) and an additional 0.4 inches for every 1 kV over 50kV. Verify the voltage of nearby overhead power lines to determine the minimum distance.
- If the project site is suspected of munitions or explosives of concern (MEC) contamination, requirements of the *Explosives Usage and Munitions Response (MR)* SOP HSE-610 shall be followed. MECs include unexploded ordnance (UXO), discarded military munitions, materials that present a potential explosive hazard, chemical warfare materials, munitions constituents, and contaminated soil or groundwater. "Down-hole" avoidance support may be required to prevent accidental contact with UXO. Safety requirements will be based on the risk assessment identified within the MR (safety) ORE (Opportunity Risk Evaluation).
- Personnel should stand clear before rig startup.
- The driller is to verify that the rig is in neutral when the operator is not at the controls.
- Become familiar with the hazards associated with the drilling method used (cable tool, air rotary, hollow-stem auger, etc.).
- Do not wear loose-fitting clothing, watches, etc., that could get caught in moving parts.
- Do not smoke or permit other spark-producing equipment around the drill rig.

- The drill rig must be equipped with a kill wire or switch, and personnel are to be informed of its location.
- Be aware and stand clear of heavy objects that are hoisted overhead.
- The driller is to verify that the rig is properly maintained in accordance with the drilling company's maintenance program.
- The driller is to verify that all machine guards are in place while the rig is in operation.
- The driller is responsible for housekeeping (maintaining a clean work area).
- The drill rig should be equipped with at least one fire extinguisher.
- If the drill rig comes into contact with electrical wires and becomes electrically energized, do not touch any part of the rig or any person in contact with the rig, and stay as far away as possible. Notify emergency personnel immediately.
- Use the drilling self-assessment checklist attached to this HSP to evaluate drilling operations.

9.5 Drum and Portable Tank Handling

Below are the hazard controls and safe work practices to follow when overseeing the movement of drums or when handling drums:

- Ensure that personnel are trained in proper lifting and moving techniques to prevent back injuries;
- Ensure drum or tank bungs and lids are secured and are labeled prior to moving;
- Ensure that drums and tanks remain covered except when removing or adding material or waste. Covers and/or lids will be properly secured at the end of each workday;
- Provide equipment to keep the operator removed from the drums to lessen the likelihood of injury. Such equipment might include: a drum grappler attached to a hydraulic excavator; a small front-end loader, which can be either loaded manually or equipped with a bucket sling; a rough terrain forklift; Roller conveyor equipped with solid rollers; drum carts designed specifically for drum handling;
- Make sure the vehicle selected has sufficient rated load capacity to handle the anticipated loads, and make sure the vehicle can operate smoothly on the available road surface;
- Ensure there are appropriately designed Plexiglas cab shields on loaders, backhoes, etc., when handling drums containing potentially explosive materials;
- Equipment cabs should be supplied with fire extinguishers, and should be air-conditioned to increase operator efficiency;
- Supply operators with appropriate respiratory protective equipment when needed;
- Ensure that drums are secure and are not in the operator's view of the roadway;
- Prior to handling, all personnel should be warned about hazards of handling;
- Before moving anything, determine the most appropriate sequence in which the various drums, portable tanks, and other containers should be moved (e.g. small containers may have to be removed first to permit heavy equipment to enter and move the drums);
- Overpack drums and an adequate volume of absorbent should be kept near areas where minor spills may occur;
- Use containers or overpacks that are compatible with the waste or materials;

- Drums containing liquids or hazardous waste will be provided with secondary containment and may not be located near a storm water inlet or conveyance;
- Allow enough aisle space between drum pallets and between drums and other equipment that the drums can be easily accessed (at least 2 to 3 feet) by fire control equipment and similar equipment.; and
- Make sure that a spill kit is available in drum or tank storage areas (or where liquids are transferred from one vessel to another).

9.6 Drum Sampling Safety

Personnel are permitted to handle and/or sample drums containing certain types of waste (drilling waste, investigation-derived waste, and waste from known sources) only. Handling or sampling drums with unknown contents requires a plan revision or amendment approved by the RHSM. The following control measures will be taken when sampling drums:

- Minimize transportation of drums;
- Sample only labeled drums or drums from a known waste stream;
- Do not sample bulging or swollen drums. Contact the RHSM;
- If drums contain, or potentially contain, flammable materials, use non-sparking tools to open;
- Use the proper tools to open and seal drums;
- Reseal bung holes or plugs whenever possible;
- Avoid mixing incompatible drum contents;
- Sample drums without leaning over the drum opening;
- Transfer/sample the content of drums using a method that minimizes contact with material;
- Use the PPE and perform air monitoring as specified in the PPE and Site Monitoring sections of this HSP;
- Take precautions to prevent contaminated media from contacting the floor or ground, such as having plastic under the sampling area, having a spill kit accessible during sampling activities; and
- If transferring/sampling drums containing flammable or combustible liquids, drums and liquid transfer equipment should be grounded and bonded to reduce the potential of a static discharge.

9.7 Fall Protection Activities

(Reference CH2M HILL, SOP HSE-308, *Fall Protection*)

Below are the hazard controls and safe work practices to follow when personnel or subcontractors are exposed to unprotected heights. Ensure the requirements in the referenced SOP are followed.

- Fall protection systems must be used to eliminate fall hazards when performing construction activities at a height of 6 feet (1.8 meters) or greater and when performing general industry activities at a height of 4 feet (1.2 meters) or greater.
- CH2M HILL staff exposed to fall hazards must complete initial fall protection training by completing either the CH2M HILL 10-Hour Construction Safety Awareness training course or the Fall Protection computer-based training module. Staff must also and receive project-specific fall protection training using the fall protection evaluation form attached to this HSP. Staff shall not use fall protection systems for which they have not been trained.

- The SC or designee must complete the Project Fall Protection Evaluation Form and provide project-specific fall protection training to all CH2M HILL staff exposed to fall hazards.
- The company responsible for the fall protection system shall provide a fall protection competent person to inspect and oversee the use of fall protection system. CH2M HILL staff shall be aware of and follow all requirements established by the fall protection competent person for the use and limitation of the fall protection system.
- When CH2M HILL designs or installs fall protection systems, staff shall be qualified as fall protection competent persons or work directly under the supervision of a CH2M HILL fall protection competent person.
- When horizontal lifelines are used, the company responsible for the lifeline system shall provide a fall protection qualified person to oversee the design, installation, and use of the horizontal lifeline.
- Inspect personal fall arrest system components prior to each use. Do not use damaged fall protection system components at any time, or for any reason. Fall protection equipment and components shall be used only to protect against falls, not to hoist materials. Personal fall arrest systems that have been subjected to impact loading shall not be used. SC shall periodically inspect CH2M HILL fall protection equipment using the Fall Protection Inspection Log form.
- Personal fall arrest systems shall be configured so that individuals can neither free-fall more than 6 feet (1.8 meters) or contact any lower level.
- Only attach personal fall arrest systems to anchorage points capable of supporting at least 5,000 pounds (2268 kg). Do not attach personal fall arrest systems to guardrail systems or hoists.
- Remain within the guardrail system when provided. Leaning over or stepping across a guardrail system is not permitted. Do not stand on objects (boxes, buckets, bricks, blocks, etc.) or ladders to increase working height on top of platforms protected by guardrails.
- Only one person shall be simultaneously attached to a vertical lifeline and shall also be attached to a separate independent lifeline.

9.8 Forklift Operations

(Reference CH2M HILL, SOP HSE-309, *Forklifts*)

Below are the hazard controls and safe work practices to follow when working around or operating forklifts. Ensure the requirements in the referenced SOP are followed.

- A rated lifting capacity must be posted in a location readily visible to the operator.
- A forklift truck must not be used to elevate employees unless a platform with guardrails, a back guard, and a kill switch is provided on the vehicle. When guardrails are not possible, fall arrest protection is required.
- The subcontractor operating the forklift must post and enforce a set of operating rules for forklift trucks.
- Only certified forklift operators shall operate forklifts.
- Stunt driving and horseplay are prohibited.
- Employees must not ride on the forks.
- Employees must never be permitted under the forks (unless forks are blocked).
- The driver must inspect the forklift once a shift and document this inspection.

- The operator must look in the direction of travel and must not move the vehicle until all persons are clear of the vehicle.
- Forks must be carried as low as possible.
- The operator must lower the forks, shut off the engine, and set the brakes (or block the wheels) before leaving the forklift operator's position unless maintenance or safety inspections require the forklift to be running.
- Trucks must be blocked and have brakes set when forklifts are driven onto their beds.
- Extreme care must be taken when tilting elevated loads.
- Every forklift must have operable brakes capable of safely stopping it when fully loaded.
- Forklifts must have parking brakes and an operable horn.
- When the operator is exposed to possible falling objects, industrial trucks must be equipped with overhead protection (canopy).
- If using certified CH2M HILL forklift operators – forklifts must be inspected and documented daily using the forklift inspection form.

9.9 Groundwater Sampling/Water Level Measurements

Below are the hazard controls and safe work practices to follow when personnel or subcontractors are performing groundwater sampling and/or water level measurements.

- Full coolers are heavy. Plan in advance to have two people available at the end of the sampling effort to load full coolers into vehicles. If two people won't be available use several smaller coolers instead of fewer large ones.
- Wear the appropriate PPE when sampling, including safety glasses, nitrile gloves, and steel toe boots (see PPE section of this HSP).
- Monitor headspace of wells prior to sampling to minimize any vapor inhalation (refer to the "Site Monitoring" section of this HSP).
- Use caution when opening well lids. Wells may contain poisonous spiders and hornet or wasp nests.
- Use the appropriate lifting procedures (see CH2M HILL SOP HSE-112) when unloading equipment and sampling at each well.
- Avoid sharp edges on well casings.
- If dermal contact occurs with groundwater or the acid used in sample preservation, immediately wash all affected skin thoroughly with soap and water.
- Avoid eating and drinking on site and during sampling.
- Use ear plugs during sampling if sampling involves a generator.
- Containerize all purge water and transport to the appropriate storage area.
- Use two people to transport full coolers/containers whenever possible. If two people are not available use a dolly to move coolers. If the coolers weigh more than 40 pounds Attachment 1 of the HSE-112, *Manual Lifting*, shall be completed by the SC. If the coolers weigh more than 50 pounds they should never be lifted by one person.

9.10 Hand and Power Tools

(Reference CH2M HILL, SOP HSE-210, *Hand and Power Tools*)

Below are the hazard controls and safe work practices to follow when personnel or subcontractors are using hand and power tools. Ensure the requirements in the referenced SOP are followed:

- Tools shall be inspected prior to use and damaged tools will be tagged and removed from service;
- Hand tools will be used for their intended use and operated in accordance with manufacturer's instructions and design limitations;
- Maintain all hand and power tools in a safe condition;
- Use PPE (such as gloves, safety glasses, earplugs, and face shields) when exposed to a hazard from a tool;
- Do not carry or lower a power tool by its cord or hose;
- Portable power tools will be plugged into GFCI protected outlets;
- Portable power tools will be Underwriters Laboratories (UL) listed and have a three-wire grounded plug or be double insulated;
- Disconnect tools from energy sources when they are not in use, before servicing and cleaning them, and when changing accessories (such as blades, bits, and cutters);
- Safety guards on tools must remain installed while the tool is in use and must be promptly replaced after repair or maintenance has been performed;
- Store tools properly in a place where they will not be damaged or come in contact with hazardous materials;
- If a cordless tool is connected to its recharge unit, both pieces of equipment must conform strictly with electrical standards and manufacturer's specifications;
- Tools used in an explosive environment must be rated for work in that environment (that is, intrinsically safe, spark-proof, etc.); and
- Working with manual and pistol-grip hand tools may involve highly repetitive movement, extended elevation, constrained postures, and/or awkward positioning of body members (for example, hand, wrist, arm, shoulder, neck, etc.). Consider alternative tool designs, improved posture, the selection of appropriate materials, changing work organization, and sequencing to prevent muscular, skeletal, repetitive motion, and cumulative trauma stressors.

Machine Guarding

- Ensure that all machine guards are in place to prevent contact with drive lines, belts, chains, pinch points or any other sources of mechanical injury.
- Unplugging jammed equipment will only be performed when equipment has been shut down, all sources of energy have been isolated and equipment has been locked/tagged and tested.
- Maintenance and repair of equipment that results in the removal of guards or would otherwise put anyone at risk requires lockout of that equipment prior to work.

9.11 Haul Trucks

Below are the hazard controls and safe work practices to follow when working around or operating haul trucks:

- Haul truck operators should be familiar with their equipment and inspect all equipment before use;
- Haul truck operators should ensure all persons are clear before operating truck or equipment. Before moving operators should sound horn or alarm, all equipment should be equipped with a working back up alarm;
- Haulage trucks or equipment with restricted visibility should be equipped with devices that eliminate blind spots;
- Employees should stay off haul roads. When approaching a haul area, employees should make eye contact and communicate their intentions directly with the equipment operator;
- If possible minimize steep grades on haul roads;
- Where grades are steep provide signage indicating the actual grade as well as measures for a runaway truck;
- Trucks are to be operated within the manufacturer's recommendations (for example- retarder charts indicate the combination of loads, grades and speeds that should not be exceeded if the truck's retarder is to work properly - to ensure the truck does not descend grade at speeds greater than listed);
- Haul roads should be well lit, sufficiently wide (at least 50% of the width of the equipment on both sides of road) and equipped with reflectors to indicate access points;
- Haul roads should have adequate right-of-way signs indicating haul directions;
- Haul trucks will follow designated haul roads; and
- Haul trucks will comply with posted speed limits.

9.12 Hexavalent Chromium (Cr VI) Exposure

(Reference the CH2M HILL SOP HSE-513, *Hexavalent Chromium - Chromium VI*)

The OSHA permissible exposure limit (PEL) and ACGIH Threshold Limit Value (TLV) for Chromium VI is 5 ug/m³ (insoluble) and 1 ug/m³ (soluble) with an action level (AL) of 2.5 ug/m³ for insoluble and 0.5 ug/ m³ for soluble. Hexavalent Chromium is considered a Human Carcinogen.

The precautions listed below shall be followed when exposed to Cr VI:

- Exposure assessments must be performed for workers who may be exposed to Cr VI above the AL.
- Avoid exposure by inhalation, skin and eye contact with fume, liquid and/or particulate Cr VI.
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person.
- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met.
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas.
- Review the fact sheet included as an attachment to this HSP.

9.13 Hoists

(Reference CH2M HILL SOP HSE-315, *Hoists*)

- Below are the hazard controls and safe work practices to follow when working around or operating hoists. Ensure the requirements in the referenced SOP are followed.

- Manufacturer's specifications and limitations applicable to the operation of material hoists shall be followed. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a professional engineer competent in the field.
- Rated load capacities, recommended operating speeds, and special hazard warnings or instructions shall be posted on hoists.
- Hoisting ropes shall be installed in accordance with the wire rope manufacturer's recommendations.
- The installation of live booms on hoists is prohibited.
- Operating rules shall be established and posted at the operator's station of on hoists.
- No person shall be allowed to ride on material hoists except for the purposes of inspection and maintenance.
- All entrances of the hoistways shall be protected by substantial gates or bars, which guard the full width of the landing entrance.
- Overhead protective coverings of 2-inch planking, 3/4-inch plywood, or other solid material of equivalent strength, shall be provided on the top of every material host cage or platform.
- All hoistway entrance bars and gates shall be painted with diagonal contrasting colors, such as black and yellow.
- A qualified hoist operator will operate, inspect, maintain and oversee all hoist operations. The SC or designee shall verify hoist operator qualifications (e.g., operator to provide for the type of hoist being operated--years of experience, training, background).
- CH2M HILL employees who are required to operate hoists shall read the hoist manufacturer's operations and maintenance manual, be evaluated and approved as qualified hoist operators. The CH2M HILL may require operators to complete separate hoist operations training, provided by commercial training specialists.

9.14 Methane

Methane is a colorless, odorless gas with a wide distribution in nature. Methane is created when organic matter decomposes (rots) without any oxygen present ("anaerobic" decomposition) and is common in landfills, marshes, septic systems and sewers.

Methane may be produced as a by-product of the biological process when biological additives are used in a remediation process (such as when emulsified oil is injected to enhance dechlorination of contaminated groundwater).

Experience has shown that methane may be present in the well space following the injection of emulsified oil, once the biological process has had time to progress. This needs to be considered when returning to collect ground water samples. Although methane degrades Engineering controls shall be considered to bring the concentrations of methane down to an acceptable level in the breathing zone.

Methane is a "simple asphyxiant," which means that it can displace available oxygen. Methane is combustible and mixtures of methane with air are explosive within the range 5-15% by volume of methane (the lower and upper explosive limits). At room temperature, methane is lighter than air, so in an outdoor environment, it tends to dissipate.

Methane is not toxic when inhaled, but it can produce suffocation by reducing the concentration of oxygen inhaled. When exposed to concentrations high enough to displace oxygen, you may experience dizziness, deeper breathing, possible nausea and eventual unconsciousness.

The primary danger is from fire and explosion, so ensure that you work in a well-ventilated area, and that there is no source of ignition present. Use spark-proof tools and intrinsically safe equipment, if necessary. If working in a confined space, make sure that appropriate controls are in place and follow an approved permit-required confined space entry plan.

9.15 Methylene Chloride

(Reference CH2M HILL SOP HSE-509, *Methylene Chloride*)

Methylene chloride has a faint, sweet odor which is not noticeable at dangerous concentrations. Methylene chloride is shipped as liquefied compressed gas and will cause frostbite on contact.

CH2M HILL is required to control employee workplace exposure to methylene chloride when personal exposures are at or above 12.5 parts per million (ppm) as an 8-hour time-weighted average (TWA) or above 125 ppm short-term exposure limit (STEL) by implementing a program that meets the requirements of the OSHA Methylene Chloride standard, *29 Code of Federal Regulations (CFR) 1910.1052*. The elements of the CH2M HILL methylene chloride program include the following:

- Exposure monitoring;
- Methods of control, including personal protective equipment (PPE) and respirators;
- Medical surveillance;
- Training on hazards of methylene chloride and control measures (includes project-specific training and the computer-based training on CH2M HILL's Virtual Office, *Methylene Chloride*) and;
- Recordkeeping requirements.

If air monitoring indicates there is potential exposure at the action level concentrations above, notify the RHSM to ensure the above have been adequately addressed. Other exposure control measures include:

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met;
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas;
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person;
- Appropriate **air-supplied respirators** must be used when methylene chloride exposures exceed PEL or STEL;
- Air supplied to respirators must meet Grade D breathing air requirements; and
- Review the fact sheet included as an attachment to this HSP.

9.16 Portable Generator Hazards

(Reference CH2M HILL SOP HSE-206, *Electrical Safety*)

- Portable generators are useful when temporary or remote electric power is needed, but they also can be hazardous. The primary hazards to avoid when using a generator are carbon monoxide (CO) poisoning from the toxic engine exhaust, electric shock or electrocution, and fire.
- NEVER use a generator indoors or in similar enclosed or partially-enclosed spaces. Generators can produce high levels of carbon monoxide (CO) very quickly. When you use a portable generator, remember that you cannot smell or see CO. Even if you can't smell exhaust fumes, you may still be exposed to CO.

- If you start to feel sick, dizzy, or weak while using a generator, get to fresh air RIGHT AWAY. DO NOT DELAY. The CO from generators can rapidly lead to full incapacitation and death.
- If you experience serious symptoms, get medical attention immediately. Inform project staff that CO poisoning is suspected. If you experienced symptoms while indoors have someone call the fire department to determine when it is safe to re-enter the building.
- Follow the instructions that come with your generator. Locate the unit outdoors and away from doors, windows, and vents that could allow CO to come indoors.
- Ensure the generator is grounded in accordance with the manufacturer's operation manual.
- Keep the generator dry and do not use in rain or wet conditions. To protect from moisture, operate it on a dry surface under an open, canopy-like structure. Dry your hands if wet before touching the generator.
- Plug appliances directly into the generator. Or, use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads. Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin.
- Most generators come with Ground Fault Circuit Interrupters (GFCI). Test the GFCIs daily to determine whether they are working
- If the generator is not equipped with GFCI protected circuits plug a portable GFCI into the generator and plug appliances, tools and lights into the portable GFCI.
- Never store fuel near the generator or near any sources of ignition.
- Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite.

9.17 Pressure Line/Vessel Systems

- Operate and maintain pressure vessels, pumps and hosing in accordance with the manufacturer's recommendations.
- Do not exceed the rated pressure of the vessels and hosing of the system.
- The system must be provided with a pressure relief valve/controller that safely reduces the system pressure to within the system rated pressure.
- The pressure relief valve must be rated at no more than 110% the rated pressure of the system and must be tested at regular intervals.
- Each vessel must be equipped with a functioning pressure gauge to monitor pressure.

9.18 Pressure Washing Operations

Below are the hazard controls and safe work practices to follow when working around or performing pressure washing.

- Only trained, authorized personnel may operate the high-pressure washer.
- Follow manufacturer's safety and operating instructions.
- Inspect pressure washer before use and confirm deadman trigger is fully operational
- The wand must always be pointed at the work area.
- The trigger should never be tied down
- Never point the wand at yourself or another worker.

- The wand must be at least 42 inches (1.1 meter) from the trigger to the tip and utilize greater than 10 degree tips.
- The operator must maintain good footing.
- Non-operators must remain a safe distance from the operator.
- No unauthorized attachment may be made to the unit.
- Do not modify the wand.
- All leaks or malfunctioning equipment must be repaired immediately or the unit taken out-of-service.
- Polycoated Tyvek or equivalent, 16-inch-high steel-toed rubber boots, safety glasses, hard hat with face shield, and inner and outer nitrile gloves will be worn, at a minimum.

9.19 Rigging

(Reference CH2M HILL SOP HSE-316, *Rigging*)

Below are the hazard controls and safe work practices to follow when personnel are overseeing or performing rigging. Ensure the requirements in the referenced SOP are followed.

9.19.1 General

- All rigging equipment shall be used only for its intended purpose, inspected by a competent person prior to use, and shall not be loaded in excess of its capacity rating. Defective rigging shall be removed from service.
- When CH2M HILL is in control of rigging operations, CH2M HILL shall provide a rigging competent person that will inspect, maintain oversee all rigging operations. The competent person shall use the appropriate rigging inspection log form to inspect wire rope, synthetic slings and/or shackles.
- Tag lines shall be attached to every load being lifted by a crane.
- Rigging equipment shall be protected from flame cutting and electric welding operations, and or contact avoided with solvents and chemicals.
- Rigging equipment, when not in use, shall be stored in an area free from damage caused by environmental elements, hazardous substances, and other factors that may compromise equipment integrity and performance.
- No modification or addition, which that could affect the capacity and or safe operation of the equipment, shall be made without the manufacturer's written approval.
- Rigging equipment shall not be shortened with knots, bolts or other makeshift devices.
- All rigging equipment shall be load tested at least annually by a competent person and documented.
- Special hoisting devices, slings, chokers, hooks, clamps, or other lifting accessories shall be marked to indicate the safe working loads and shall be proof -tested prior to initial use to 125 percent of their rated load. Vendors or suppliers will provide documentation of proof testing documentation.

9.19.2 Equipment

- Protruding end strands of wire rope shall be covered or blunted.
- Wire rope shall not be used, if in any length of eight diameters, the number of total number of visible broken wires exceeds 10% percent of the total number of wires, or if the rope shows other signs of excessive wear, corrosion, or defect.

- When inspecting the end fittings of wire rope slings, if more than one wire in a lay is broken in the fitting, do not use the sling.
- Synthetic web slings shall be immediately removed from service if any of the following conditions are present:
 - acid or caustic burns; melting or charring of any part of the sling
 - surface; snags, punctures, tears or cuts; broken or worn stitches; distortion of fittings;
 - discoloration of or rotting; red warning line showing.
- Never use makeshift hooks, links or other fasteners. Job or shop hooks and links, or makeshift fasteners, formed from bolts, rods, etc., or other such attachments, shall not be used.
- Alloy steel chains shall have permanently affixed identification stating size, grade, rated capacity and reach.
- Shackles and hooks shall be constructed of forged alloy steel with the identifiable load rating on the shackle or hook.

9.19.3 Rigging Use

- Rigging shall not be pulled from under a load when the load is resting on the rigging.
- Place sling(s) in center bowl of hook.
- When attaching slings to the load hoist hook, corners and sharp edges should be “packed” to prevent cutting or damaging the rope or slings.
- Never use nylon, polyester, or polypropylene web slings, or web slings with aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of acids, caustics or phenolics are present.
- Natural and synthetic fiber rope slings, except for wet frozen slings, may be used in a temperature range from minus 20° F to plus 180° F without decreasing the working load limit. For operations outside this temperature range, and for wet frozen slings, the sling manufacturer’s recommendations shall be followed.
- When used for eye splices, the U-bolt shall be installed so that the “U” section is in contact with the dead end of the rope.

9.20 Stairways and Ladders

(Reference CH2M HILL SOP HSE-214, *Stairways and Ladders*)

Below are the hazard controls and safe work practices to follow when using stairways and ladders. Ensure the requirements in the referenced SOP are followed.

- Stairway or ladder is generally required when a break in elevation of 19 inches (48.3 cm) or greater exists.
- Personnel should avoid using both hands to carry objects while on stairways; if unavoidable, use extra precautions.
- Personnel must not use pan and skeleton metal stairs until permanent or temporary treads and landings are provided the full width and depth of each step and landing.
- Ladders must be inspected by a competent person for visible defects prior to each day’s use. Defective ladders must be tagged and removed from service.
- Always obey and pay attention to warning labels or stickers on the specific ladder being used.

- Ladders must be used only for the purpose for which they were designed and shall not be loaded beyond their rated capacity.
- Ladder safety training on safe use (e.g., review SOP HSE-214 as part of a safety meeting) must be documented and kept with the project files.
- Only one person at a time shall climb on or work from an individual ladder.
- User must face the ladder when climbing; keep belt buckle between side rails.
- Ladders shall not be moved, shifted, or extended while in use.
- User must use both hands to climb; use rope to raise and lower equipment and materials.
- Straight and extension ladders must be tied off to prevent displacement.
- Ladders that may be displaced by work activities or traffic must be secured or barricaded.
- Personnel climbing ladders shall face the ladder and maintain 3 points of contact with the ladder.
- Portable ladders must extend at least 3 feet (91.5 cm) above landing surface.
- Straight and extension ladders must be positioned at such an angle that the ladder base to the wall is one-fourth of the working length of the ladder.
- Stepladders are to be used in the fully opened and locked position.
- Users are not to stand on the top two steps of a stepladder; nor are users to sit on top or straddle a stepladder.
- Fixed ladders \geq 24 feet (7.3 meters) in height must be provided with fall protection devices.
- Fall protection should be considered when working from extension, straight, or fixed ladders greater than six feet (1.8 meters) from lower levels and both hands are needed to perform the work, or when reaching or working outside of the plane of ladder side rails.

9.21 Traffic Control

(Reference CH2M HILL SOP HSE-216, *Traffic Control*)

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a sub contractor. Ensure the requirements in the referenced SOP are followed.

- Exercise caution when exiting traveled way or parking along street – avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility safety vests.
- Eye protection should be worn to protect from flying debris.
- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route (e.g., behind an established barrier, parked vehicle, guardrail, etc).
- Always pay attention to moving traffic – never assume drivers are looking out for you.

- Work as far from traveled way as possible to avoid creating confusion for drivers.
- When workers must face away from traffic, a “buddy system” should be used, where one worker is looking towards traffic.
- When working on highway projects, obtain a copy of the contractor’s traffic control plan.
- Work area should be protected by a physical barrier – such as a K-rail or Jersey barrier.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.
- Either a barrier or shadow vehicle should be positioned a considerable distance ahead of the work area. The vehicle should be equipped with a flashing arrow sign and truck-mounted crash cushion (TMCC). All vehicles within 40 feet (12.2 meters) of traffic should have an orange flashing hazard light atop the vehicle.
- Except on highways, flaggers should be used when 1) two-way traffic is reduced to using one common lane, 2) driver visibility is impaired or limited, 3) project vehicles enter or exit traffic in an unexpected manner, or 4) the use of a flagger enhances established traffic warning systems.
- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers.
- Vehicles should be parked at least 40 feet (12.2 meters) away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.
- Traffic control training module on the VO shall be completed when CH2M HILL workers who work in and around roadways and who exposed to public vehicular traffic.

9.22 Utilities (underground)

An assessment for underground utilities must be conducted where there is a potential to contact underground utilities or similar subsurface obstructions during intrusive activities. Intrusive activities include excavation, trenching, drilling, hand augering, soil sampling, or similar activities.

The assessment must be conducted before any intrusive subsurface activity and must include at least the following elements:

1. A background and records assessment of known utilities or other subsurface obstructions.
2. Contacting and using the designated local utility locating service.
3. Conducting an independent field survey to identify, locate, and mark potential underground utilities or subsurface obstructions. *Note: This is independent of, and in addition to, any utility survey conducted by the designated local utility locating service above.*
4. A visual survey of the area to validate the chosen location.

When any of these steps identifies an underground utility within 5 feet (1.5 meters) of intrusive work, then non-aggressive means must be used to physically locate the utility before a drill rig, backhoe, excavator or other aggressive method is used.

Aggressive methods are never allowed within 2 feet of an identified high risk utility (see paragraph below).

Any deviation from these requirements must be approved by the Responsible HS Manager and the Project Manager.

Background and Records Assessment of Known Utilities

Identify any client- or location-specific permit and/or procedural requirements (e.g., dig permit or intrusive work permit) for subsurface activities. For military installations, contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.

Obtain available utility diagrams and/or as-built drawings for the facility.

Review locations of possible subsurface utilities including sanitary and storm sewers, electrical lines, water supply lines, natural gas lines, fuel tanks and lines, communication lines, lighting protection systems, etc. Note: Use caution in relying on as-built drawings as they are rarely 100 percent accurate.

Request that a facility contact with knowledge of utility locations review and approve proposed locations of intrusive work.

Designated Local Utility Locating Service

Contact your designated local utility locating service (e.g., Dig-Safe, Blue Stake, One Call) to identify and mark the location of utilities. Call 811 in the US or go to www.call811.com to identify the appropriate local service group. Contacting the local utility locating service is a legal requirement in most jurisdictions.

Independent Field Survey (Utility Locate)

The organization conducting the intrusive work (CH2M HILL or subcontractor) shall arrange for an independent field survey to identify, locate, and mark any potential subsurface utilities in the work area. This survey is in addition to any utility survey conducted by the designated local utility locating service.

The independent field survey provider shall determine the most appropriate instrumentation/technique or combinations of instrumentation/techniques to identify subsurface utilities based on their experience and expertise, types of utilities anticipated to be present, and specific site conditions.

A CH2M HILL or subcontractor representative must be present during the independent field survey to observe the utility locate and verify that the work area and utilities have been properly identified and marked. If there is any question that the survey was not performed adequately or the individual was not qualified, then arrangements must be made to obtain a qualified utility locate service to re-survey the area. Obtain documentation of the survey and clearances in writing and signed by the party conducting the clearance. Maintain all documentation in the project file.

If the site owner (military installation or client) can provide the independent field survey, CH2M HILL or the subcontractor shall ensure that the survey includes:

- Physically walking the area to verify the work location and identify, locate, and mark underground utility locations;
- Having qualified staff available and instrumentation to conduct the locate;
- Agreeing to document the survey and clearances in writing.
- Should any of the above criteria not be met, CH2M HILL or subcontractor must arrange for an alternate independent utility locate service to perform the survey.

- The markings from utility surveys must be protected and preserved until the markings are no longer required. If the utility location markings are destroyed or removed before intrusive work commences or is completed, the PM, SC, or designee must notify the independent utility locate service or the designated local utility locating service to resurvey and remark the area.

Visual Assessment before and during Intrusive Activities

Perform a “360 degree” assessment. Walk the area and inspect for utility-related items such as valve caps, previous linear cuts, patchwork in pavement, hydrants, manholes, utility vaults, drains, and vent risers in and around the dig area.

The visual survey shall include all surface landmarks, including manholes, previous liner cuts, patchwork in pavement, pad-mounted transformers, utility poles with risers, storm sewer drains, utility vaults, and fire hydrants.

If any unanticipated items are found, conduct further research before initiating intrusive activities and implement any actions needed to avoid striking the utility or obstruction.

Subsurface Activities within 5 feet of an Underground Utility or if there is Uncertainty

When aggressive intrusive activities will be conducted within 5 feet (1.5 meters) of an underground utility or when there is uncertainty about utility locations, locations must be physically verified by non-aggressive means such as air or water knifing, hand digging, or human powered hand augering. Non-conductive tools must be used if electrical hazards may be present. If intrusive activities are within 5 feet (1.5 meters) and parallel to a marked existing utility, the utility location must be exposed and verified by non-aggressive methods every 100 feet (30.5 meters). Check to see if the utility can be isolated during intrusive work.

Intrusive Activities within 2 feet of an Underground Utility

Use non-aggressive methods (hand digging, vacuum excavation, etc.) to perform intrusive activities within 2 feet of a high risk utility (i.e., a utility that cannot be de-energized or would cause significant impacts to repair/replace). Hazardous utilities shall be de-energized whenever possible.

Spotter

A spotter shall be used to monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon, presence of pea gravel or sand in soils, presence of concrete or other debris in soils, refusal of auger or excavating equipment). If any suspicious conditions are encountered, stop work immediately and contact the PM or RHSM to evaluate the situation. The spotter must have a method to alert an operator to stop the intrusive activity (e.g., air horn, hand signals).

9.23 Utilities (overhead)

Proximity to Power Lines

No work is to be conducted within 50 feet (15.2 meters) of overhead power lines without first contacting the utility company to determine the voltage of the system. No aspect of any piece of equipment is to be operated within 50 feet (15.2 meters) of overhead power lines without first making this determination.

Operations adjacent to overhead power lines are PROHIBITED unless one of the following conditions is satisfied:

- Power has been shut off, positive means (such as lockout) have been taken to prevent the lines from being energized, lines have been tested to confirm the outage, and the utility company has provided a signed certification of the outage.
- The minimum clearance from energized overhead lines is as shown in the table below, or the equipment will be repositioned and blocked to ensure that no part, including cables, can come within the minimum clearances shown in the table.

MINIMUM DISTANCES FROM POWERLINES

Powerlines Nominal System Kv	Minimum Required Distance, Feet (Meters)
0-50	10 (3.0)
50-200	15 (4.6)
201-350	20 (6.1)
351-500	25 (7.6)
501-750	35 (10.7)
751-1000	45 (13.7)
Over 1000	Established by utility owner/operator or by a professional engineer in electrical power transmission/distribution

(These distances have been determined to eliminate the potential for arcing based on the line voltage.)

- The power line(s) has been isolated through the use of insulating blankets which have been properly placed by the utility. If insulating blankets are used, the utility will determine the minimum safe operating distance; get this determination in writing with the utility representative's signature.
- All inquiries regarding electric utilities must be made in writing and a written confirmation of the outage/isolation must be received by the PM prior to the start of work.

9.24 Vacuum Trucks

When CH2M HILL personnel are exposed to vacuum truck operations, the following safe work practices/hazard controls shall be implemented.

- A pre-operational check should be performed on the vacuum truck before use. Operators must be familiar with the operator's manual.
- Operators of vacuum trucks should be trained and familiar with the equipment. At least one person should be operating the boom and one person signaling and assisting the boom operator.
- Before use the hoses and lines should be checked for fraying and connections checked for leakage. Proper selection of hose diameter and type of hose (smooth bore hose vs. corrugated hose) is vital before the job is performed.
- The amount of force produced by a vacuum truck can kill hose operators. If an eight-inch hose gets stuck to your body at 27 inches Hg, it can be fatal. All trucks should be equipped with an emergency release the hose operator or assistant can initiate if a worker gets sucked into a hose. A remote release, manual release near the truck and an inline "T" should be present on the truck. The inline "T" should be installed between the very last section of hose and the working section of hose. The cord that releases the in-line relief should be tethered to the hose handler's belt or a watch buddy should be nearby holding the cord and ready to relieve in the event of an emergency. Operators should never attempt to vacuum hose with any part of their body to check for suction.
- Tanks on vacuum trucks are a confined space. Before the tank is opened and anyone enters a confined space assessment should be performed.

- The truck should always be grounded before use. The static electricity produced when sucking materials into the system can produce a spark and ignite anything in the tank or hose. Use of a grounding wire will prevent static electric explosions. Vacuum trucks should not be used to pump mixtures with a flash point less than 140 degrees or less - this is an accepted industry standard - refer to the operators manual for more information.
- When positioning truck to work, be extra cautions of personnel and other equipment located next to truck.
- Wet and dry material should not be mixed in the tank.
- When swinging the boom, change directions slowly.
- Do not load dump body beyond rated capacity. Be aware of possible load surge when turning or braking.

9.25 Welding and Cutting

(Reference CH2M HILL, SOP-314, *Welding and Cutting*)

Below are the hazard controls and safe work practices to follow when working around or performing welding and cutting. Ensure the requirements in the referenced SOP are followed.

- Workers designated to operate welding and cutting equipment shall have been properly instructed and qualified to operate such equipment.
- Before welding or cutting is permitted, the area shall be inspected by the individual responsible for authorizing the welding or cutting operation. The authorization, preferably in the form of a written permit, shall detail precautions to be taken before work is to begin.
- Suitable fire extinguishing equipment shall be immediately available in the work area.
- Flame-resistant blankets shall be used to control sparks produced by welding and cutting operations from traveling to lower levels or adjacent surfaces.
- If the valve on a fuel-gas cylinder is found to leak around the valve stem, the valve shall be closed and the gland nut tightened. If this does not stop the leak, the cylinder is to be tagged and removed from service.
- Nothing should be placed on top of a cylinder or manifold that will damage it or interfere with the quick closing of the valve.
- Flow gages and regulators shall be inspected prior to use and removed from cylinders when not in use.
- Hoses, leads, and cables shall be not be routed through doorways and walkways unless covered, elevated, or protected from damage. Where hoses, leads, and cables pass through wall openings, adequate protection shall be provided to prevent damage.
- Flash arresters shall be installed at the torch handle.
- Arc welding electrodes shall not be struck against compressed gas cylinders to strike an arc.
- All arc welding or cutting operations shall be shielded by noncombustible or flame resistant screens to protect employees or other persons in the vicinity from the direct rays of the arc.
- Proper ventilation shall be provided so as to maintain the level of contaminants in the breathing zone of welders below applicable permissible exposure limits.
- Minimum personal protective equipment includes the following:

- Safety-toed shoes or boots, hard hats, and safety glasses
- Body protection (such as gloves, coveralls, or Tyvek) when chemical hazards exist
- Hearing protection when working in close proximity to loud equipment and machinery
- Protective clothing and gloves to prevent burns
- Suitable eye protective equipment for the type of welding or cutting performed
- Opaque screens to block arc flash from arc welding and cutting operations
- Mechanical ventilation systems for welding and cutting operations conducted in enclosed or confined spaces
- Air monitoring or sampling equipment to evaluate airborne concentrations of welding and cutting contaminants
- Respiratory protection when airborne concentrations of contaminants exceed regulatory limits

9.25.1 Compressed Gas Cylinders

- Cylinders being transported, moved, or stored shall have valve protection caps installed. When transported by motor vehicle, hoisted, or carried, cylinders shall be in the vertical position.
- Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials by a minimum of 20 feet (6.1 meters) or by a noncombustible barrier at least 5 feet (1.5 meters) high having a fire resistant rating of at least one half hour.
- Inside of buildings, cylinders shall be stored in well-ventilated, dry locations at least 20 feet (6.1 meters) from highly combustible materials. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage areas shall be located where cylinders will not be knocked over or damaged.
- During use, cylinders shall be kept far enough away from the actual welding and cutting operations to prevent sparks, hot slag, or flames from reaching them. When impractical, fire resistant shields shall be provided.
- Cylinders containing oxygen or fuel-gas shall not be taken into confined spaces.
- If cylinders are frozen, warm (not boiling) water shall be used to thaw them.

9.25.2 Welding and Cutting Equipment

- Fuel-gas and oxygen hoses shall be easily distinguishable from each other and shall not be interchangeable between fuel-gas and oxygen.
- Hoses shall be inspected at the beginning of each shift. Defective hoses shall be removed from service.
- Hose couplings shall be designed to be disconnected with a rotary motion, not by straight pull.
- Torches shall be inspected at the beginning of each shift for leaking valves, connections, and couplings. Defective torches shall be removed from service.
- Torches shall be ignited with friction lighters, not open flames or hot work.

9.25.3 Arc Welding and Cutting

- Only manual electrode holders that are designed for arc welding or cutting and are capable of safely handling the maximum rated current shall be used.
- Only cable that is free from repair or splices for a minimum distance of 10 feet (3 meters) from the cable's attachment to the electrode holder shall be used.

- Any current-carrying part that arc welders or cutters grip in their hand, as well as the outer surfaces of the jaws of the holder, shall be fully insulated against the maximum voltage encountered to ground.
- The frames of arc welding or cutting machines shall be grounded. Grounding circuits, other than by means of the structure, shall be checked to ensure that the circuit between the ground and the grounded power conductor has resistance low enough to permit sufficient current flow to cause the fuse or circuit breaker to interrupt the current.
- When electrode holders are left unattended, the electrode shall be removed and the holder placed where it cannot harm employees.
- Hot electrode holders shall not be dipped in water to cool them.
- When welding or cutting is stopped for any appreciable length of time, or before the welding or cutting machine is moved, the power shall be shut off.
- Before starting welding or cutting operations, all connections to the machine shall be checked.

9.25.4 Toxic Fumes and Gases

- General mechanical or local exhaust ventilation shall be provided when welding or cutting in a confined space.
- Contaminated air exhausted from the work area shall be discharged into the open air or otherwise clear of the intake air.
- Other employees exposed to the same atmosphere as the welder or cutter shall be protected in the same manner as the welder or cutter.
- In enclosed spaces, all surfaces covered with toxic preservative coatings shall be stripped to a distance of at least four inches from the area to be heated, or the worker shall be protected with an air-line respirator.
- Welding or cutting in an enclosed space shall be performed with local exhaust ventilation or air-line respirators when the following metal bases, fillers, or coatings are involved: lead, cadmium, mercury, zinc, stainless steel, or beryllium.
- Employees welding or cutting in the open air and who are exposed to the metals noted above shall be protected with filter-type respirators; however, when working with beryllium, the employee shall be protected with an air-line respirator.

9.25.5 Fire Prevention

- When the potential for an explosive atmosphere exists in the immediate area of welding or cutting operations, air monitoring instruments shall be used to verify that no explosive atmosphere is present before or during welding or cutting operations.
- When welding or cutting on walls, floors, or ceilings, the same precautions shall be taken on the opposite side as for the welding or cutting side.
- Whenever openings or cracks in the floor, walls, or doorways cannot be closed, precautions shall be taken to prevent combustible materials in other areas from coming in contact with sparks.
- To prevent fire in enclosed spaces, the gas supply to the torch shall be shut off at some point outside the enclosed space whenever the torch is not in use or is left unattended.
- Drums or hollow structures that have contained toxic or flammable substances shall be filled with water or thoroughly cleaned, ventilated, and tested before welding or cutting on them.

- Before heat is applied to a drum, container, or structure, a vent or opening shall be provided to release built-up pressure during the application of heat.
- Before welding or cutting on any surface covered by a preservative coating whose flammability is unknown, a competent person shall test to determine its flammability.
- Preservative coatings shall be considered highly flammable when scrapings burn rapidly.
- When preservative coatings are determined to be highly flammable, they shall be stripped from the area to be heated.

9.26 Working Around Material Handling Equipment

When CH2M HILL personnel are exposed to material handling equipment, the following safe work practices/hazard controls shall be implemented:

- Never approach operating equipment from the rear. Always make positive contact with the operator, and confirm that the operator has stopped the motion of the equipment.
- Never approach the side of operating equipment; remain outside of the swing and turning radius.
- Maintain distance from pinch points of operating equipment.
- Never turn your back on any operating equipment.
- Never climb onto operating equipment or operate contractor/subcontractor equipment.
- Never ride contractor/subcontractor equipment unless it is designed to accommodate passengers and equipped with firmly attached passenger seat.
- Never work or walk under a suspended load.
- Never use equipment as a personnel lift; do not ride excavator buckets or crane hooks.
- Always stay alert and maintain a safe distance from operating equipment, especially equipment on cross slopes and unstable terrain.
- Wear a high visibility safety vest or high visibility clothing

10.0 Physical Hazards and Controls

Physical hazards include exposure to temperature extremes, sun, noise, and radiation. If you encounter a physical hazard that has not been identified in this plan, contact the RHSM so that a revision to this plan can be made.

10.1 Noise

(Reference CH2M HILL SOP HSE-108, *Hearing Conservation*)

CH2M HILL is required to control employee exposure to occupational noise levels of 85 decibels, A-weighted, (dBA) and above by implementing a hearing conservation program that meets the requirements of the OSHA Occupational Noise Exposure standard, 29 CFR 1910.95. A noise assessment may be conducted by the RHSM or designee based on potential to emit noise above 85 dBA and also considering the frequency and duration of the task.

- Areas or equipment emitting noise at or above 90dBA shall be evaluated to determine feasible engineering controls. When engineering controls are not feasible, administrative controls can be developed and appropriate hearing protection will be provided.
- Areas or equipment emitting noise levels at or above 85 dBA, hearing protection must be worn.
- Employees exposed to 85 dBA or a noise dose of 50% must participate in the Hearing Conservation program including initial and annual (as required) audiograms.
- The RHSM will evaluate appropriate controls measures and work practices for employees who have experienced a standard threshold shift (STS) in their hearing.
- Employees who are exposed at or above the action level of 85 dBA are required to complete the online Noise Training Module located on CH2M HILL's virtual office.
- Hearing protection will be maintained in a clean and reliable condition, inspected prior to use and after any occurrence to identify any deterioration or damage, and damaged or deteriorated hearing protection repaired or discarded.
- In work areas where actual or potential high noise levels are present at any time, hearing protection must be worn by employees working or walking through the area.
- Areas where tasks requiring hearing protection are taking place may become hearing protection required areas as long as that specific task is taking place.
- High noise areas requiring hearing protection should be posted or employees must be informed of the requirements in an equivalent manner and a copy of the OSHA standard 29 CFR 1910.95 shall be posted in the workplace.

10.2 Ultraviolet Radiation (sun exposure)

Health effects regarding ultraviolet (UV) radiation are confined to the skin and eyes. Overexposure can result in many skin conditions, including erythema (redness or sunburn), photoallergy (skin rash), phototoxicity (extreme sunburn acquired during short exposures to UV radiation while on certain medications), premature skin aging, and numerous types of skin cancer. Implement the following controls to avoid sunburn.

Limit Exposure Time

- Rotate staff so the same personnel are not exposed all of the time.

- Limit exposure time when UV radiation is at peak levels (approximately 2 hours before and after the sun is at its highest point in the sky).
- Avoid exposure to the sun, or take extra precautions when the UV index rating is high.

Provide Shade

- Take lunch and breaks in shaded areas.
- Create shade or shelter through the use of umbrellas, tents, and canopies.
- Fabrics such as canvas, sailcloth, awning material and synthetic shade cloth create good UV radiation protection.
- Check the UV protection of the materials before buying them. Seek protection levels of 95 percent or greater, and check the protection levels for different colors.

Clothing

- Reduce UV radiation damage by wearing proper clothing; for example, long sleeved shirts with collars, and long pants. The fabric should be closely woven and should not let light through.
- Head protection should be worn to protect the face, ears, and neck. Wide-brimmed hats with a neck flap or “Foreign Legion” style caps offer added protection.
- Wear UV-protective sunglasses or safety glasses. These should fit closely to the face. Wrap-around style glasses provide the best protection.

Sunscreen

- Apply sunscreen generously to all exposed skin surfaces at least 20 minutes before exposure, allowing time for it to adhere to the skin.
- Re-apply sunscreen at least every 2 hours, and more frequently when sweating or performing activities where sunscreen may be wiped off.
- Choose a sunscreen with a high sun protection factor (SPF). Most dermatologists advocate SPF 30 or higher for significant sun exposure.
- Waterproof sunscreens should be selected for use in or near water, and by those who perspire sufficiently to wash off non-waterproof products.
- Check for expiration dates, because most sunscreens are only good for about 3 years. Store in a cool place out of the sun.
- No sunscreen provides 100 percent protection against UV radiation. Other precautions must be taken to avoid overexposure.

10.3 Temperature Extremes

(Reference CH2M HILL SOP HSE-211, *Heat and Cold Stress*)

Each employee is responsible for the following:

- Recognizing the symptoms of heat or cold stress;
- Taking appropriate precautionary measures to minimize their risk of exposure to temperature extremes (see following sections); and
- Communicating any concerns regarding heat and cold stress to their supervisor or SC.

10.3.1 Heat

California has a specific heat illness prevention regulation that must be implemented. This includes,

- Having enough water onsite so that each worker can consume at a minimum, **one quart per hour per shift**.
- Frequent reminders and/or water breaks shall be taken so that each person can consume enough water.
- Access to shade (i.e., blockage from direct sunlight) shall be provided at all times and shall be reasonably close to the work area. Keep in mind that a vehicle or other enclosed area with no air conditioning is NOT considered shade. Must be a well ventilated area or have air conditioning.
- Workers suffering from heat illness-related symptoms OR if needed for preventative recovery shall be provided access to shade for at least 5 minutes, or longer, for recovery. (if heat related symptoms are occurring, contact the RHSM).
- Training on risk factors, signs and symptoms of heat illness, importance of hydration and acclimatization, and importance of reporting symptoms and what to do in case of heat illness emergency, and contacting emergency medical services (see sections that follow).

Heat-related illnesses are caused by more than just temperature and humidity factors.

Physical fitness influences a person's ability to perform work under heat loads. At a given level of work, the more fit a person is, the less the physiological strain, the lower the heart rate, the lower the body temperature (indicates less retained body heat—a rise in internal temperature precipitates heat injury), and the more efficient the sweating mechanism.

Acclimatization is a gradual physiological adaptation that improves an individual's ability to tolerate heat stress. Acclimatization requires physical activity under heat-stress conditions similar to those anticipated for the work. With a recent history of heat-stress exposures of at least two continuous hours per day for 5 of the last 7 days to 10 of the last 14 days, a worker can be considered acclimatized. Its loss begins when the activity under those heat-stress conditions is discontinued, and a noticeable loss occurs after 4 days and may be completely lost in three to four weeks. Because acclimatization is to the level of the heat-stress exposure, a person will not be fully acclimatized to a sudden higher level; such as during a heat wave.

Dehydration reduces body water volume. This reduces the body's sweating capacity and directly affects its ability to dissipate excess heat.

The ability of a body to dissipate heat depends on the ratio of its surface area to its mass (surface area/weight). **Heat dissipation** is a function of surface area, while heat production depends on body mass. Therefore, overweight individuals (those with a low ratio) are more susceptible to heat-related illnesses because they produce more heat per unit of surface area than if they were thinner. Monitor these persons carefully if heat stress is likely.

When wearing **impermeable clothing**, the weight of an individual is not as important in determining the ability to dissipate excess heat because the primary heat dissipation mechanism, evaporation of sweat, is ineffective.

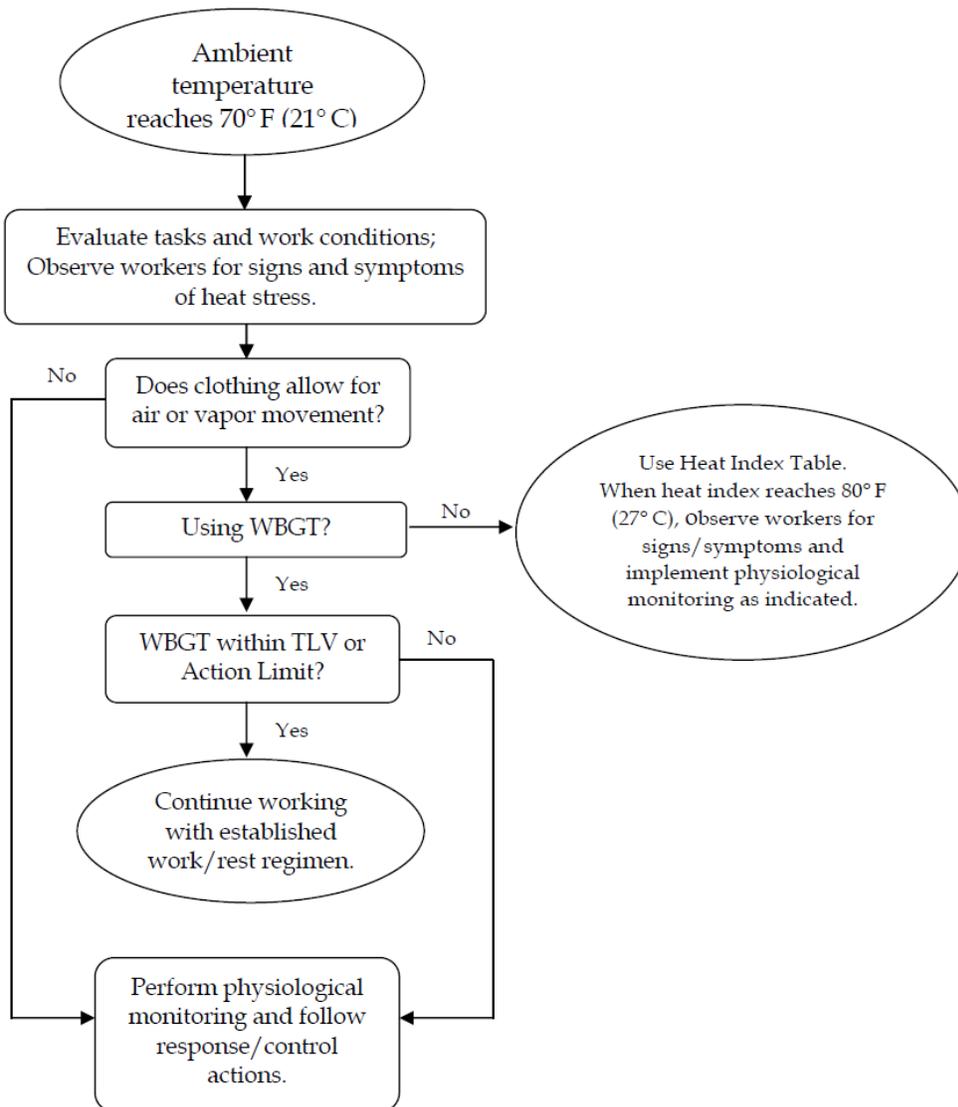
SYMPTOMS AND TREATMENT OF HEAT STRESS					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool—but not cold—water. Call ambulance, and get medical attention immediately!

Precautions

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°Fahrenheit (10 degrees Celsius [C]) to 60°Fahrenheit (F) (15.6 degrees C) should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons (7.5 liters) per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
- Acclimate yourself by slowly increasing workloads (do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. PREVENTION and communication is key.

Thermal Stress Monitoring

Thermal Stress Monitoring Flow Chart



Thermal Stress Monitoring – Permeable or Impermeable Clothing

When permeable work clothes are worn (street clothes or clothing ensembles over street clothes), regularly observe workers for signs and symptoms of heat stress and implement physiological monitoring as indicated below. This should start when the heat index reaches 80° F (27° C) [see Heat Index Table below], or sooner if workers exhibit symptoms of heat stress indicated in the table above. These heat index values were devised for shady, light wind conditions; exposure to full sunshine can increase the values by up to 15° F (8° C). Also, strong winds, particularly with very hot, dry air, can be extremely hazardous.

When wearing **impermeable clothing** (e.g., clothing doesn't allow for air or water vapor movement such as Tyvek), physiological monitoring as described below shall be conducted when the ambient temperature reaches 70° F (21° C) or at a lower temperature when workers begin to exhibit signs and symptoms of heat stress.

Heat Index	Possible Heat Disorders	Minimum Frequency of Physiological Monitoring
80°F - 90°F (27°C - 32°C)	Fatigue possible with prolonged exposure and/or physical activity	Observe Workers for signs of heat stress and implement physiological monitoring if warranted.
90°F - 105°F (32°C - 41°C)	Sunstroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity	Every 2 hours, or sooner, if signs of heat stress are observed.
105°F - 130°F (41°C - 54°C)	Sunstroke, heat cramps, or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity.	Every 60 minutes or sooner if signs of heat stress are observed.
130°F or Higher (54°C or Higher)	Heat/Sunstroke highly likely with continued exposure.	Every 30 minutes or sooner if signs of heat stress are observed.
Source: National Weather Service		

Physiological Monitoring and Associated Actions

The following physiological monitoring protocol below, using either radial pulse or aural temperature, will occur when the heat index is 80 degrees F or greater (or when personnel exhibit signs of heat stress), the following will be performed:

- The sustained heart rate during the work cycle should remain below 180 beats per minute (bpm) minus the individual's age (e.g. 180 - 35 year old person = 145 bpm). The sustained heart rate can be estimated by measuring the heart rate at the radial pulse for 30 seconds as quickly as possible prior to starting the rest period.
- The heart rate after one minute rest period should not exceed 120 beats per minute (bpm).
- If the heart rate is higher than 120 bpm, the next work period should be shortened by 33 percent, while the length of the rest period stays the same.
- If the pulse rate still exceeds 120 bpm at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent.
- Continue this procedure until the rate is maintained below 120 bpm.
- Alternately, the body temperature can be measured, either oral or aural (ear), before the workers have something to drink.
- If the oral or aural temperature exceeds 99.6° F (37.6 ° F) at the beginning of the rest period, the following work cycle should be shortened by 33 percent.
- Continue this procedure until the oral or aural (ear) temperature is maintained below 99.6 ° F (37.6° C). While an accurate indication of heat stress, oral temperature is difficult to measure in the field, however, a digital aural (aural) thermometer is easy to obtain and inexpensive to purchase.
- Use the form attached to this HSP to track workers' measurements and actions taken.

Procedures for when Heat Illness Symptoms are Experienced

- **Always** contact the RHSM when any heat illness related symptom is experienced so that controls can be evaluated and modified, if needed.
- In the case of cramps, reduce activity, increase fluid intake, move to shade until recovered.

- In the case of all other heat-related symptoms (fainting, heat rash, heat exhaustion), and if the worker is a CH2M HILL worker, contact the occupational physician at 1-866-893-2514 and immediate supervisor.
- In the case of heat stroke symptoms, call 911, have a designee give location and directions to ambulance service if needed, follow precautions under the emergency medical treatment of this HSP.
- Follow the Incident Notification, Reporting, and Investigation section of this HSP.

10.3.2 Cold

General

Low ambient temperatures increase the heat lost from the body to the environment by radiation and convection. In cases where the worker is standing on frozen ground, the heat loss is also due to conduction.

Wet skin and clothing, whether because of water or perspiration, may conduct heat away from the body through evaporative heat loss and conduction. Thus, the body cools suddenly when chemical protective clothing is removed if the clothing underneath is perspiration soaked.

Movement of air across the skin reduces the insulating layer of still air just at the skin's surface. Reducing this insulating layer of air increases heat loss by convection.

Non-insulating materials in contact or near-contact with the skin, such as boots constructed with a metal toe or shank, conduct heat rapidly away from the body.

Certain common drugs, such as alcohol, caffeine, or nicotine, may exacerbate the effects of cold, especially on the extremities. These chemicals reduce the blood flow to peripheral parts of the body, which are already high-risk areas because of their large surface area to volume ratios. These substances may also aggravate an already hypothermic condition.

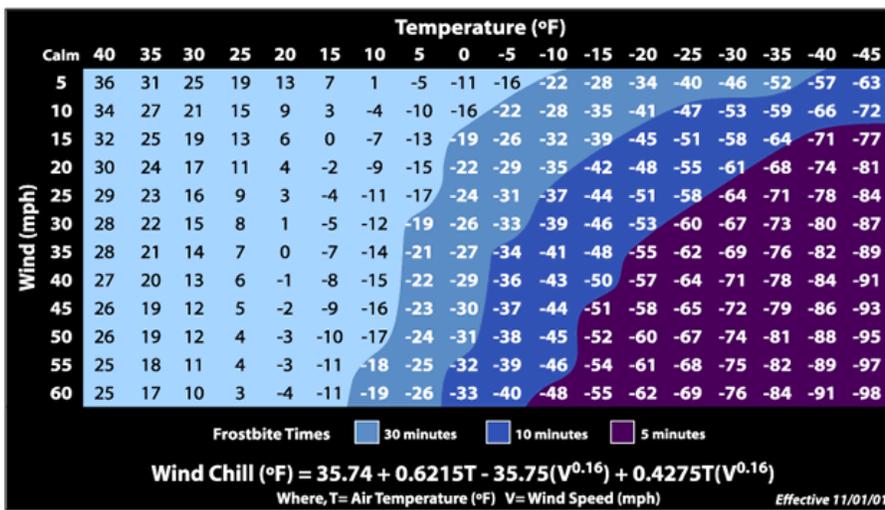
Precautions

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in wet weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index (below) is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
- Persons who experience initial signs of immersion foot, frostbite, and/or hypothermia should report it immediately to their supervisor/PM to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

SYMPTOMS AND TREATMENT OF COLD STRESS			
	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm—but not hot—water. Have victim drink warm fluids, but not coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but not coffee or alcohol. Get medical attention.



Wind Chill Chart



11.0 Biological Hazards and Controls

Biological hazards are everywhere and change with the region and season. If you encounter a biological hazard that has not been identified in this plan, contact the RHSM so that a revision to this plan can be made. Whether it is contact with a poisonous plant, a poisonous snake, or a bug bite, do not take bites or stings lightly. If there is a chance of an allergic reaction or infection, or to seek medical advice on how to properly care for the injury, contact the occupational nurse at 1-866-893-2514.

11.1 Africanized Honey Bees

Africanized honey bees are present in the Phoenix, Arizona area and other parts of the southwestern United States. They can be more aggressive than the common honey bee. The following precautions should be taken:

- Aside from watching for nests, be extra careful when moving discarded materials on the ground.
- Be alert for bees that appear to be acting more aggressive or strange. Do not disturb colonies.
- If bees begin to fly at your face or buzz around over your head, quickly retrace your steps and leave the area immediately. Report this occurrence to the SC and fellow workers at the site. Avoid this area until instructed that it is safe to reenter.
- Wear light colored clothing as dark clothing/colors appears to attract and anger bees.
- Avoid wearing any type of aftershave or perfume. This may also attract bees.
- If swarmed by bees, run quickly to an enclosed shelter. Do not stop to pickup belongings or materials. Do not flail at bees as this will increase their attack, but cover head and face as best able.
- Once away from bees evaluate your condition. If you have been stung or if you are having any symptoms other than local pain and swelling, call the occupational nurse at 1-866-893-2514.

11.2 Bees and Other Stinging Insects

Bees and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform your supervisor and/or a buddy. If you are stung, contact the occupational nurse at 1-866-893-2514. If a stinger is present, remove it as soon as possible using something with a thin, hard edge (e.g., credit card) to scrape the stinger out. Be sure to sanitize the object first with hand sanitizer, alcohol or soap and water. Wash and disinfect the wound, cover it, and apply ice. Watch for an allergic reaction if you have never been stung before. Call 911 if the reaction is severe.

11.3 Bird Droppings

Large amounts of bird droppings may present a disease risk. The best way to prevent exposure to fungus spores in bird droppings is to avoid disturbing it. A brief inhalation exposure to highly contaminated dust may be all that is needed to cause infection and subsequent development of fungal disease.

If disturbing the droppings or if removal is necessary to perform work, follow these controls:

- Use dust control measures (wetting with water or HEPA vacuuming) for all activities that may generate dust from the accumulated droppings.
- Wear Tyvek with hoods, disposable gloves and booties, and air-purifying respirators with a minimum N95 rating.

- Put droppings into plastic/poly bags and preferably into a 55-gallon drum to prevent bag from ripping.

11.4 Cougars/Mountain Lions

Like bears, cougars will often retreat if given the opportunity. Walking in groups and making noise will give the cougar the chance to retreat and reduce the likelihood of a sudden encounter. Be especially cautious during dusk and dawn.

If you see a cougar – do not play dead, do not run. Running may trigger an attack. Face the cougar and retreat slowly maintaining eye contact. If the cougar continues advancing, raise your arms above your head to make yourself look larger than normal. This may help to intimidate the cougar. Sometimes aggressive yelling and rock throwing may scare it off.

If attacked, fight back with whatever is at hand (without turning your back) – people have utilized rocks, jackets, garden tools, tree branches, and even bare hands to turn away cougars.

11.5 Coyotes

While far from domesticated, coyotes show little fear of humans and have become comfortable living in close proximity to our communities. Although they tend to do most of their hunting after dusk, coyotes can be active at any time. Under normal circumstances, a coyote is not a danger to humans. They are, however, territorial and will respond aggressively if they or their family are threatened.

If you encounter a coyote that behaves aggressively, you have probably gotten too close to its prey or its family. Try to scare the coyote by yelling and waving your arms. Throw rocks, sticks or other objects. Do not turn away and run.

11.6 Feral Dogs

Avoid all dogs – both leashed and stray. Do not disturb a dog while it is sleeping, eating, or caring for puppies. If a dog approaches to sniff you, stay still. An aggressive dog has a tight mouth, flattened ears and a direct stare. If you are threatened by a dog, remain calm, do not scream and avoid eye contact. If you say anything, speak calmly and firmly. Do not turn and run, try to stay still until the dog leaves, or back away slowly until the dog is out of sight or you have reached safety (e.g. vehicle). If attacked, retreat to vehicle or attempt to place something between you and the dog. If you fall or are knocked to the ground, curl into a ball with your hands over your head and neck and protect your face. If bitten, contact the occupational nurse at 1-866-893-2514. Report the incident to the local authorities.

11.7 Fire Ants

There are several types of fire ants in the United States that can cause painful bites and allergic reactions. Fire ants aggressively defend their nests by stinging several times after climbing on their victims. Large ant mounds are easily visible, but there can be smaller mounds or nests with little “worked” soil that can be stepped on inadvertently. They can also be under rocks, wood or other debris. Implement the following when fire ants are observed:

- Be aware of fire ants and take care not to stand on ant nests;
- Use insect repellents on clothing and footwear to temporarily discourage ants from climbing; and
- Tuck pants into socks.

If stung, get away from the area you are standing on, briskly brush off ants – wash affected area with soap. Call the occupational nurse.

11.8 Hantavirus

Hantavirus pulmonary syndrome (HPS) is a disease caused by a virus which can be transmitted from certain rodents to humans and is prevalent throughout the United States. Avoid disturbing rodent nests. Contact is most likely to occur when there is a current rodent infestation in things like control boxes, storage sheds, wellheads, remediation equipment, or trailers. Once excreted into the environment by the rodent, hantaviruses can survive in the environment and remain infectious for a period of 2-3 days. Ultraviolet rays in sunlight inactivate hantaviruses.

Nesting material and droppings must be removed if work is necessary in a rodent-infested area. PPE for removal shall include:

- Tyvek coveralls;
- Rubber boots or disposable shoe covers;
- Rubber, latex, or vinyl gloves;
- Respiratory protection such as a full face or half-mask air-purifying respirator with a high-efficiency particulate air (HEPA) filter; and
- Protective goggles if wearing a half-mask respirator.

Spray any urine, droppings, and nesting materials with either a bleach and water solution (1 parts bleach to 9 parts water) or a household disinfectant prepared according to the label instructions for dilution and disinfection time. Soak well and let stand for 15 minutes. Use a paper towel or rag to pick up the materials and dispose of them.

Mop floors after spraying them using bleach and water solution or a disinfectant. Dirt floors can be sprayed with either bleach and water solution or a disinfectant.

Personal protective gear shall be decontaminated upon removal at the end of the day. All potentially infective waste material (including respirator filters) from clean-up operations shall be double-bagged in plastic bags.

Symptoms of HPS

Symptoms develop between 14 and 31 days after exposure to infected rodents and include fatigue, fever, and muscle aches, especially the large muscle groups--thighs, hips, back and sometimes shoulders. About half of all HPS patients also experience headaches, dizziness, chills and/or abdominal pain. Four to 10 days after the initial phase of the illness, late symptoms of HPS may appear. These include coughing and shortness of breath. If you develop symptoms suggestive of HPS, call the occupational nurse at 1-866-893-2514.

11.9 Mosquito Bites

Due to the recent detection of the West Nile Virus in the southwestern United States it is recommended that preventative measures be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquitoes are believed to be the primary source for exposure to the West Nile Virus as well as several other types of encephalitis. The following guidelines should be followed to reduce the risk of these concerns for working in areas where mosquitoes are prevalent:

- Stay indoors at dawn, dusk, and in the early evening;
- Wear long-sleeved shirts and long pants whenever you are outdoors;
- Spray clothing with repellents containing permethrin or N,N-diethyl-meta-toluamide (DEET) since mosquitoes may bite through thin clothing;

- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET. Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands; and
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.

Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

Symptoms of Exposure to the West Nile Virus

Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death.

The West Nile Virus incubation period is from 3 to 15 days.

Contact the project RHSM with questions, and immediately report any suspicious symptoms to your supervisor, PM, and contact the occupational nurse at 1-866-893-2514.

11.10 Poison Ivy, Poison Oak, and Poison Sumac

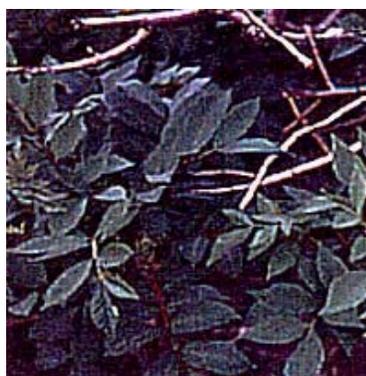
Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Shrubs are usually 12 to 30 inches high, or can also be a tree-climbing vine, with triple leaflets and short, smooth hair underneath. Plants are red and dark green in spring and summer, with yellowing leaves anytime especially in dry areas. Leaves may achieve bright reds in fall, but plants lose its (yellowed, then brown) leaves in winter, leaving toxic stems. All parts of the plant remain toxic throughout the seasons. These plants contain urushiol a colorless or pale yellow oil that oozes from any cut or crushed part of the plant, including the roots, stems and leaves and causes allergic skin reactions when contacted. The oil is active year round.

Become familiar with the identity of these plants (see below). Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

Poison Ivy



Poison Sumac



Poison Oak



Contamination with poison ivy, sumac or oak can happen through several pathways, including:

- Direct skin contact with any part of the plant (even roots once above ground foliage has been removed).
- Contact with clothing that has been contaminated with the oil.

- Contact from removing shoes that have been contaminated (shoes are coated with urishol oil).
- Sitting in a vehicle that has become contaminated.
- Contact with any objects or tools that have become contaminated.
- Inhalation of particles generated by weed whacking, chipping, vegetation clearing.

If you must work on a site with poison ivy, sumac or oak the following precautions are necessary:

- Do not drive vehicles onto the site where it will come into contact with poison ivy, sumac or oak. Vehicles which need to work in the area, such as drill rigs or heavy equipment must be washed as soon as possible after leaving the site.
- All tools used in the poison ivy, sumac or oak area, including those used to cut back poison oak, surveying instruments used in the area, air monitoring equipment or other test apparatus must be decontaminated before they are placed back into the site vehicle. If on-site decontamination is not possible, use plastic to wrap any tools or equipment until they can be decontaminated.
- Personal protective equipment, including Tyvek coveralls, gloves, and boot covers must be worn. PPE must be placed into plastic bags and sealed if they are not disposed immediately into a trash receptacle.
- As soon as possible following the work, shower to remove any potential contamination. Any body part with suspected or actual exposure should be washed with Zanfel, Tecnu or other product designed for removing urishiol. If you do not have Zanfel or Tecnu wash with cold water. Do not take a bath, as the oils can form an invisible film on top of the water and contaminate your entire body upon exiting the bath.
- Tecnu may also be used to decontaminate equipment.
- Use IvyBlock or similar products to prevent poison oak, ivy and sumac contamination. Check with the closest CH2M HILL warehouse to see if these products are available. Follow all directions for application.

If you do come into contact with one of these poisonous plants and a reaction develops, contact your supervisor and the occupational nurse 1-866-893-2514.

11.11 Poodle Dog Bush



A species of plant that thrives in areas scorched by wildfire, the lavender-flowered *Turricula parryi* also known as the “poodle dog bush.” Skin contact can cause rashes, blisters, swelling and general irritation. The plant appears only periodically and is frequently mistaken for lupine, which also has purple flowers.

It is endemic to California and Baja California, and can be found from the southern Sierra Nevada and San Joaquin Valley southwards to Baja California.

It is found in chaparral, on slopes and ridges from 100 to 2300 meters. Its seeds can remain dormant in soil for long periods, with the plant springing up quickly when the soil is disturbed or after a wildfire. It is very common in the area burned by the 2009 Station Fire in Southern California.

It grows into a moderate size, perennial woody shrub, branching from the base but with main stems extending for up to 3 meters. Its leaves are long and narrow, and may be toothed at the edge; they can be from 4 to 30 cm long. It flowers from June to August, having clusters (cymes) of attractive bell-

shaped blue, lavender or purple flowers. However it has a rank smell. Its flower clusters and hairy stem are similar to those of many plants in the genus *Phacelia*, but it can be distinguished from them by its greater height.

11.12 Scorpions



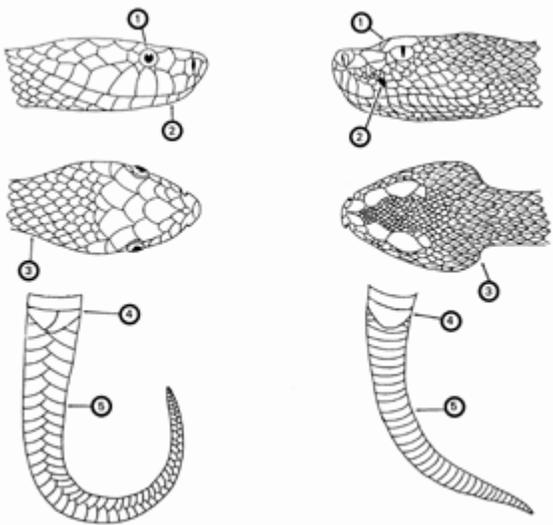
Scorpions usually hide during the day and are active at night. They may be hiding under rocks, wood, or anything else lying on the ground. Some species may also burrow into the ground. Most scorpions live in dry, desert areas; however, some species can be found in grasslands, forests, and inside caves.

When entering an area that has the potential to contain scorpions, the following PPE is recommended: long pants, long sleeved shirts with collars, leather work gloves and leather work boots. Reaching into enclosures or recesses without prior visual inspection is not recommended. Thoroughly inspect each area before accessing. Shake out clothing, jackets, shoes or boots prior to putting them on.

11.13 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Call the occupational nurse at 1-866-893-2514 immediately. Do not apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings. Below is a guide to identifying poisonous snakes from non-poisonous snakes.

Identification of Poisonous Snakes

Major Identification Features Non-venomous Snake	Major Identification Features Venomous Snake
<ol style="list-style-type: none"> 1. Round pupils 2. No sensing pit 3. Head slightly wider than neck 4. Divided anal plate 5. Double row of scales on the underside of the tail 	<ol style="list-style-type: none"> 1. Elliptical pupils 2. Sensing pit between eye and nostril 3. Head much wider than neck 4. Single anal plate 5. Single scales on the underside of the tail
	

11.14 Spiders - Brown Recluse and Widow

The Brown Recluse spider can be found most anywhere in the United States. It varies in size in shape, but the distinguishing mark is the violin shape on its body. They are typically non-aggressive. Keep an eye out for irregular, pattern-less webs that sometimes appear almost tubular built in a protected area such as in a crevice or between two rocks. The spider will retreat to this area of the web when threatened.

The Black Widow, Red Widow and the Brown Widow are all poisonous. Most have globose, shiny abdomens that are predominantly black with red markings (although some may be pale or have lateral stripes), with moderately long, slender legs. These spiders are nocturnal and build a three-dimensional tangled web, often with a conical tent of dense silk in a corner where the spider hides during the day.

Hazard Controls

- Inspect or shake out any clothing, shoes, towels, or equipment before use.
- Wear protective clothing such as a long-sleeved shirt and long pants, hat, gloves, and boots when handling stacked or undisturbed piles of materials.
- Minimize the empty spaces between stacked materials.
- Remove and reduce debris and rubble from around the outdoor work areas.

- Trim or eliminate tall grasses from around outdoor work areas.
- Store apparel and outdoor equipment in tightly closed plastic bags.
- Keep your tetanus boosters up-to-date (every 10 years). Spider bites can become infected with tetanus spores.

If you think you have been bit by a poisonous spider, immediately call the occupational nurse at 1-866-893-2514 and follow the guidance below:

- Remain calm. Too much excitement or movement will increase the flow of venom into the blood;
- Apply a cool, wet cloth to the bite or cover the bite with a cloth and apply an ice bag to the bite;
- Elevate the bitten area, if possible;
- Do not apply a tourniquet, do not try to remove venom; and
- Try to positively identify the spider to confirm its type. If the spider has been killed, collect it in a plastic bag or jar for identification purposes. Do not try to capture a live spider – especially if you think it is a poisonous spider.

Black Widow



Red Widow



Brown Widow



Brown Recluse



If you are stung by a scorpion, call the occupational nurse 1-866-893-2514 and try to note the description of the scorpion. Cleanse the sting area and apply ice.

11.15 Ticks

Every year employees are exposed to tick bites at work and at home putting them at risk of illness. Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch (6.4 mm) in size.

In some geographic areas exposure is not easily avoided. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray only outside of clothing with permethrin or permanone and spray skin with only DEET; and check yourself frequently for ticks.

Where site conditions (vegetation above knee height, tick endemic area) or when tasks (having to sit or kneel in vegetation) diminish the effectiveness of the other controls mentioned above, bug-out suits (check with your local or regional warehouse) or Tyvek shall be used. Bug-out suits are more breathable than Tyvek.

Take precautions to avoid exposure by including pre-planning measures for biological hazards prior to starting field work. Avoid habitats where possible, reduce the abundance through habitat disruption or application of acaricide. If these controls aren't feasible, contact your local or regional warehouse for preventative equipment such as repellants, protective clothing and tick removal kits. Use the buddy system and perform tick inspections prior to entering the field vehicle. If ticks were not planned to be encountered and are observed, do not continue field work until these controls can be implemented.

See Tick Fact Sheet attached to this HSP for further precautions and controls to implement when ticks are present. If bitten by a tick, follow the removal procedures found in the tick fact sheet, and call the occupational nurse at 1-866-893-2514.

Be aware of the symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme disease is a rash that might appear that looks like a bull's eye with a small welt in the center. RMSF is a rash of red spots under the skin 3 to 10 days after the tick bite. In both RMSF and Lyme disease, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, again contact the occupational nurse at 1-866-893-2514.

Be sure to complete an Incident Report (either use the Hours and Incident Tracking System [HITS] system on the VO) if you do come in contact with a tick.

11.16 Valley Black Gnats

Valley Black Gnats or no-see-ums (*Leptoconops torrens*), so nicknamed named because of their near invisibility, are common in parts of California's Central Valley, particularly in areas with alkaline clay soils. During the late spring and early summer months the adults are emerging and go into a feeding frenzy. The adults are black and tiny, about 1/16-inch long, and are small enough to pass through window screens.

The bite is generally painless, but usually results in a small flat red spot that, within 12 hours, becomes excruciatingly itchy. A single bite can welt into a one- or two-inch diameter spot, which lasts about two weeks.

Do not scratch it, it will double the length of time required for healing and can lead to infected sores. Take precautions to prevent the bite. If possible, avoid this short period of time (typically several weeks) when the gnats are most active. Schedule field work for another time to eliminate the exposure altogether. If field work cannot be delayed take the following precautions:

- Wear light-colored, long sleeve shirts, long pants and tuck pants into long socks.
- Use minimum 20% (preferably higher) DEET insect repellent on exposed skin surfaces (including hands, face, and neck).
- If a visible cloud of the gnats are encountered or if repellent and above controls still result in bites, do not continue field work, or delay activities until Bug-Out suits are obtained (available through the Milwaukee warehouse). The full ensemble of the Bug-Out suit is to be worn (pants, shirt and head coverings) with 100% DEET applied over any remaining skin surfaces.
- If bitten, report the bite immediately and refrain from scratching. Over the counter anti-itch creams and antihistamine blockers can be used to minimize the discomfort while the bite heals. If bites appear to be worsening or becoming infected, notify supervisor and project manager immediately. Contact the CH2M HILL Occupational Nurse at 1-866-893-2514 whenever there is a workplace injury (including bug bites). The nurse will refer you to a clinic for evaluation.

12.0 Contaminants of Concern

The table below summarizes the potential contaminants of concern (COC) and their occupational exposure limit and signs and symptoms of exposure. The table also includes the maximum concentration of each COC and the associated location and media that was sampled (groundwater, soil boring, surface soil). These concentrations were used to determine engineering and administrative controls described in the "Project-Specific Hazard Controls" section of this HSP, as well as PPE and site monitoring requirements.

Contaminants of Concern					
Contaminant	Location and Maximum ^a Concentration (ug/L)	Exposure Limit ^b	IDLH ^c	Symptoms and Effects of Exposure	PIP ^d (eV)
Cadmium	GW: 59 SB: SS:	0.005 mg/m ³	9 mg/m ³ as Cd Ca	Pulmonary edema, coughing, chest tightness/pain, headache, chills, muscle aches, nausea, vomiting, diarrhea, difficulty breathing, loss of sense of smell, emphysema, mild anemia	NA
Chromium (as Cr(II) & Cr(III))	GW: 622 SB: SS:	0.5 mg/m ³	25 mg/m ³	Irritated eyes, sensitization dermatitis, histologic fibrosis of lungs	NA
Cobalt (dissolved in water)	GW: 34 SB: SS:	0.05 mg/m ³	20 mg/m ³	Coughing, difficulty breathing, wheezing, decreased pulmonary function, diffuse nodule fibrosous, dermatitis, respiratory hypersensitivity, asthma	NA
Hexavalent Chromium (former all Metals Facility)	GW: 948 SB: SS:	5 ug/m ³ (insoluble) 1 ug/m ³ (soluble)	15 mg/m ³ as Cr (VI)	Acute: Coughing, sneezing, chest pain, breathing difficulty, itching and burning sensation to skin and lungs. Long term (Chronic): Allergic (asthma like symptoms) respiratory reaction, skin and eye irritation, nosebleeds, contact dermatitis, allergic like skin reaction, ulceration and perforation of the nasal septum.	NA
Hexavalent Chromium (Drilube vicinity)	GW: 920 SB: SS:	5 ug/m ³ (insoluble) 1 ug/m ³ (soluble)	15 mg/m ³ as Cr (VI)	Acute: Coughing, sneezing, chest pain, breathing difficulty, itching and burning sensation to skin and lungs. Long term (Chronic): Allergic (asthma like symptoms) respiratory reaction, skin and eye irritation, nosebleeds, contact dermatitis, allergic like skin reaction, ulceration and perforation of the nasal septum.	NA
Tetrachloroethylene (PCE) Drilube vacinity	GW: 82 SB: SS:	25 ppm	150 Ca	Eye, nose, and throat irritation; nausea; flushed face and neck; vertigo; dizziness; sleepiness; skin redness; headache; liver damage	9.32
Trichloroethylene (TCE) Drilube vacinity	GW: 1600 SB: SS:	10 ppm	1,000 Ca	Headache, vertigo, visual disturbance, eye and skin irritation, fatigue, giddiness, tremors, sleepiness, nausea, vomiting, dermatitis, cardiac arrhythmia, paresthesia, liver injury	9.45
Footnotes:					
^a Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), SS (Surface Soil), SL (Sludge), SW (Surface Water).					
^b Appropriate value of permissible exposure limit (PEL), recommended exposure limit (REL), or threshold limit value (TLV) listed.					
^c IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.					
^d PIP = photoionization potential; NA = Not applicable; UK = Unknown.					
eV = electron volt mg/kg = milligram per kilogram mg/m ³ = milligrams per cubic meter ug/m ³ = micrograms per cubic meter					
Potential Routes of Exposure					
Dermal: Contact with contaminated media. This route of exposure is minimized through use of engineering controls, administrative controls and proper use of PPE.		Inhalation: Vapors and contaminated particulates. This route of exposure is minimized through use of engineering controls, administrative controls and proper use of respiratory protection when other forms of control do not reduce the potential for exposure.		Other: Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).	

13.0 Site Monitoring

(Reference CH2M HILL SOP HSE-207, *Exposure Monitoring for Airborne Chemical Hazards*)

When performing site monitoring, record all the information, such as in a field logbook. Note date and time, describe monitoring location (for example, in breathing zone, at source and site location), and what the reading is. If any action levels are reached, note it in the field logbook and note the action taken.

Exposure records (air sampling) must be preserved for the duration of employment plus thirty years. Ensure that copies of the field log book are maintained in the project file.

Copies of all project exposure records (e.g., copies of field logbook pages where air monitoring readings are recorded and associated calibration) shall be sent to the regional SPA for retention and maintained in the project files.

13.1 Direct Reading Monitoring Specifications

Instrument	Tasks	Action Levels ^a	Action to be Taken when Action Level reached	Frequency ^b	Calibration
PID: MiniRAE PID with 10.6 eV lamp or equivalent	Drilling, excavation	< 10 ppm > 10 ppm	Level D Level C	Continuously within breathing zone when drilling	Daily
NOTE: The GEM 2000 (or equivalent) may be used for H₂S, methane LEL, and O₂ using the action levels listed above.					
Noise-Level Monitor ^d	Drilling	<85 dB(A) 85-120 dB(A) 120 dB(A)	No action required Hearing protection required Stop; re-evaluate	Initially and periodically during task	Daily

^a Action levels apply to sustained breathing-zone measurements above background.

^b The exact frequency of monitoring depends on field conditions and is to be determined by the SC; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate.

^c If the measured percent of O₂ is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O₂ action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O₂ action levels are required for confined-space entry.

^d Noise monitoring and audiometric testing also required.

13.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
PID: OVM, 10.6 or 11.7 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	0.5 lpm reg T-tubing
Sound Level Meter	Refer to Instrument Manual on site			

Calibrate air monitoring equipment daily (or prior to use) in accordance with the instrument's instructions. Document the calibration in the field logbook (or equivalent) and include the following information:

- Instrument name
- Serial Number
- Owner of instrument (for example, CH2M HILL, HAZCO)

- Calibration gas (including type and lot number)
- Type of regulator (for example, 1.5 lpm)
- Type of tubing (for example, direct or T-tubing)
- Ambient weather condition (for example, temperature and wind direction)
- Calibration/instrument readings
- Operator's name and signature
- Date and time

13.3 Integrated Personal Air Sampling (not applicable for this project tasks)

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the RHSM immediately if these contaminants are encountered.

Method Description

Personal Breathing Zone and Area Samples

Personal breathing zone and area sampling results must be sent immediately to the RHSM.

Employees potentially exposed to the substances for which air sampling is being performed shall be given the opportunity to observe the exposure measurements, and records shall be made available to all affected employees upon request or when they are required to be provided by a specific regulation. Employees may also receive a copy of their exposure records from the Medical Surveillance Program Administrator (MSPA).

14.0 Personal Protective Equipment

(Reference CH2M HILL- SOP HSE-117, *Personal Protective Equipment*)

14.1 Required Personal Protective Equipment

PPE must be worn by employees when actual or potential hazards exist and engineering controls or administrative practices cannot adequately control those hazards.

A PPE assessment has been conducted by the RHSM based on project tasks (see PPE specifications below). Verification and certification of assigned PPE by task is completed by the RHSM that approved this plan. Below are items that need to be followed when using any form of PPE:

- Employees must be trained to properly wear and maintain the PPE;
- Employees must be trained in the limitations of the PPE;
- In work areas where actual or potential hazards are present at any time, PPE must be worn by employees working or walking through the area;
- Areas requiring PPE should be posted or employees must be informed of the requirements in an equivalent manner;
- PPE must be inspected prior to use and after any occurrence to identify any deterioration or damage;
- PPE must be maintained in a clean and reliable condition;
- Damaged PPE shall not be used and must either be repaired or discarded; and
- PPE shall not be modified, tampered with, or repaired beyond routine maintenance.

The table below outlines PPE to be used according to task based on project-specific hazard assessment. If a task other than the tasks described in this table needs to be performed, contact the RHSM so this table can be updated.

Project-Specific Personal Protective Equipment Requirements^a

Task	Level	Body	Head	Respirator ^b
General site access	D	Work clothes; safety toed leather work boots and gloves	Hardhat ^c Safety glasses with side shields Ear protection ^d	None required
Drilling and sampling,		Work clothes or cotton coveralls Boots: Safety-toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves. OR	Hardhat ^c Safety glasses with side shields Ear protection ^d	
	Modified D	Work Clothes or Coveralls. SC to determine body protection based on potential contact with site contaminants. If outer layer of personal clothing cannot be kept clean, then outer cotton coveralls or uncoated Tyvek coveralls shall be worn. (Polycoated Tyvek when there is potential to contact contaminated groundwater or free liquids from drums.)		None required

IDW Mgmt.	Modified D	Coveralls: Uncoated Tyvek® Boots: Safety -toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Splash shield ^c Safety glasses with side shields ^d Ear protection ^d	None required.
Work near vehicular traffic ways or earth moving equipment.	All	Appropriate level of ANSI/ISEA 107-2010 high-visibility safety vests.	Work near vehicular traffic ways or earth moving equipment.	
Equipment decontamination if using pressure washer	Modified D with splash protection	Coveralls: Polycoated Tyvek® Boots: 16-inch-high steel-toed rubber boots Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Splash shield ^c over safety glasses with side shields or splash goggles Ear protection ^d	None required.
Only upon notification and authorization by RHSM.	C	Coveralls: Polycoated Tyvek® Boots: Safety -toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Splash shield ^c Ear protection ^d Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; [Organic vapor cartridge type] ^e .

Reasons for Upgrading or Downgrading Level of Protection (with approval of the RHSM)

Upgrade ^f	Downgrade
<ul style="list-style-type: none"> Request from individual performing tasks. Change in work tasks that will increase contact or potential contact with hazardous materials. Occurrence or likely occurrence of gas or vapor emission. Known or suspected presence of dermal hazards. Instrument action levels in the “Site Monitoring” section exceeded. 	<ul style="list-style-type: none"> New information indicating that situation is less hazardous than originally thought. Change in site conditions that decrease the hazard. Change in work task that will reduce contact with hazardous materials.

^a Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

^b No facial hair that would interfere with respirator fit is permitted.

^c Hardhat and splash-shield areas are to be determined by the SC.

^d Ear protection should be worn when conversations cannot be held at distances of 3 feet (1 meter) or less without shouting.

^e See cartridge change-out schedule.

^f Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the RHSM, and an SC qualified at that level is present.

14.2 Respiratory Protection

(Reference CH2M HILL SOP HSE-121, *Respiratory Protection*)

Implement the following when using respiratory protection:

- Respirator users must have completed appropriate respirator training within the past 12 months. Level C training is required for air-purifying respirators (APR) use and Level B training is required for supplied-air respirators (SAR) and self-contained breathing apparatus (SCBA) use. Specific training is required for the use of powered air-purifying respirators (PAPR);
- Respirator users must complete the respirator medical monitoring protocol and been approved for the specific type of respirator to be used;
- Tight-fitting facepiece respirator (negative or positive pressure) users must have passed an appropriate fit test within past 12 months;

- Respirator use shall be limited to those activities identified in this plan. If site conditions change that alters the effectiveness of the specified respiratory protection, the RHSM shall be notified to amend the written plan;
- Tight-fitting facepiece respirator users shall be clean-shaven and shall perform a user seal check before each use;
- Canisters/cartridges shall be replaced according to the change-out schedule specified in this plan. Respirator users shall notify the SC or RHSM of any detection of vapor or gas breakthrough. The SC shall report any breakthrough events to the RHSM for schedule upgrade;
- Respirators in regular use shall be inspected before each use and during cleaning;
- Respirators in regular use shall be cleaned and disinfected as often as necessary to ensure they are maintained in a clean and sanitary condition;
- Respirators shall be properly stored to protect against contamination and deformation;
- Field repair of respirators shall be limited to routine maintenance. Defective respirators shall be removed from service;
- When breathing air is supplied by cylinder or compressor, the SC or RHSM shall verify the air meets Grade D air specifications; and
- The SC or designee shall complete the Self-Assessment Checklist - Respiratory Protection included in as attachment to this plan to verify compliance with CH2M HILL's respiratory protection program.

Respirator Change-Out Schedule

Contaminant	Change-Out Schedule
General site	End-of-service life or end of shift (whichever occurs first)

15.0 Worker Training and Qualification

15.1 CH2M HILL Worker Training

(Reference CH2M HILL SOP HSE-110, *Training*)

15.1.1 Hazardous Waste Operations Training

All employees engaging in hazardous waste operations or emergency response shall receive appropriate training as required by 29 CFR 1910.120 and 29 CFR 1926.65. At a minimum, the training shall have consisted of instruction in the topics outlined in 29 CFR 1910.120 and 29 CFR 1926.65. Personnel who have not met these training requirements shall not be allowed to engage in hazardous waste operations or emergency response activities.

15.1.1.1 Initial Training

General site workers engaged in hazardous waste operations shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations, unless otherwise noted in the above-referenced standards.

Employees who may be exposed to health hazards or hazardous substances at treatment, storage, and disposal (TSD) operations shall receive a minimum of 24 hours of initial training to enable the employee to perform their assigned duties and functions in a safe and healthful manner.

Employees engaged in emergency response operations shall be trained to the level of required competence in accordance with 29 CFR 1910.120.

15.1.1.2 Three-Day Actual Field Experience

General site workers for hazardous waste operations shall have received three days of actual experience (on-the-job training) under the direct supervision of a trained, qualified supervisor and shall be documented. If the field experience has not already been received and documented at a similar site, this supervised experience shall be accomplished and documented at the beginning of the assignment of the project.

15.1.1.3 Refresher Training

General site workers and TSD workers shall receive 8-hours of refresher training annually (within the previous 12-month period) to maintain qualifications for fieldwork. Employees engaged in emergency response operations shall receive annual refresher training of sufficient content and duration to maintain their competencies or shall demonstrate competency in those areas at least annually.

15.1.1.4 Eight-Hour Supervisory Training

On site management or supervisors who will be directly responsible for, or supervise employees engaged in hazardous waste site operations, will have received at least 8 hours of additional specialized training on managing such operations. Employees designated as Safety Coordinator – Hazardous Waste are considered 8-hour HAZWOPER Site Safety Supervisor trained.

15.1.2 First Aid/Cardiopulmonary Resuscitation

First aid and CPR training consistent with the requirements of a nationally recognized organization such as the American Red Cross Association or National Safety Council shall be administered by a certified trainer. A minimum of two personnel per active field operation will have first aid and CPR training. Bloodborne pathogen training located on CH2M HILL's Virtual Office is also required for those designated as first aid/CPR trained.

15.1.3 Safety Coordinator Training

SCs are trained to implement the HSE program on CH2M HILL field projects. A qualified SC is required to be identified in the site-specific HSP for CH2M HILL field projects. SCs must also meet the requirements of the worker category appropriate to the type of field project (construction or hazardous waste). In addition, the SCs shall have completed additional safety training required by the specific work activity on the project that qualifies them to implement the HSE program (for example, fall protection, excavation).

15.1.4 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed site-specific training that will address the contents of applicable HSPs, including the activities, procedures, monitoring, and equipment used in the site operations. Site-specific training will also include site and facility layout, potential hazards, risks associated with identified emergency response actions, and available emergency services. This training allows field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and work operations for their particular activity.

15.1.5 Project-Specific Training Requirements

Project-specific training for this project includes:

- HSPs/ AHAs
- BBLPS
- Hearing Conservation/Noise

16.0 Medical Surveillance and Qualification

(Reference CH2M HILL SOP HSE-113, *Medical Surveillance*)

All site workers participating in hazardous waste operations or emergency response (HAZWOPER) will maintain an adequate medical surveillance program in accordance with 29 CFR 1910.120 or 29 CFR 1926.65 and other applicable OSHA standards. Documentation of employee medical qualification (e.g., physician's written opinion) will be maintained in the project files and made available for inspection.

16.1 Hazardous Waste Operations and Emergency Response

CH2M HILL personnel expected to participate in on site HAZWOPER tasks are required to have a current medical qualification for performing this work. Medical qualification shall consist of a qualified physician's written opinion regarding fitness for duty at a hazardous waste site, including any recommended limitations on the employee's assigned work. The physician's written opinion shall state whether the employee has any detected medical conditions that would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use.

16.2 Job or Site-Specific Medical Surveillance

Due to the nature of hazards for a particular job or work site, specialized medical surveillance may be necessary. This surveillance could include biological monitoring for specific compounds, or specialized medical examinations.

Site-specific medical surveillance includes:

- {e.g., lead}

16.3 Respirator User Qualification

Personnel required to wear respirators must have a current medical qualification to wear respirators. Medical qualification shall consist of a qualified physician's written opinion regarding the employee's ability to safely wear a respirator in accordance with 29 CFR 1910.134.

16.4 Hearing Conservation

Personnel working in hazardous waste operations or operations that fall under 29 CFR 1910.95 and exposed to noise levels in excess of the 85dBA time-weighted average shall be included in a hearing conservation program that includes annual audiometric testing.

17.0 Site-Control Plan

17.1 Site-Control Procedures

(Reference CH2M HILL SOP HSE-218, *Hazardous Waste Operations*)

Site control is established to prevent the spread of contamination throughout the site and to ensure that only authorized individuals are permitted into potentially hazardous areas.

The SC will implement site control procedures including the following bulleted items.

- Establish support, contamination reduction, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
 - Line-of-sight and hand signals;
 - Air horn; and
 - Two-way radio or cellular telephone if available.
- Establish offsite communication.
- Establish and maintain the “buddy system.”

17.2 Remediation Work Area Zones

(Reference CH2M HILL SOP HSE-218 Hazardous Waste Operations)

A three-zone approach will be used to control areas where site contaminants exist. Access will be allowed only after verification of appropriate training and medical qualification. The three-zone approach shall include an EZ, Contamination Reduction Zone (CRZ) and a Support Zone (SZ). The three-zone approach is not required for construction work performed outside contaminated areas where control of site contamination is not a concern.

Specific work control zones shall be established as necessary during task planning. Site work zones should be modified in the field as necessary, based on such factors as equipment used, air monitoring results, environmental conditions, or alteration of work plans. The following guidelines shall be used for establishing and revising these preliminary zone designations.

17.2.1 Support Zone

The SZ is an uncontaminated area (trailers, offices, field vehicles, etc.) that will serve as the field support area for most operations. The SZ provides field team communications and staging for emergency response. Appropriate sanitary facilities and safety and emergency response equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged and decontaminated materials, or personnel with medical emergencies that cannot be decontaminated.

17.2.2 Contamination Reduction Zone

The CRZ is established between the EZ and the SZ, upwind of the contaminated area where possible. The CRZ provides an area for decontamination of personnel, portable handheld equipment and tools, and heavy equipment. In addition, the CRZ serves as access for heavy equipment and emergency support services.

17.2.3 Exclusion Zone

The EZ is where activities take place that may involve exposure to site contaminants and/or hazardous materials or conditions. This zone shall be demarcated to prevent unauthorized entry. More than one EZ may be established if there are different levels of protection to be employed or different hazards that exist in the same work area. The EZ shall be large enough to allow adequate space for the activity to be completed, including field personnel and equipment, as well as necessary emergency equipment.

The EZ shall be demarcated with some form of physical barrier or signage. The physical barrier or signage shall be placed so that they are visible to personnel approaching or working in the area. Barriers and boundary markers shall be removed when no longer needed.

17.2.4 Other Controlled Areas

Other work areas may need to be controlled due to the presence of an uncontrolled hazard, to warn workers of requirements, or to prevent unauthorized entry. Examples include general construction work areas, open excavations, high noise areas, vehicle access areas, and similar activities or limited access locations. These areas shall be clearly demarcated with physical barriers (fencing, cones, reinforced caution tape or rope) as necessary and posted with appropriate signage.

18.0 Decontamination

(Reference CH2M HILL SOP HSE-218, *Hazardous Waste Operations*)

Decontamination areas will be established for work in potentially contaminated areas to prevent the spread of contamination. Decontamination areas should be located upwind of the exclusion zone where possible and should consider any adjacent or nearby projects and personnel. The SC must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SC. The SC must ensure that procedures are established for disposing of materials generated on the site.

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SC should establish areas for eating, drinking, and smoking.

18.1 Contamination Prevention

Preventing or avoiding contamination of personnel, tools, and equipment will be considered in planning work activities at all field locations. Good contamination prevention and avoidance practices will assist in preventing worker exposure and result in a more efficient decontamination process. Procedures for contamination prevention and avoidance include the following:

- Do not walk through areas of obvious or known contamination;
- Do not directly handle or touch contaminated materials;
- Make sure there are no cuts or tears in PPE;
- Fasten all closures in suits and cover them with duct tape, if appropriate;
- Take particular care to protect any skin injuries;
- Stay upwind of airborne contamination, where possible;
- Do not eat or drink in contaminated work areas;
- Do not carry food, beverages, tobacco, or flame-producing equipment into contaminated work areas;
- Minimize the number of personnel and amount of equipment in contaminated areas to that necessary for accomplishing the work;
- Choose tools and equipment with nonporous exterior surfaces that can be easily cleaned and decontaminated;
- Cover monitoring and sampling equipment with clear plastic, leaving openings for the sampling ports, as necessary; and
- Minimize the amount of tools and equipment necessary in contaminated areas.

18.2 Personnel and Equipment Decontamination

Personnel exiting an EZ must ensure that they are not spreading potential contamination into clean areas or increasing their potential for ingesting or inhaling potential contaminants. Personal decontamination may range from removing outer gloves as exiting the EZ, to proceeding through an outer layer doffing station including a boot and glove wash and rinse, washing equipment, etc. Equipment that has come into contact with contaminated media must also be cleaned/decontaminated when it is brought out of the EZ.

18.3 Decontamination During Medical Emergencies

Standard personnel decontamination practices will be followed whenever possible. For emergency life saving first aid and/or medical treatment, normal decontamination procedures may need to be abbreviated or omitted. In this situation, site personnel shall accompany contaminated victims to advise emergency response personnel on potential contamination present and proper decontamination procedures.

Outer garments may be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Protective clothing can be cut away. If the outer garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances or medical personnel. Outer garments can then be removed at the medical facility.

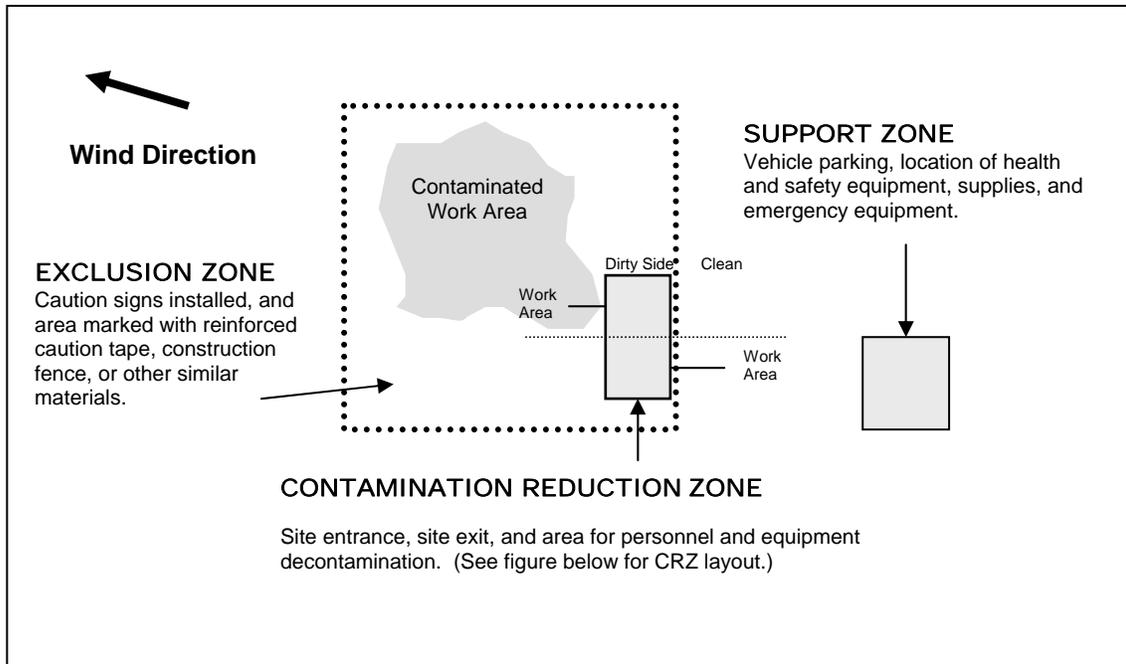
18.4 Waste Collection and Disposal

All contaminated material generated through the personnel and equipment decontamination processes (e.g., contaminated disposable items, gross debris, liquids, sludges) will be properly containerized and labeled, stored at a secure location, and disposed in accordance with the project plans.

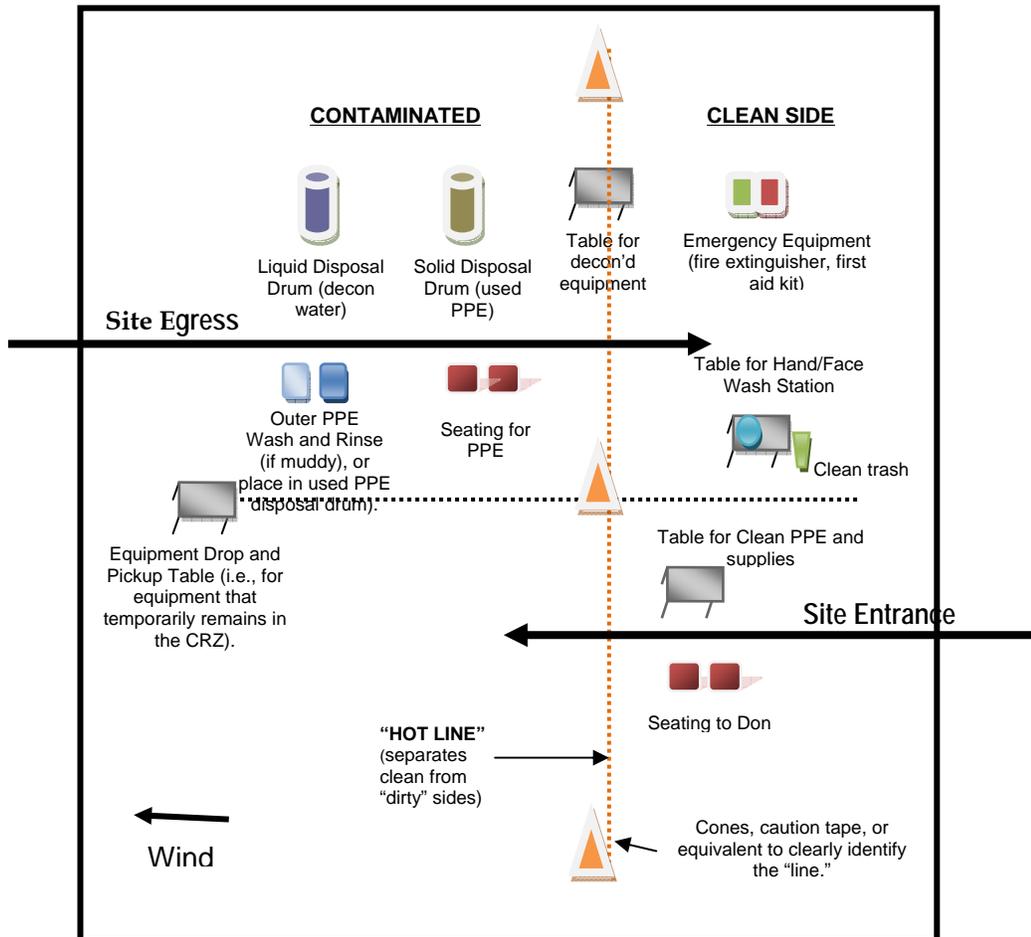
18.5 Diagram of Personnel-Decontamination Line

The following figure illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SC to accommodate task-specific requirements.

Work Area - Set up appropriately based on wind direction



Typical Contamination Reduction Zone



19.0 Emergency Response Plan

(Reference CH2M HILL SOP HSE-106, *Emergency Planning*)

19.1 Pre-Emergency Planning

The Emergency Response Coordinator (ERC), typically the SC or designee, performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate. Pre-Emergency Planning activities performed by the ERC include:

- Review the facility emergency and contingency plans where applicable;
- Determine what onsite communication equipment is available (two-way radio, air horn);
- Determine what offsite communication equipment is needed (nearest telephone, cell phone);
- Confirm and post the “Emergency Contacts” page and route to the hospital located in this section in project trailer(s) and keep a copy in field vehicles along with evacuation routes and assembly areas. Communicate the information to onsite personnel and keep it updated;
- Field Trailers: Post “Exit” signs above exit doors, and post “Fire Extinguisher” signs above locations of extinguishers. Keep areas near exits and extinguishers clear;
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures;
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies;
- Inventory and check site emergency equipment, supplies, and potable water;
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases;
- Rehearse the emergency response plan before site activities begin. This may include a “tabletop” exercise or an actual drill depending on the nature and complexity of the project. Drills should take place periodically but no less than once a year;
- Brief new workers on the emergency response plan; and
- The ERC will evaluate emergency response actions and initiate appropriate follow-up actions.

19.2 Emergency Equipment and Supplies

The ERC shall ensure the following emergency equipment is on the site. Verify and update the locations of this equipment as needed. The equipment will be inspected in accordance with manufacturer’s recommendations. The inspection shall be documented in a field logbook or similar means to be kept in the project files.

Emergency Equipment and Supplies	Location
20 (or two 10) class A,B,C fire extinguisher	Drill rig and site vehicles
First aid kit	Field vehicle
Eye wash	Field vehicle
Potable water	Field vehicle
Bloodborne-pathogen kit	Field vehicle
Additional equipment (specify):	Cell phone

19.3 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Notify appropriate response personnel;
- Shut down CH2M HILL operations and evacuate the immediate work area;
- Account for personnel at the designated assembly area(s);
- Assess the need for site evacuation, and evacuate the site as warranted;
- Implement HSE-111, Incident Notification, Reporting and Investigation; and
- Notify and submit reports to clients as required in contract.

Small fires or spills posing minimal safety or health hazards may be controlled with onsite spill kits or fire extinguishers without evacuating the site. When in doubt evacuate. Follow the incident reporting procedures in the "Incident Notification, Reporting, and Investigation" section of this HSP.

19.4 Emergency Medical Treatment

Emergency medical treatment is needed when there is a life-threatening injury (such as severe bleeding, loss of consciousness, breathing or heart has stopped). When in doubt if an injury is life-threatening or not, treat it as needing emergency medical treatment.

- Notify 911 or other appropriate emergency response authorities as listed in the "Emergency Contacts" page located in this section.
- The ERC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury, perform decontamination (if applicable) where feasible; lifesaving and first aid or medical treatment takes priority.
- Initiate first aid and CPR where feasible.
- Notify supervisor and if the injured person is a CH2M HILL employee, the supervisor will call the occupational nurse at 1-866-893-2514 and make other notifications as required by HSE SOP-111, *Incident Notification, Reporting and Investigation*.
- Make certain that the injured person is accompanied to the emergency room.
- Follow the Serious Incident Reporting process in HSE SOP-111, Incident Notification, Reporting and Investigation, and complete incident report using the HITS system on the VO or if not feasible, use the hard copy forms provided as an attachment to this HSP.
- Notify and submit reports to client as required in contract.

19.5 Evacuation

- Evacuation routes, assembly areas, and severe weather shelters (and alternative routes and assembly areas) are to be specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the ERC or designee before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The ERC and a "buddy" will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.

- The ERC will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The ERC will follow the incident reporting procedures in the “Incident Notification, Reporting and Investigation” section of this HSP.

19.6 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

19.7 Inclement Weather

Sudden inclement weather can rapidly encroach upon field personnel. Preparedness and caution are the best defenses. Field crew members performing work outdoors should carry clothing appropriate for inclement weather. Personnel are to take heed of the weather forecast for the day and pay attention for signs of changing weather that indicate an impending storm. Signs include towering thunderheads, darkening skies, or a sudden increase in wind. If stormy weather ensues, field personnel should discontinue work and seek shelter until the storm has passed.

Protective measures during a lightning storm include seeking shelter; avoiding projecting above the surrounding landscape (don't stand on a hilltop--seek low areas); staying away from open water, metal equipment, railroad tracks, wire fences, and metal pipes; and positioning people several yards apart. Some other general precautions include:

- Know where to go and how long it will take to get there. If possible, take refuge in a large building or vehicle. Do not go into a shed in an open area;
- The inclination to see trees as enormous umbrellas is the most frequent and most deadly mistake. Do not go under a large tree that is standing alone. Likewise, avoid poles, antennae, and towers;
- If the area is wide open, go to a valley or ravine, but be aware of flash flooding;
- If you are caught in a level open area during an electrical storm and you feel your hair stand on end, drop to your knees, bend forward and put your hands on your knees or crouch. The idea is to make yourself less vulnerable by being as low to the ground as possible and taking up as little ground space as possible. Lying down is dangerous, since the wet earth can conduct electricity. Do not touch the ground with your hands; and
- Do not use telephones during electrical storms, except in the case of emergency.

Remember that lightning may strike several miles from the parent cloud, so work should be stopped and restarted accordingly. The lightning safety recommendation is 30-30: Seek refuge when thunder sounds within 30 seconds after a lightning flash; and do not resume activity until 30 minutes after the last thunder clap.

High winds can cause unsafe conditions, and activities should be halted until wind dies down. High winds can also knock over trees, so walking through forested areas during high-wind situations should be avoided. If winds increase, seek shelter or evacuate the area. Proper body protection should be worn in case the winds hit suddenly, because body temperature can decrease rapidly.

Emergency Contacts

24-hour CH2M HILL Injury Reporting– 1-866-893-2514

24-hour CH2M HILL Serious Incident Reporting Contact – 720-286-4911

Medical Emergency – 911	CH2M HILL- Medical Consultant WorkCare Dr. Peter Greaney M.D. 300 S. Harbor Blvd, Suite 600 Anaheim , CA 92805 800-455-6155/866-893-2514 714-978-7488
Fire/Spill Emergency – 911	CH2M HILL Director – Health, Safety, Security & Environment Andy Strickland/DEN (720) 480-0685 (cell) or (720) 286-2393 (office)
Security & Police – 911	CH2M HILL Responsible Health and Safety Manager (RHSM) Name: Rick Cavit, CSP Phone: 408-896-0140
Utilities Emergency Phone Numbers Water: City of Glendale Water and Power 818-548-2011 Gas/Electric: City of Glendale Water and Power 818-548-2011	CH2M HILL Human Resources Department Phone: Employee Connect toll-free number 1-877-586-4411 (U.S. and Canada)
CH2M HILL Project Manager Name: David Towell Phone: 213-228-8285	CH2M HILL Worker’s Compensation: Contact Business Group HR dept. to have form completed or contact Jennifer Rindahl after hours: (720)891-5382
CH2M HILL Safety Coordinator (SC) Name: TBD Phone: TBD	Media Inquiries Corporate Strategic Communications Name: John Corsi Phone: (720) 286-2087
CH2M HILL Project Environmental Manager Name: David Towell Phone: 213-228-8285	Automobile Accidents Rental: Jennifer Rindahl/DEN: 720-286-2449 CH2M HILL owned vehicle: Linda George/DEN: 720-286-2057
Federal Express Dangerous Goods Shipping Phone: 800/238-5355	CHEMTEL (hazardous material spills) Phone: 800/255-3924
Facility Alarms:	Evacuation Assembly Area(s):

Facility/Site Evacuation Route(s):
Will vary at each site, TBD upon arrival by the SC-HW.

Directions to Local Hospital

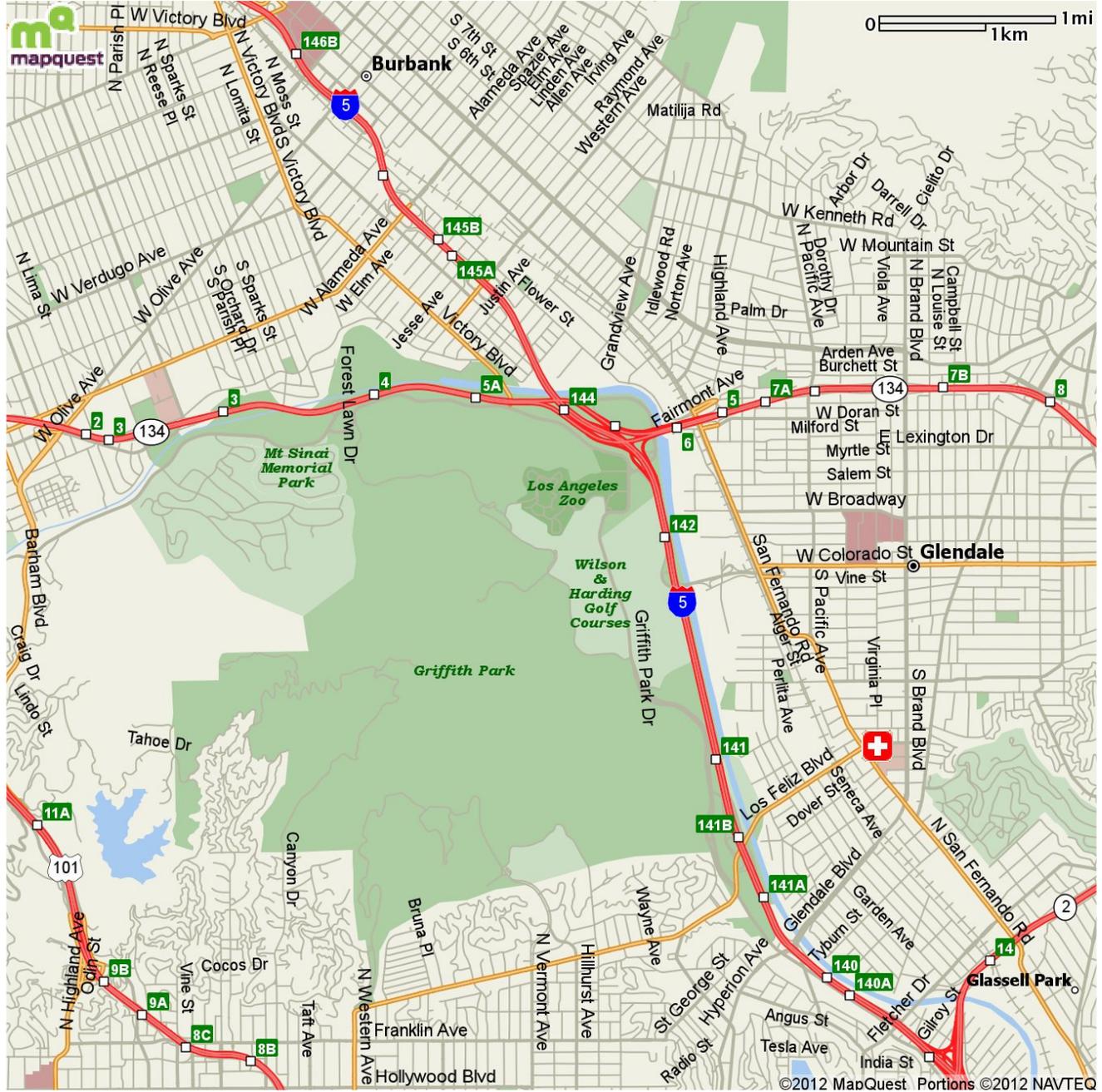
Local Hospital

Local Hospital - Glendale Memorial Hospital, 1420 S Central Ave, Glendale, CA

[<Back](#)

Glendale Memorial Hospital and Health Center

1420 S Central Ave
Glendale, CA 91204-2508



[Use Subject to License/Copyright](#)

This map is informational only. No representation is made or warranty given as to its content or usability. User assumes all risk of use. CHW Hospitals, MapQuest and their suppliers assume no responsibility for any loss resulting from such use.

20.0 Spill Containment Procedures

CH2M HILL and subcontractor personnel working at the project site shall be knowledgeable of the potential health, safety and environmental concerns associated with petroleum and other substances that could potentially be released at the project site.

The following is a list of criteria that must be addressed in CH2M HILL's or the subcontractor's plans in the event of a spill or release. In the event of a large quantity spill notify emergency services. Personnel discovering a spill shall (only if safe to do so):

- Stop or contain the spill immediately (if possible) or note source. Shut off the source (e.g., pump, treatment system) if possible. If unsafe conditions exist, then leave the area, call emergency services, inform nearby personnel, notify the site supervisors, and initiate incident reporting process. The SC shall be notified immediately;
- Extinguish sources of ignition (flames, sparks, hot surfaces, cigarettes);
- Clear personnel from the spill location and barricade the area;
- Use available spill control equipment in an effort to ensure that fires, explosions, and releases do not occur, recur, or spread;
- Use sorbent materials to control the spill at the source;
- Construct a temporary containment dike of sorbent materials, cinder blocks, bricks or other suitable materials to help contain the spill;
- Attempt to identify the character, exact source, amount, and extent of the released materials. Identification of the spilled material should be made as soon as possible so that the appropriate cleanup procedure can be identified;
- Assess possible hazards to human health or the environment as a result of the release, fire or explosion; and
- Follow incident notification, reporting, and investigation section of this plan.

21.0 Inspections

21.1 Project Activity Self-Assessment Checklists

In addition to the hazard controls specified in this document, Project Activity Self-Assessment Checklists are contained as an attachment to this HSP. The Project-Activity Self-Assessment Checklists are based upon minimum regulatory compliance and some site-specific requirements may be more stringent. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. The self-assessment checklists, including documented corrective actions, shall be made part of the permanent project records and maintained by the SC.

The self-assessment checklists will also be used by the SC in evaluating the subcontractors and any client contractors' compliance on site.

The self-assessment checklists for the following tasks and exposures are required when the task or exposure is initiated and weekly thereafter while the task or exposure is taking place. The checklists shall be completed by the SC or other CH2M HILL representative and maintained in project files.

- Drilling
- Hand and Power Tools
- Electrical Safety
- Respiratory Protection
- Traffic Control
- Hazardous Materials Handling
- PPE

21.2 Safe Behavior Observations

Safe Behavior Observations (SBOs) are a tool to be used by supervisors to provide positive reinforcement for work practices performed correctly, while also identifying and eliminating deviations from safe work procedures that could result in a loss.

The SC or designee shall perform at least two SBO's each week for any field work performed by subcontractors or when there are at least two CH2M HILL personnel performing field work.

The SC or designee shall complete the SBO form (attached to this HSP) for the task/operation being observed and submit them weekly.

For Federal projects, SBOs may be submitted electronically by e-mailing them to the address, "CH2M HILL ES FED Safe Behavior Observations" when connected to the network or at CH2MHILLLESFEDSafeBehaviorObservation@ch2m.com.

22.0 Incident Notification, Reporting, and Investigation

(Reference CH2M HILL SOP HSE-111, *Incident Notification, Reporting and Investigation*)

22.1 General Information

This section applies to the following:

- All injuries involving employees, third parties, or members of the public;
- Damage to property or equipment;
- Interruptions to work or public service (hitting a utility);
- Incidents which attract negative media coverage;
- Near misses;
- Spills, leaks, or regulatory violations; and
- Motor vehicle accidents.

Documentation, including incident reports, investigation, analysis and corrective measure taken, shall be kept by the SC and maintained onsite for the duration of the project.

22.2 Section Definitions

Incident: An incident is an event that causes or could have caused undesired consequences. An incident may be caused by natural forces, employees, subcontractors, or third parties in any location associated with CH2M HILL operations, including offices, warehouses, project sites, private property, or public spaces. Incidents include:

- Injury or illness to a CH2M HILL employee or subcontractor employee, or member of the public;
- Property damage;
- Spill or release;
- Environmental requirement or permit violation;
- A “near-miss”; or
- Other (e.g., fire, explosion, bomb threat, workplace violence, threats)**Accident:** an incident involving actual loss through injury, damage to assets, or environmental harm.

Near Miss: A near-miss occurs when an intervening factor prevented an injury or illness, property damage, spill or release, permit violation or other event from occurring. Examples of near-miss situations include: a hard hat or other personal protective equipment (PPE) prevented an injury; secondary containment or emergency shutoff prevented a spill; or an alert co-worker prevented an incident.

Serious Incident:

A Serious Incident must be immediately reported to senior management includes:

- Work related death, or life threatening injury or illness of a CH2M HILL employee;
- subcontractor, or member of the public;
- Kidnap/missing person;
- Acts or threats of terrorism;

- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage; or
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

22.3 Reporting Requirements

All employees and subcontractors' employees shall immediately report any incident (including "near misses," as defined in the section above) in which they are involved or witness to their supervisor.

The CH2M HILL or Subcontractor supervisor, upon receiving an incident report, shall inform his immediate superior and the CH2M HILL SC.

The SC shall immediately report the following information to the RHSM and PM by phone and e-mail:

- Project Name and Site Manager;
- Date and time of incident;
- Description of incident;
- Extent of known injuries or damage;
- Level of medical attention; and
- Preliminary root cause/corrective actions

The RHSM shall immediately inform the EM (or available alternate) of spills, potential environmental permit compliance, or any environmental situation that could result in a notice of violation from an agency.

The CH2M HILL team shall comply with all applicable statutory incident reporting requirements such as those to OSHA, the police, or state or Federal environmental agency.

22.4 HITS System and Incident Report Form

CH2M HILL maintains a HITS entry and/or Incident Report Form (IRF) for all work-related injuries and illnesses sustained by its employees in accordance with recordkeeping and insurance requirements. A HITS entry and/or IRF will also be maintained for other incidents (property damage, fire or explosion, spill, release, potential violation, and near misses) as part of our loss prevention and risk reduction initiative.

The SC shall complete an entry into the Hours and Incident Tracking System (HITS) database system located on CH2M HILL's Virtual Office (or if VO not available, use the hard copy Incident Report Form and Root Cause Analysis Form and forward it to the RHSM) within 24 hours and finalize those forms within 3 calendar days.

22.5 Injury Management/Return-to-Work (for US/Puerto Rico based CH2M HILL Staff Only)

(Reference CH2M HILL, SOP HSSE-124, Injury Management/Return-to-Work)

22.5.1 Background

The Injury Management Program has been established to provide orderly, effective and timely medical treatment and return-to-work transition for an employee who sustains a work-related injury or illness. It also provides guidance and assistance with obtaining appropriate treatment to aid recovery, keep supervisors informed of employee status, and to quickly report and investigate work-related injury/illnesses to prevent recurrence.

To implement the Injury Management/Return-to-Work Program successfully, supervisors and/or SC should:

- Ensure employees are informed of the Injury Management/Return-to-Work Program;
- Become familiar with the Notification Process (detailed below); and
- Post the Injury Management/Return-to-Work Notification Poster.

22.5.2 The Injury Management/Return-to-Work Notification Process:

- Employee informs their supervisor.
- Employee calls the Injury Management Program toll free number 1-866-893-2514 immediately and speaks with the Occupational Injury Nurse. This number is operable 24 hours per day, 7 days a week.
- Supervisor ensures employee immediately calls the Injury Management Program number. Supervisor makes the call with the injured worker or for the injured worker, if needed.
- Nurse assists employee with obtaining appropriate medical treatment, as necessary schedules clinic visit for employee (calls ahead, and assists with any necessary follow up treatment). The supervisor or SC accompanies the employee if a clinic visit is necessary to ensure that employees receive appropriate and timely care.
- Supervisor or SC completes the HITS entry or Incident Report Form immediately (within 24 hours) and forwards it to the Project Manager and RHSM.
- Nurse notifies appropriate CH2M HILL staff by e-mail (supervisor, Health & Safety, Human Resources, Workers' Compensation).
- Nurse communicates and coordinates with and for employee on treatment through recovery.
- Supervisor ensures suitable duties are identified and available for injured or ill workers who are determined to be medically fit to return to work on transitional duty (temporary and progressive).
- Supervisor ensures medical limitations prescribed (if any) by physician are followed until the worker is released to full duty.

22.6 Serious Incident Reporting Requirements

(Reference CH2M HILL SOP HSE-111, *Incident Reporting, Notification and Investigation*)

The serious incident reporting requirements ensures timely notification and allows for positive control over flow of information so that the incident is handled effectively, efficiently, and in conjunction with appropriate corporate entities. This standard notification process integrates Health, Safety, Security and Environment and Firm Wide Security Operations requirements for the consistent reporting of and managing of serious events throughout our operations.

22.6.1 Serious Incident Determination

The following are general criteria for determining whether an incident on CH2M HILL owned or managed facilities or program sites is considered serious and must be immediately reported up to Group President level through the reporting/notification process:

- Work related death, or life threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public;
- Kidnap or missing person;
- Acts or threats of terrorism;

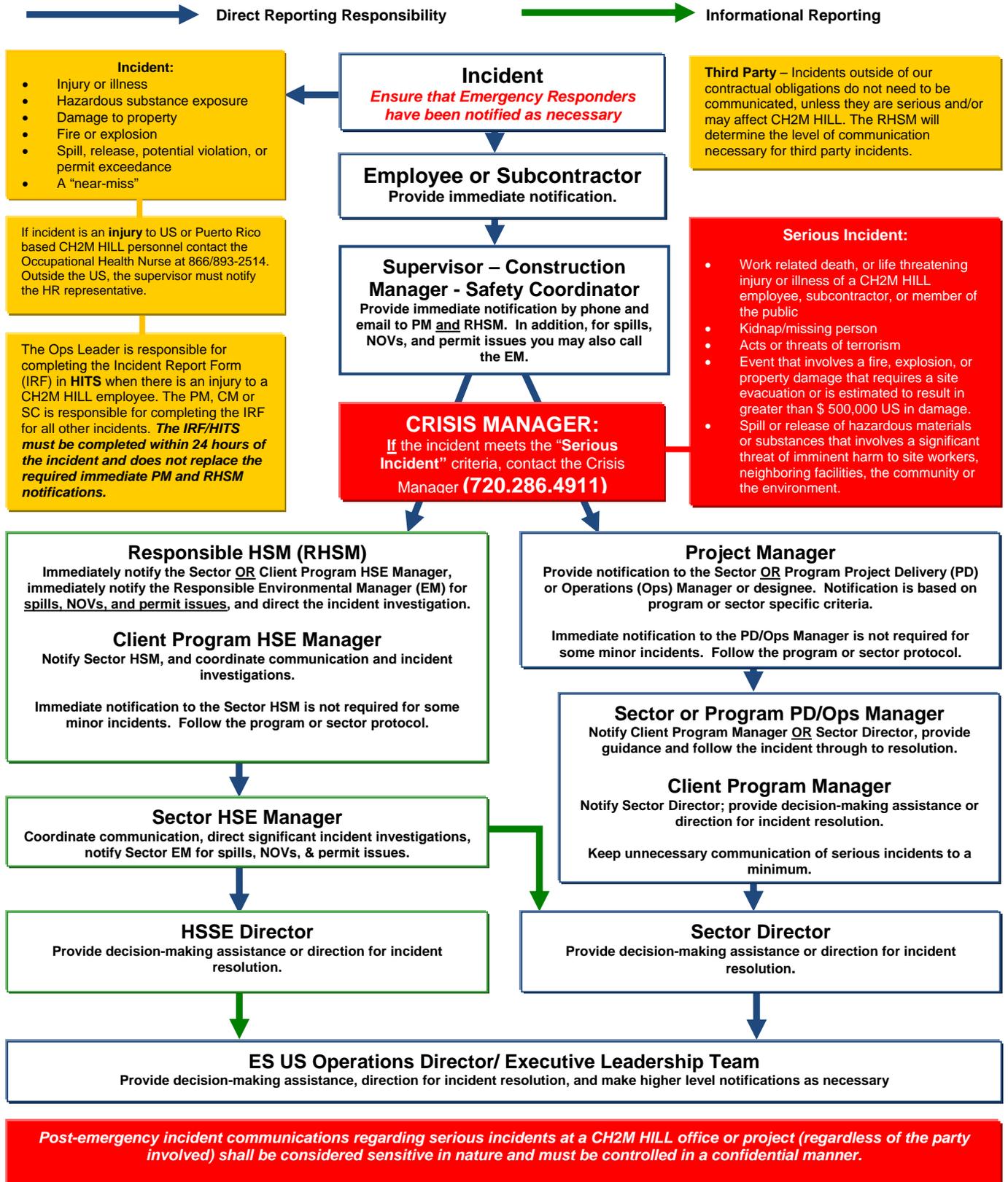
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$ 500,000 in damage; or
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community or the environment.

22.6.2 Serious Incident Reporting

If an incident meets the “Serious Incident” criteria, the Project Manager is to immediately contact the Crisis Manager at 720-286-4911, then follow the standard incident reporting procedure.

For all serious incidents this standard reporting process is implemented immediately so as to ultimately achieve notification to the Business Group President within 2 hours of incident onset or discovery, and notification to appropriate corporate Crisis Management Support Team.

ESBG US Operations Incident Reporting Flow Diagram



22.7 Incident Root Cause Analysis

The accident analysis is essential if all causes of the incident are to be identified for the correct remedial actions to be taken to prevent the same and similar type of incident from recurring. Root Cause Analysis (RCA) shall be completed for all recordable injuries, property damage incidents in excess of \$5000.00 (US), environmental permit violations, spills and releases which are required to be reported to regulatory agencies, and any other incident, including near misses where they RHSM or PM determines an RCA is appropriate. The RHSM/REM is responsible for ensuring it is completed and results entered in the incident report form in HITS. RCA's must be completed using a Team that includes, at least the RHSM or designee, the involved party(ies), a responsible operations representative (e.g. PM, construction manager, crew supervisor, etc.) and an independent management representative not associated with the incident.

The Root Cause Analysis Form must be completed for all Loss Incidents and Near Loss Incidents. This form must be submitted to the investigation team for review.

For minor losses or near losses, the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, determine the root cause, and develop recommendations. More complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This point is especially important when the investigation team will not be able to review the loss scene.

The investigation team must follow the Root Cause Analysis Flow Chart (see Attachment 4 of the SOP) to assist in identifying the root cause(s) of a loss. Any loss may have one or more root causes and contributing factors. The root cause is the primary or immediate cause of the incident, while a contributing factor is a condition or event that contributes to the incident happening, but is not the primary cause of the incident. Root causes and contributing factors that relate to the person involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors." Causes that pertain to the system within which the loss or injury occurred should be referred to as "job factors."

Personal factors include:

- Lack of skill or knowledge;
- Correct way takes more time and/or requires more effort;
- Short-cutting standard procedures is positively reinforced or tolerated; or
- Person thinks there is no personal benefit to always doing the job according to standards.

Job Factors include:

- Lack of or inadequate operational procedures or work standards;
- Inadequate communication of expectations regarding procedures or standards; or
- Inadequate tools or equipment.

The root cause(s) could be any one or a combination of these seven possibilities or some other uncontrollable factor. In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be used rarely and only after a thorough review eliminates all seven other factors.

22.7.1 Corrective Actions

Include all corrective actions taken or those that should be taken to prevent recurrence of the incident. Include the specific actions to be taken, the employer and personnel responsible for implementing the actions, and a timeframe for completion. Be sure the corrective actions address the causes.

Once the investigation report has been completed, the PM shall hold a review meeting to discuss the incident and provide recommendations. The responsible supervisors shall be assigned to carry out the recommendations, and shall inform the SC upon successful implementation of all recommended actions.

- Evaluation and follow-up of the IRF will be completed by the type of incident by the RHSM, EM, or FWSO.
- Incident investigations must be initiated and completed as soon as possible but no later than 72 hours after the incident.

23.0 Records and Reports

An organized project filing system is essential for good documentation and recordkeeping. There are many benefits to an organized filing system:

- Other CH2M HILL employees can easily and quickly find documents;
- Records are readily available for review;
- Records may be needed during OSHA investigations, audits, or other legal matters;
- Records may be needed on short notice in case of an accident, illness or other emergency; and
- Systematic recordkeeping aids in overall project organization.

The project filing system shall be established at the beginning of the project and maintained throughout all phases of construction and archived in accordance with CH2M HILL's Records Retention Policy. The information contained in the filing system shall be updated regularly and/or as specified in this document. The PM and SC are responsible for collecting documentation, including subcontractor documentation, and maintaining a complete and organized filing system.

Below are examples of records that must be maintained as the project progresses:

- Exposure records includes air monitoring data (including calibration records), MSDSs, exposure modeling results;
- Physical hazard exposure records include noise, ionizing radiation, non-ionizing radiation, vibration, and lasers exposure assessments and measurements;
- Respiratory fit test records;
- Training records;
- Incident reports, investigations and associated back-up information such as agency notifications, calculations, and corrective actions taken;
- Federal or state agency inspection records;
- Other Records:
 - Ergonomic evaluations;
 - HSE audits and assessments;
 - Project-specific HSE plans;
 - Confined space entry permits;
 - Equipment inspections;
 - Equipment maintenance;
 - Emergency equipment inspection records;
 - SBOs;
 - Self-assessment checklists
- The RHSM shall coordinate with the PM or designee to ensure that final project-specific HSE records described in this section, including negative exposure determinations, are maintained with the project files in accordance with the CH2M HILL records retention schedule, or forwarded to the Medical Surveillance Program Administrator, as appropriate. Records retention requirements are detailed in the Recordkeeping and Access to Records SOP, HSE-119.

CH2M HILL Health and Safety Plan
Attachment 1

Health and Safety Plan Employee Sign-off Form

CH2M HILL Health and Safety Plan
Attachment 2

Chemical Inventory/Register Form

CH2M HILL Health and Safety Plan
Attachment 3

Chemical-Specific Training Form

CHEMICAL-SPECIFIC TRAINING FORM

Refer to SOP HSE-107 Attachment 1 for instructions on completing this form.

Location:	Project # :
HCC:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

- Physical and health hazards
- Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)
- Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

CH2M HILL Health and Safety Plan

Attachment 4

Project Activity Self-Assessment Checklists/Permits/Forms

Drilling
Forklifts
Earthmoving Equipment
Electrical
Excavations
Hand and Power Tools
Hazardous Materials Handling
Hexavalent Chromium
Manual Lifting
Personal Protective Equipment
Respiratory Protection
Rigging
Stairways & Ladders
Traffic Control

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project’s written safety plan.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to drilling hazards, 2) CH2M HILL staff are providing support function related to drilling activities, and/or 3) CH2M HILL oversight of a drilling subcontractor is required.

Safety Coordinator may consult with drilling subcontractors when completing this checklist, but shall not direct the means and methods of drilling operations nor direct the details of corrective actions. Drilling subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately, or all exposed personnel shall be removed from the hazard until corrected.

Project Name: _____ Project No.: _____
 Location: _____ PM: _____
 Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

Evaluate CH2M HILL employee exposures to drilling hazards (complete Section 1).
 Evaluate CH2M HILL support functions related to drilling activities (complete Section 2).
 Evaluate a CH2M HILL subcontractor’s compliance with drilling safety requirements (complete entire checklist).
 Subcontractors Name: _____

- Check “Yes” if an assessment item is complete/correct.
 - Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the drilling subcontractor. Section 3 must be completed for all items checked “No.”
 - Check “N/A” if an item is not applicable.
 - Check “N/O” if an item is applicable but was not observed during the assessment.
- Numbers in parentheses indicate where a description of this assessment item can be found in SOP HSE-204.

SECTION 1 - SAFE WORK PRACTICES (4.1)		Yes	No	N/A	N/O
1.	Personnel cleared during rig startup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Personnel clear of rotating parts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Personnel not positioned under hoisted loads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	Loose clothing and jewelry removed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Smoking is prohibited around drilling operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Personnel wearing appropriate personal protective equipment (PPE), per written plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	Personnel instructed not to approach equipment that has become electrically energized	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SECTION 2 - SUPPORT FUNCTIONS (4.2)					
FORMS/PERMITS (4.2.1)					
8.	Driller license/certification obtained	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	Well development/abandonment notifications and logs submitted and in project files	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	Water withdrawal permit obtained, where required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	Dig permit obtained, where required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UTILITY LOCATING (4.2.2)					
12.	Location of underground utilities and structures identified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 2 (Continued)				
WASTE MANAGEMENT (4.2.3)	Yes	No	N/A	N/O
13. Drill cuttings and purge water managed and disposed properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILLING AT HAZARDOUS WASTE SITES (4.2.4)				
14. Waste disposed of according to project's written safety plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Appropriate decontamination procedures being followed, per project's written safety plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILLING AT MUNITIONS RESPONSE (4.2.5)				
16. MEC plan prepared and approved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. MEC avoidance provided, routes and boundaries cleared and marked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Initial pilot hole established by UXO technician with hand auger	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Personnel remain inside cleared areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SECTION 3 - DRILLING SAFETY REQUIREMENTS (4.3)				
GENERAL (4.3.1)				
20. Only authorized personnel operating drill rigs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Daily safety briefing/meeting conducted with crew	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Daily inspection of drill rig and equipment conducted before use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Manufacturer equipment inspections current and paperwork available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG PLACEMENT (4.3.2)				
24. Location of underground utilities and structures identified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Safe clearance distance maintained from overhead power lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Drilling pad established, when necessary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Drill rig leveled and stabilized	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Additional precautions taken when drilling in confined areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG TRAVEL (4.3.3)				
29. Rig shut down and mast lowered and secured prior to rig movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Tools and equipment secured prior to rig movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Only personnel seated in cab are riding on rig during movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Safe clearance distance maintained while traveling under overhead power lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Backup alarm or spotter used when backing rig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG OPERATION (4.3.4)				
34. Kill switch clearly identified and operational	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. All machine guards are in place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Rig ropes not wrapped around body parts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Pressurized lines and hoses secured from whipping hazards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Drill operation stopped during inclement weather	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Air monitoring conducted per written safety plan for hazardous atmospheres	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Rig placed in neutral when operator not at controls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG SITE CLOSURE (4.3.5)				
41. Ground openings/holes filled or barricaded	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Equipment and tools properly stored	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. All vehicles locked and keys removed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG MAINTENANCE (4.3.6)				
44. Defective components repaired immediately	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Lockout/tagout procedures used prior to maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Cathed in clean, sound condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Drill rig ropes in clean, sound condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Fall protection used for fall exposures of 6 feet (U.S.) 1.5 meters (Australia) or greater	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Rig in neutral and augers stopped rotating before cleaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. Good housekeeping maintained on and around rig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

HS&E Self-Assessment Checklist – Electrical Safety

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project’s written safety plan.

This checklist is to be used at locations when: (1) CH2M HILL employees are required to use electrical appliances, are exposed to electrical hazards, or are working on or near exposed energized electrical equipment; and/or (2) CH2M HILL provides oversight of an electrical subcontractor.

The Safety Coordinator (SC) may consult with electrical subcontractors when completing this checklist, but shall not direct the means and methods of electrical operations nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies, and CH2M HILL must carefully rely on their expertise. Items or conditions considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately, or all exposed personnel shall be removed from the hazard until corrected.

Project Name: _____	Project No.: _____
Location: _____ Project Manager: _____	
Auditor: _____ Title: _____ Date: _____	
This specific checklist has been completed to:	
<input type="checkbox"/> Evaluate CH2M HILL employee exposure to electrical hazards (Complete Section 1)	
<input type="checkbox"/> Evaluate a CH2M HILL subcontractor’s compliance with electrical safety requirements (Complete entire checklist)	
Subcontractor’s Name: _____	
<ul style="list-style-type: none"> • Check “Yes” if an assessment item is complete/correct. • Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked “No.” • Check “N/A” if an item is not applicable. • Check “N/O” if an item is applicable but was not observed during the assessment. 	
Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-206.	

<u>SECTION 1 – SAFE WORK PRACTICES</u>				
	Yes	No	N/A	N/O
General Requirements (5.1)				
1. Personnel have completed electrical safety training.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Attempts are made to locate all energized electrical circuits before work begins.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Installation/repair areas sufficiently guarded with barriers and signs to prevent unauthorized entry.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Only qualified employees installing or working with electrical equipment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Electrical circuits that may be contacted are de-energizing and grounded or guarded.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Lockout/Tagout procedures when required verified using the checklist provided in HSE-307.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Only qualified electrical workers defeating electrical safety interlocks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Where the location of underground power lines is unknown, insulated gloves are used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical Power Tools and Extension Cords (5.3)				
9. Electric power tools and extension cords inspected prior to use. Damaged equipment not used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Extension cords supplying power tools provided with Ground Fault Circuit Interrupters (GFCI).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Electric power tools operated and maintained according to manufacturer’s instructions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Electric power tools effectively grounded or double-insulated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Extension cords grounded and designed for heavy duty or industrial grade.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Extension cords not substituted for fixed wiring.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Extension cords covered, elevated, or protected when passing through work areas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Extension cords passing through doorways or other pinch points protected from damage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Extension cords not concealed or run through walls, ceilings, or floors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Extension cords not fastened with staples, hung from nails, or suspended with wire.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Working space, walkways, and similar areas are kept clear of cords to prevent tripping hazards.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 1 – SAFE WORK PRACTICES (Continued)</u>				
	Yes	No	N/A	N/O
Portable Lighting (5.4)				
20. Portable lamps wired with flexible cord with grounded plugs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Portable lights not suspended by their electric cords unless designed for suspension.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Portable lights protected from contact or breakage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Portable lights used in wet locations operated at 12 volts or less or used with GFCI.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overhead Power Lines (5.5)				
24. Lines de-energized and grounded, insulated, or safe clearance distance maintained.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Personnel stay clear of grounding point of equipment intentionally grounded.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Personnel do not touch or approach equipment that has become energized.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u>SECTION 2 – ELECTRICAL SAFETY REQUIREMENTS</u>				
General Installation Requirements (5.7)				
35. Competent person overseeing electrical activities, including inspections.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Subcontractor personnel using appropriate safety and protective equipment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Electrical equipment free from recognized hazards.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Equipment approved for intended use and installed according to approvals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Manufacturer's name, trademark, or other descriptive marking placed on equipment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Energized parts > 50 volts guarded against accidental contact.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Electrical equipment > 600 volts placed in a vault, room, closet, or protected area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Sufficient access and working clearances provided and maintained for all electric equipment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Means provided to disconnect conductors from the service-entrance conductors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Circuit breakers sufficient for system current load.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Over-current protection devices readily accessible and legibly marked to indicate purpose.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Equipment firmly secured to surface on which it is mounted.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Electrical equipment ventilated for cooling as required.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Electrical equipment protected from damage by environmental conditions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Equipment in hazardous locations maintained in a dust-tight, ignition-proof condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. Equipment producing arcs, sparks, flames, enclosed or separated from combustible material.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Conductors spliced or joined properly and free ends covered with insulation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Equipment grounding provided on all equipment requiring such grounding.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ground-fault Protection (5.6)				
53. GFCIs used or an assured equipment-grounding conductor (AEGC) program implemented.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. When GFCIs used, installed on all 120-volt, 15- and 20-ampere temporary receptacle outlets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. When AEGC program used, covers all extension cords and temporary receptacles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. AEGC program also covers all equipment connected by cord and plug.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. Under AEGC program, equipment visually inspected for external defects before each day's use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Under AEGC program, continuity and grounding testing performed at least every 3 months.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Records maintained for all AEGC program testing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

FIELD VEHICLE INSPECTIONS

	Y	N	NA
GENERAL			
Rear and side view mirrors adjusted for driver			
Seat and steering wheel adjusted for driver			
Signals, brake lights, head lights, wipers working & familiar with controls			
First aid kits [stocked, mouth breather, Benadryl, BBP kit]			
Jumper cables in truck (optional)			
Wheel Chocks			
Spill kit appropriate for work			
Fire extinguisher – inspected, pin in place, secured			
SECURE LOADS			
Are chemicals, tools, equipment, drums stored securely so as not to create a hazard [ratchet straps, cargo nets, boards, ropes, cages, tool boxes, etc.]			
Loads sticking out of truck are flagged [hi vis orange flags]			
Fire Extinguisher is secured			
Small tools, containers, etc. are secured			
Nothing is rolling around on floor, especially in the driver's seat			
EQUIPMENT, TOOLS & STORAGE			
Tools in good condition [handles stable, scissors sharp, screwdrivers not bent or mushroomed]			
Tools have a "home" – a designated storage place			
Hand tools have guards [i.e., guards haven't been removed]			
Ladders – clean, locking mechanisms work, feet attached, read labels			
Fittings on compressors, air lines or hoses in good condition			
No knives that do not conform to CH2M HILL ESG Knife Policy			
Chemical containers closed when not in use			
Gasoline in metal safety cans [spring closure, flame arrestor] & labeled			
Tools and equipment, when found to be defective, tagged "Do Not Use" or similar			
Only storing/transporting necessary equipment; not hauling unnecessary equipment, equipment left over from former jobs			
PROTECTIVE EQUIPMENT			
Drinking water – in clean container, separate from equipment and field gear			
DEET bug spray, sunscreen, bee/wasp spray			
PPE available and in good condition [hard hat, respirator, high visibility vests, Kevlar gloves, glasses/goggles, nitrile gloves, work gloves, ear plugs/muffs, Tyvek, aprons, YakTrax, etc.]			
Cones, barricades, flags, etc., available and secured			
HAZARD COMMUNICATION			
All containers have MSDS label or manufacturer hazard label			
Chemicals purchased locally (i.e., Home Depot, WalMart, TruValue, etc.) on hazardous chemical inventory and have MSDS (if using differently than average consumer)			
Are flammable & combustible liquids in an approved and labeled container			
ELECTRICAL			
Grounding pin intact on three-wire extension cords			
Extension cords free of cuts or damage to the insulation			

Grounding pins intact on portable power tools, or double-insulated			
Reptacles free of cracks or breaks & weatherproof cover			
GFCI used on every electrical cord			
GFCIs checked before each use			
Generator has GFCI; external ground if needed			
SLINGS			
Are synthetic slings inspected before each use [marked capacity, broken or cut fibers, discoloration or rotting, punctures/snags, visible core warning yarns – usually red]			

HOUSEKEEPING INSPECTIONS - FIELD			
Floors/ground free of water, mud, ice, grease, trash and waste materials. If not, mitigations in place [ice melt or sand on ground, use YakTrax, oil absorbent, etc.]			
Unmovable ground hazards like tree roots are flagged with caution tape or similar. Holes are also flagged or backfilled.			
Traffic routes are marked and clear. They are free of tripping hazards such as electrical cables, hoses and stored materials.			
Exits and stairways are well-marked. They are kept clear at all times, and are not used for storage.			
Fire extinguishers are charged and inspected monthly. They are located where they will be easily accessible in case of a fire. They are not obstructed by stored materials. In vehicles, they are secured.			
Trash cans are located where they are needed and are emptied regularly.			
Oily rags are disposed of in covered metal cans.			
Lighting is adequate for safety. Burned-out lights are replaced promptly. Adequate lighting is provided for night work.			
Equipment/materials needed for work are staged at the site. Minimize in/out of vehicles.			
Supplies and materials are stored so they cannot fall over or down.			
Any chemicals are safely stored in the correct kinds of containers. Lids on. Properly labeled, MSDS available. Chemical storage takes into account the requirements of temperature, ventilation and humidity for various materials. Potentially incompatible materials are separated.			
No eating/drinking/smoking in work area.			
Flammable and combustible materials are stored away from sources of ignition.			
Machinery is kept clean, free of oil, grease and dust. Equipment is maintained properly to prevent fires and accidents.			
Tools are cleaned and put away right after they are used. There are designated places for tools. [i.e., not throw in back of vehicle]			
Work stations/work site is left clean, organized and secured at the end of the shift.			
Surfaces and equipment are checked over regularly for hazards such as protruding nails and rough surfaces.			



HOUSEKEEPING INSPECTIONS - OFFICE			
Drawers and cabinet doors are kept closed to prevent tripping accidents.			
Filing cabinets are filled from the bottom up to prevent them from tipping over.			
Lunch areas are kept clean and free of trash. Washrooms are also kept clean and dry.			
Paper files are put away after use; not stockpiled in work space.			
Overhead shelves are not overloaded with files, binders, etc.			
Electrical and computer cables are organized and kept out of walkways.			
Keyboard tray is stowed when not in use; it is adjusted to proper height for user to avoid bumped knees.			
Sharp, damaged edges of metal furniture is taped over or otherwise protected.			
Staplers, tape dispensers, etc are in good working order or disposed. Broken staplers and dull tape dispensers can cause injury.			
Area rugs are secured in place; they don't wrinkle or "flip up"			
During wet weather, carpets or similar are provided to prevent puddles and slippery floors.			
Office workers walk carefully; don't run around corners, blast through doors and bump into others			
Don't carry loads that obstruct vision or prevent ability to safely open doors, climb stairs, select elevator buttons, etc. Use a dolly, a friend, or make multiple trips.			
Adequate lighting provided, especially in stairwells.			
Coffee pots and similar turned off when not in use.			

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project’s HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to hazards associated with forklift operations, 2) CH2M HILL employees are operating forklifts, and/or 3) CH2M HILL provides oversight of a subcontractor operating forklifts.

SC may consult with subcontractors using forklifts when completing this checklist, but shall not direct the means and methods of forklift operations nor direct the details of corrective actions. Subcontractors using forklifts shall determine how to correct deficiencies, and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

- Evaluate CH2M HILL employee exposures to forklift hazards (Complete Section 1).
- Evaluate CH2M HILL employees operating forklifts (Complete entire checklist).
- Evaluate a CH2M HILL subcontractor’s compliance with forklift safety requirements (Complete entire checklist).
Subcontractor’s Name: _____

- Check “Yes” if an assessment item is complete/correct.
- Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked “No.”
- Check “N/A” if an item is not applicable.
- Check “N/O” if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-48.

SAFE WORK PRACTICES (5.1)	<u>SECTION 1</u>			
	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
1. Personnel maintaining safe distance from operating forklifts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Positioning personnel in proximity to operating forklifts is avoided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Personnel wearing high-visibility vests when close to operating forklifts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Personnel approach operating forklifts safely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Personnel only riding in seats equipped with seat belts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Personnel not lifted or lowered by forklift unless approved for such use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Personnel not positioned under elevated loads or forks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Personnel do not place body between mast uprights or outside running lines during operation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Personnel do not touch or approach forklift that has become electrically energized.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

FORKLIFT SAFETY REQUIREMENTS	<u>SECTION 2</u>	Yes	No	N/A	N/O
PRIOR TO OPERATING FORKLIFT (5.2.1)					
10. Only certified personnel operating forklifts.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Daily safety briefing/meeting conducted with forklift operators.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Daily inspection of forklift conducted and documented.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Rated capacity of forklift visible to operator.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Modifications and attachments used approved by forklift manufacturer.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. High-lift forklifts have load backrest and overhead guard.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Seat belts are provided and used.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Backup alarm or spotter used when backing forklift.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Operational horn provided and used as necessary.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Braking system capable of stopping capacity load.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Forklifts equipped with lights for low-light operations.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Carbon monoxide concentrations below PEL (50 ppm).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. At least one fire extinguisher available at the forklift operating area.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DESIGNATIONS AND LOCATIONS (5.2.2)					
23. Atmosphere/locations classified as hazardous or non-hazardous.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Only properly designated forklifts used in hazardous locations.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FORKLIFT LOADING/UNLOADING (5.2.3)					
25. Operator handles only loads within rated capacity, adjusts for long or tall loads.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Loads are stabilized before forklift travel.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Operator using proper tilt to stabilize load, uses caution when tilting elevated loads.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. When two forklifts lift a load in unison, operators stay in close communication.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Trucks, trailers, railroad cars secured from movement before entering with forklift.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Dockplates/bridgeplates secured before use; capacity not exceeded.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Truck, trailer, railroad car flooring checked for weakness before forklift boarding.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Personnel platforms secured to forklift and shut off means provided on platform.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FORKLIFT TRAVEL (5.2.4)					
33. Forklift operated on safe roadways and grades.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Grades ascended/descended properly.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Forklift operated at safe speed, kept under control at all times		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Operators slow down and use horn at areas with obstructed vision.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Forklifts operating in reverse when load obstructs vision.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Operator keeping clear view of path of travel.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Forklifts do not pass other stopped vehicles at areas with obstructed vision.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Operators maintain safe distance from edge of ramps and platforms.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Overhead clearance maintained from installations.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Forklifts not parked within 8 feet of center of railroad tracks. Tracks crossed diagonally.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Forklift parked correctly when operator is dismounted.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FORKLIFT MAINTENANCE (5.2.5)					
44. Forklifts with unsafe conditions removed from service and tagged as such to prevent use.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Forklifts repaired in designated, non-hazardous locations by authorized personnel.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Battery disconnected when repairing electrical systems.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Additions or omissions of parts not performed without manufacturer's approval.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Good housekeeping maintained on and around forklift.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Water mufflers checked daily, kept at 75% full.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. Forklifts removed from service if sparks, flames, or elevated operating temperatures occur.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Suspended forklifts or components are supported prior to work under or between.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Fueling/battery charging conducted in designated, well-ventilated area.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Fueling/battery charging areas properly equipped for task.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. No smoking in fueling/battery charging areas.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Spillage of fuel properly cleaned up before starting forklift.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CH2MHILL

HS&E Self-Assessment Checklist—HAND AND POWER TOOLS

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project’s HSP/FSI.

This checklist is to be used at locations where: (1) CH2M HILL employees are exposed to hand and power tool hazards and/or (2) CH2M HILL provides oversight of subcontractor personnel who are exposed to hand and power tool hazards.

SC may consult with subcontractors when completing this checklist, but shall not direct the means and methods of hand and power tool use nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the HS&E Staff for review.

Project Name: _____ Project No.: _____
 Location: _____ PM: _____
 Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

Evaluate CH2M HILL employee exposure to hand and power tool hazards.
 Evaluate a CH2M HILL subcontractor’s compliance with hand and power tool requirements.
 Subcontractors Name: _____

- Check “Yes” if an assessment item is complete/correct.
 - Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked “No.”
 - Check “N/A” if an item is not applicable.
 - Check “N/O” if an item is applicable but was not observed during the assessment.
- Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-210.

<u>SECTION 1</u>		<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
SAFE WORK PRACTICES (3.1)					
1.	All tools operated according to manufacturer’s instructions and design limitations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	All hand and power tools maintained in a safe condition and inspected and tested before use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Defective tools are tagged and removed from service until repaired.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	PPE is selected and used according to tool-specific hazards anticipated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Power tools are not carried or lowered by their cord or hose.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Tools are disconnected from energy sources when not in use, servicing, cleaning, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	Safety guards remain installed or are promptly replaced after repair.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	Tools are stored properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	Cordless tools and recharging units both conform to electrical standards and specifications.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	Tools used in explosive environments are rated for such use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	Knife or blade hand tools are used with the proper precautions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	Consider controls to avoid muscular skeletal, repetitive motion, and cumulative trauma stressors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 2

Yes No N/A N/O

GENERAL (3.2.1)

- 13. PPE is selected and used according to tool-specific hazards anticipated. Yes No N/A N/O
- 14. Tools are tested daily to assure safety devices are operating properly. Yes No N/A N/O
- 15. Damaged tools are removed from service until repaired. Yes No N/A N/O
- 16. Power operated tools designed to accommodate guards have guards installed. Yes No N/A N/O
- 17. Rotating or moving parts on tools are properly guarded. Yes No N/A N/O
- 18. Machines designed for fixed locations are secured or anchored. Yes No N/A N/O
- 19. Floor and bench-mounted grinders are provided with properly positioned work rests. Yes No N/A N/O
- 20. Guards are provided at point of operation, nip points, rotating parts, etc. Yes No N/A N/O
- 21. Fluid used in hydraulic-powered tools is approved fire-resistant fluid. Yes No N/A N/O

ELECTRIC-POWERED TOOLS (3.2.2)

- 22. Electric tools are approved double insulated or grounded and used according to SOP HSE-206. Yes No N/A N/O
- 23. Electric cords are not used for hoisting or lowering tools. Yes No N/A N/O
- 24. Electric tools are used in damp/ wet locations are approved for such locations or GFCI installed. Yes No N/A N/O
- 25. Hand-held tools are equipped with appropriate on/off controls appropriate for the tool. Yes No N/A N/O
- 26. Portable, power-driven circular saws are equipped with proper guards. Yes No N/A N/O

ABRASIVE WHEEL TOOLS (3.2.3)

- 27. All employees using abrasive wheel tools are wearing eye protection. Yes No N/A N/O
- 28. All grinding machines are supplied with sufficient power to maintain spindle speed. Yes No N/A N/O
- 29. Abrasive wheels are closely inspected and ring-tested before use. Yes No N/A N/O
- 30. Grinding wheels are properly installed. Yes No N/A N/O
- 31. Cup-type wheels for external grinding are protected by the proper guard or flanges. Yes No N/A N/O
- 32. Portable abrasive wheels used for internal grinding are protected by safety flanges. Yes No N/A N/O
- 33. Safety flanges are used only with wheels designed to fit the flanges. Yes No N/A N/O
- 34. Safety guards on abrasive wheel tools are mounted properly and of sufficient strength. Yes No N/A N/O

PNEUMATIC-POWERED TOOLS (3.2.4)

- 35. Tools are secured to hoses or whip by positive means to prevent disconnection. Yes No N/A N/O
- 36. Safety clips or retainers are installed to prevent attachments being expelled. Yes No N/A N/O
- 37. Safety devices are installed on automatic fastener feed tools as required. Yes No N/A N/O
- 38. Compressed air is not used for cleaning unless reduced to < 30 psi, with PPE, and guarded. Yes No N/A N/O
- 39. Manufacturer’s safe operating pressure for hoses, pipes, valves, etc. are not exceeded. Yes No N/A N/O
- 40. Hoses are not used for hoisting or lowering tools. Yes No N/A N/O
- 41. All hoses >1/2-inch diameter have safety device at source to reduce pressure upon hose failure. Yes No N/A N/O
- 42. Airless spray guns have required safety devices installed. Yes No N/A N/O
- 43. Blast cleaning nozzles are equipped with operating valves, which are held open manually. Yes No N/A N/O
- 44. Supports are provided for mounting nozzles when not in use. Yes No N/A N/O
- 45. Air receiver drains, handholes, and manholes are easily accessible. Yes No N/A N/O
- 46. Air receivers are equipped with drainpipes and valves for removal of accumulated oil and water. Yes No N/A N/O
- 47. Air receivers are completely drained at required intervals. Yes No N/A N/O
- 48. Air receivers are equipped with indicating pressure gauges. Yes No N/A N/O
- 49. Safety, indicating, and controlling devices are installed as required. Yes No N/A N/O
- 50. Safety valves are tested frequently and at regular intervals to assure good operating condition. Yes No N/A N/O

SECTION 2 (continued)

Yes No N/A N/O

LIQUID FUEL-POWERED TOOLS (3.2.5)

- 51. Liquid fuel-powered tools are stopped when refueling, servicing, or maintaining.
- 52. Liquid fuels are stored, handled, and transported in accordance with SOP HSE-403
- 53. Liquid fuel-powered tools are used in confined spaces in accordance with SOP HSE-203.
- 54. Safe operating pressures of hoses, valves, pipes, filters, and other fittings are not exceeded.

POWDER-ACTUATED TOOLS (3.2.6)

- 55. Only trained employee operates powder-actuated tools.
- 56. Powder-actuated tools are not loaded until just prior to intended firing time.
- 57. Tools are not pointed at any employee at any time.
- 58. Hands are kept clear of open barrel end.
- 59. Loaded tools are not left unattended.
- 60. Fasteners are not driven into very hard or brittle materials.
- 61. Fasteners are not driven into easily penetrated materials unless suitable backing is provided.
- 62. Fasteners are not driven into spalled areas.
- 63. Powder-actuated tools are not used in an explosive or flammable atmosphere.
- 64. All tools are used with correct shields, guards, or attachments recommended by manufacturer.

JACKING TOOLS (3.2.7)

- 65. Rated capacities are legibly marked on jacks and not exceeded.
- 66. Jacks have a positive stop to prevent over-travel.
- 67. The base of jacks are blocked or cribbed to provide a firm foundation, when required.
- 68. Wood blocks are place between the cap and load to prevent slippage, when required.
- 69. After load is raised, it is cribbed, blocked, or otherwise secured immediately.
- 70. Antifreeze is used when hydraulic jacks are exposed to freezing temperatures.
- 71. All jacks are properly lubricated.
- 72. Jacks are inspected as required.
- 73. Repair or replacement parts are examined for possible defects.
- 74. Jacks not working properly are removed from service and repaired or replaced.

HAND TOOLS (3.2.8)

- 75. Wrenches are not used when jaws are sprung to the point of slippage.
- 76. Impact tools are kept free of mushroomed heads.
- 77. Wooden handles of tools are kept free of splinters or cracks and are tightly fitted in tool.

This checklist is provided as a method of verifying compliance with regulations pertaining to the handling of hazardous materials. It shall be used at locations where CH2M HILL employees handle hazardous materials, or are required to perform oversight of subcontractor personnel handling hazardous materials, or both.

CH2M HILL staff shall not direct the means and methods of subcontractor operations nor direct the details of corrective actions. The subcontractor must determine how to correct deficiencies, and CH2M HILL staff must carefully rely on the subcontractor's expertise. Items considered imminently dangerous (possibility of serious injury or death) must be corrected immediately, or all exposed personnel must be removed from the hazard until it is corrected.

Completed checklists must be sent to the appropriate regional health and safety program manager for review.

Project Name: _____ Project No.: _____
 Location: _____ PM: _____
 Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to (check only one of the boxes below):

- Evaluate CH2M HILL compliance with hazardous material handling requirements (SOP HSE-403)
- Evaluate a CH2M HILL subcontractor's compliance with hazardous material requirements
 Subcontractor's Name: _____

- Check "Yes" if an assessment item is complete or correct.
- Check "No" if an item is incomplete or deficient. Section 2 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-403.

<u>SECTION 1</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
PROCEDURES FOR HAZARDOUS MATERIAL HANDLING (6.0)				
GENERAL GUIDELINES (6.1)				
1. Acids are stored away from bases.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Oxidizers and organics are stored away from inorganic reducing agents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Flammables and corrosives are stored in appropriate storage cabinets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Paper and other combustibles are not stored near flammables.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Secondary containment and lipped shelving are in place in storage areas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. A fire suppression system is available.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SPILL CONTROL/CLEANUP (6.2)				
7. Spill control materials are located on the project site.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HAZARDOUS CHEMICAL INVENTORY REPORTING (6.3)				
8. Reporting is required if the project site handles and stores 10,000 lb or more of a hazardous chemical.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Or 500 lb or the threshold planning quantity (TPQ) of an extremely hazardous substance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Regional ECC has been consulted for hazardous chemical inventory reporting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TOXIC CHEMICAL RELEASE REPORTING				
11. Reporting requirements for toxic chemical release reporting have been followed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 1 (continued)</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
FLAMMABLE AND COMBUSTIBLE LIQUIDS (6.5)				
GENERAL STORAGE (6.5.1)				
12. Only approved containers/portable tanks used to store flammable and combustible liquids.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Approved safety cans used for handling flammable liquids in quantities 1-5 gallons.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. For quantities of one gallon or less, the original container must be used for storage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Flammable or combustible liquids are not stored in stairways or personnel passageways.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INDOOR STORAGE (6.5.2)				
16. Quantities of flammable or combustible liquids > 25 gallons stored in approved storage cabinet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. No more than 25 gallons of flamm. or comb. liquids can be stored outside an approved cabinet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Cabinets are labeled with "FLAMMABLE: KEEP FIRE AWAY."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. No more than 60 gallons of flamm. or 120 gallons of comb. liquids stored in one storage cabinet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Not more than three cabinets located in a single storage area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OUTSIDE STORAGE (6.5.3)				
21. Storage of containers (not more than 60 gallons each) do not exceed 1,100 gallons in any area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Storage areas are not within 20 feet of any building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Storage areas graded to divert spills away from buildings and surrounded by an earth dike.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Storage areas are free from weeds, debris, and other combustible materials.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Outdoor portable tanks are provided with emergency vent devices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Outdoor portable tanks are no closer than 20 feet from any building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Signs indicating no smoking are posted around the storage area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DISPENSING (6.5.4)				
28. Areas where liquids are dispensed in >5-gal quantities are separated from other operations by 25'.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Drainage or other means provided to control spills.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Adequate natural or mechanical ventilation provided to maintain concentration of flammable vapor < 10% of the lower flammable limit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Dispensing of flammable liquids from one container to another is done only when containers are electrically interconnected (bonded).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Dispensing flammable or combustible liquids by means of air pressure on the container or portable tanks prohibited.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Dispensing devices and nozzles for flammable liquids are of an approved type.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
USE (6.5.5)				
34. Flammable liquids are kept in closed containers when not in actual use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Leakage or spillage of flammable or combustible liquids is disposed of promptly and safely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Sources of ignition are kept at least 50 feet from flammable liquids.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LIQUID PETROLEUM GAS (6.6)				
37. LPG containers meet DOT requirements.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Each container or system has a safety relief device or valve in good working order.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Portable heaters using LPG have an automatic shutoff device in the event of flame failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Storage of LPG within buildings is prohibited.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. LPG storage location has at least one portable fire extinguisher rated not less than 20-B:C.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 1 (continued)</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
COMPRESSED GAS CYLINDERS (6.7)				
GENERAL (6.7.1)				
42. Cylinders and apparatus inspected for defects and leakage prior to use. Damaged items not used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Gas distributor notified and subsequent instructions followed for defective cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Leaking cylinders removed from the work area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Cylinder users do not modify, tamper, or attempt repair on cylinders or apparatus.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Only cylinder owners or authorized agent refill cylinders or attempt to mix gases in a cylinder.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Cylinders labeled with the identity of the contents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TRANSPORTING (6.7.2)				
48. Cylinders not rolled in the horizontal position or dragged; suitable material-handling device used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Cylinders being transported have valve protection caps installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. Cylinders in vertical position when transported by motor vehicle, hoisted, or carried.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Cylinders hoisted by a cradle or pallet designed for such use, and not by magnets, slings, or their valve protection caps.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STORAGE (6.7.3)				
52. Cylinders are stored in the vertical position with valve protection caps installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Cylinders are secured from being knocked over by a chain or other stabilizing device.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. Cylinders are stored away from readily ignitable substances.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Cylinders are protected from exposure to temperature extremes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. Oxygen cylinders in storage are separated from fuel gas cylinders or combustible materials > 20' or by a ½-hour fire-resistant barrier at least 5' high.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. Cylinders inside buildings are stored in dry, well-ventilated locations > 20' from comb. materials.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Cylinders are stored in definitely assigned places away from elevators, stairs, or gangways.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Signs indicating no smoking are provided for storage areas containing flammable gas cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PLACEMENT FOR USAGE (6.7.4)				
60. Cylinders are located where they will not be knocked over or damaged.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61. Cylinders are secured in the vertical position.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62. Cylinders are not placed where they can become part of an electrical circuit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63. Cylinders are kept far enough away from welding and cutting operations to prevent sparks, hot slag, or flames from reaching them. When impractical, fire resistant shields are provided.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64. Cylinders are not taken into confined spaces.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CYLINDER CONNECTIONS (6.7.5)				
65. Pressure-controlling apparatus is compatible with the particular gas used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66. Cylinders and pressure-controlling apparatus are kept free of oil and grease.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
67. Pressure-controlling apparatus is kept gastight to prevent leakage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68. Cylinders not attached to process where backflow could occur unless check valves or traps used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
69. Manifolds designed for product used at the appropriate temperatures, pressures, and flow rates.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70. Manifolds are labeled and placed in well-ventilated and accessible locations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
71. Cylinders are not cross-connected with plant air lines.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
72. Flash arrestors or reverse flow check valves are installed on all flammable gas cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
USAGE (6.7.6)				
73. Eye protection (safety glasses or goggles) is worn when using cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
74. Cylinder valve and regulator are inspected for foreign material before connecting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
75. If cylinders are frozen, warm (not boiling) water is used to thaw cylinders.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
76. Cylinder valve remains closed except when the cylinder is in use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
77. Fuel gas cylinder valves are not opened more than 1½ turns, for quick closing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
78. If a special wrench is used to open a cylinder valve, it is left in position on the valve.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 1 (continued)</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
USAGE (continued) (6.7.6)				
79. Acetylene cylinders are used in the vertical position.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
80. Acetylene cylinders are not used > 15 psig or > 30 psia.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
81. Copper pipe or fittings are not used with acetylene systems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
82. Compressed gas is not used to dust off clothing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
83. Cylinder valve closed and regulator relieved of internal pressure before regulators are removed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EXPLOSIVES (6.8)				
84. Written authorization provided by Munitions Market Segment Leader designating individuals who can store or use high explosives under the authority of the CH2M HILL BATF Type 33 User of High Explosives License/permit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
85. Written authorization provided by Munitions Market Segment Leader designating individuals who can manufacture high explosives under the authority of the CH2M HILL BATF Type 20 Manufacturer of High Explosives License/permit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
86. Approved Explosive Siting Plan (ESP).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
87. Approved Explosive Management Plan (EMP).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
88. Sources of ignition are not brought in or near storage magazines, or within 50' of an area where explosives are being handled, transported, or used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
89. Radio transmitting or receiving equipment is not brought within 1,000' of blasting activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
90. Transportation and storage of explosives comply with local, state, and federal regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
91. Vehicles transporting explosives are placarded and displayed according to DOT regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
92. Detonators or blasting caps are not stored with explosive charges.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
93. Explosives are stored in storage magazines as required by local, state, and federal regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
94. Contact the Munitions Response market Segment Leader for additional instructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PROCEDURES FOR HAZARDOUS MATERIALS SHIPPING (7.0)				
1. Only dangerous goods shippers are permitted to ship dangerous goods (CH2M HILL only).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Dangerous goods are shipped or transported in accordance with CH2M HILL's procedures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. All personnel shipping dangerous goods have completed the computer-based training (CH2M HILL only)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Dangerous goods are stored only in the equipment warehouse prior to shipping.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Written authorization provided by Munitions Market Segment Leader designating individuals who can "offer explosives for shipment" under the authority of the CH2M HILL Department of Transportation Hazardous Materials Certificate of Registration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SHIPPING BY AIR (7.1)				
5. Shipments for Federal Express meet IATA requirements for dangerous goods.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Before shipping, packages are clearly identified, packed, marked, labeled, and documented.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The quantity does not exceed IATA regulations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Packaging meets IATA requirements and withstand transport by air.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Shipper classifies each item into one of the 9 hazard classes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Inner packages are packed to prevent breaking or leaking during shipping.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Absorbent or cushioning material does not react with the contents of the inner package.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Outer packages in fiberboard, a plastic case, or other sturdy container.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Package is capable of withstanding 4' drop test with no damage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Package is marked with: proper shipping name of contents, technical name, UN number, total net. quantity, and the name and address of the shipper and recipient.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Irrelevant labels have been removed from package.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Hazard label and handling label are secured in correct locations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Dangerous goods airbill has been completed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. Dangerous goods are not shipped via UPS.

SECTION 1 (continued)

SHIPPING BY HIGHWAY (7.2)

19. Use Federal Express packaging and paperwork requirements that comply with DOT regs for ground transportation of dangerous goods.

20. Consult with local state highway police if route includes vehicular tunnels.

21. Inner packaging prevents breakage or leakage under normal conditions of transport.

22. Absorbent/cushioning material does not react with contents of the package.

23. Labels for highway transportation are the same as those for air transportation.

24. Engine turned off, brake set during loading and unloading.

Yes No N/A N/O

EMERGENCY RESPONSE (7.3)

25. Appropriate emergency response information available not on the package, within reach of driver.

26. Information includes copy of pages from *Emergency Response Guidebook* for each item.

27. An MSDS for each item must also be included.

28. Emergency response information must also include the information found on the shipping papers.

29. CH2M HILL's 24-hour EMERGENCY RESPONSE TELEPHONE NUMBER, (800) 255-3954, is included, as required.

30. In the event of an accident, keep other individuals, except response workers, from the vicinity.

31. In case of breakage, spillage, or leakage, use means to prevent spreading and contain the spill.

32. Care taken during the handling of cargo to minimize hazards.

33. MSDS is consulted for safe handling procedures.

34. Wash the area of the vehicle where the dangerous goods may have spilled.

35. Consult your supervisor in the event of a spill.

36. Ask your supervisor to call CHEM-TEL of the local HAZMAT unit if the spill poses a danger.

CH2MHILL

HSE Self-Assessment Checklist—Lifting

This checklist shall be used **only** by CH2M HILL personnel and shall be completed at the frequency specified in the project’s HSP/FSI.

This checklist is to be used at locations where: (1) CH2M HILL employees perform manual lifting activities (office or projects), and/or (2) CH2M HILL provides oversight of a subcontractor performing manual lifting activities. SC or Office Safety Coordinators/Committee members may consult with subcontractors (if applicable) when completing this checklist but shall not direct the means and methods of activities nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies, and we must carefully rely on their expertise. Conditions considered imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazardous area until corrected.

Complete the appropriate project or office information:

Project Information				
Project Name: _____		Project No.: _____		
Location: _____		PM: _____		
Auditor: _____		Title: _____		Date: _____
Office Information				
Office Location: _____		Date: _____		
Auditor: _____		Title: _____		Date: _____
This specific checklist has been completed to:				
<input type="checkbox"/> Evaluate CH2M HILL employee manual lifting activities. <input type="checkbox"/> Evaluate a CH2M HILL subcontractor’s manual lifting activities. Subcontractor Name: _____				
<ul style="list-style-type: none"> • Check “Yes” if an assessment item is complete/correct. • Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. • Check “N/A” if an item is not applicable. • Check “N/O” if an item is applicable but was not observed during the assessment. Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-112.				
Planning Activities				
	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
1. Efforts have been made to inquire about receiving equipment or supplies in containers weighting less than 50 pounds (23 kilograms).	o	o	o	o
2. Equipment or supplies are being delivered as close as possible to their use point.	o	o	o	o
3. Heavy equipment or supplies are being stored off the ground and no lower than knee height.	o	o	o	o
4. Adequate space has been provided to access and lift equipment or supplies without reaching or twisting.	o	o	o	o
Safe Work Practices (5.1)				
	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
5. Tasks or activities have been modified to reduce or minimize manual lifting.	o	o	o	o
6. All employees performing manual lifting have received training on how to lift safely.	o	o	o	o

7.	Manual lifting control measures are evaluated during assessments.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8.	Manual lifting incidents are reviewed as part of the HSE Program reviews.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.	Manual lifting incidents are reviewed as part of the HSE Program reviews.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Office Environments (5.1.1)		<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
10.	Employees have received lifting training.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11.	Mechanical devices are readily available to employees handling equipment or supplies weighing more than 40 pounds (18 kilograms).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Field Projects (5.1.2)		<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
12.	All manual lifting tasks or activities have been addressed in the written site safety plan.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.	Employees have received safe lifting training as required by the written site safety plan.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mechanical Lifting (5.2)		<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
14.	Hand trucks and trolleys are visually inspected before use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.	Hand trucks and trolleys do not have any broken or damaged parts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.	Hand truck and trolley paths are free of uneven surfaces, water, oil, or cracks and holes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17.	Loads carried by hand trucks are balanced and sturdy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18.	Hand trucks or dollies are being pushed when on level ground.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19.	When going up or down a slope using a hand truck or trolley, the load is downslope of the person.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20.	Employees using hand trucks or dollies are moving slowly and cautiously.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21.	Employees using hand trucks or trolleys are able to see over the load.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assisted Lifting (5.3)		<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
22.	Personnel are not performing manual lifting beyond their physical capabilities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23.	Loads are evenly distributed when being handled by multiple people.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manual Lifting (5.4)		<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
24.	Before the lift, the load and path was assessed.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25.	Loads being lifted are free of sharp edges, slivers, or wet or greasy spots.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26.	Gloves are used for manual lifts of loads with sharp or splintered edges.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27.	Employees performing manual lifts use the proper lifting techniques.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28.	Special tools fabricated for lifting grates or manhole covers are used.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

CH2MHILL

HS&E Self-Assessment Checklist: PPERSONAL PROTECTIVE EQUIPMENT

Page 1 of 3

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where CH2M HILL employees are required to wear PPE or are required to perform oversight of a subcontractor using PPE or both.

CH2M HILL staff shall not direct the means and methods of subcontractor use of PPE nor direct the details of corrective actions. The subcontractor must determine how to correct deficiencies and CH2M HILL staff must carefully rely on their expertise. Conditions considered to be imminently dangerous (possibility of serious injury or death) must be corrected immediately or all exposed personnel must be removed from the hazard until corrected.

Project Name: _____	Project No.: _____
Location: _____ PM: _____	
Auditor: _____ Title: _____ Date: _____	
This specific checklist has been completed to (check only one of the boxes below):	
<input type="checkbox"/> Evaluate CH2M HILL compliance with its PPE program (SOP HSE-117) <input type="checkbox"/> Evaluate a CH2M HILL subcontractor's compliance with its PPE program Subcontractor's Name: _____	
Check the appropriate box, as follows:	
<ul style="list-style-type: none"> • Check "Yes" if an assessment item is complete or correct. • Check "No" if an item is incomplete or deficient. Section 2 must be completed for all items checked "No." • Check "N/A" if an item is not applicable. • Check "N/O" if an item is applicable but was not observed during the assessment. 	
Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-121.	
SECTION 1	Yes No N/A N/O
GENERAL	
1. Required PPE listed in HSP FSI or AHA.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2. PPE available for use by employees.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3. PPE cleaning supplies available for use.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4. PPE stored appropriately to prevent deformation or distortion.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
5. PPE written certification has been completed.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
EYEWEAR (Glasses/Goggles/Face Shields)	
6. Eyewear cleaning supplies available.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
7. Safety glasses in good condition and lenses free of scratches.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
8. Goggles adjustment strap not cracked or frayed, not deformed, or lenses not scratched.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
9. Face shields in good condition, including adjustment band, and free of scratches or chips.	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

CH2MHILL

HS&E Self-Assessment Checklist: PERSONAL PROTECTIVE EQUIPMENT

SECTION 1 (Continued)	Yes	No	N/A	N/O
HEAD PROTECTION				
10. Hard hat bill and suspension attached as allowed by manufacturer.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Shell is pliable, free of dents, cracks, nicks, or any damage due to impact.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Suspension maintained at 1.25 inches from inside of shell.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Suspension free of cuts or fraying, torn headband, adjustment strap workable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Electrical hard hat matched to hazard classification.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Dated to determine whether within manufacturer's allowable 5-year use time period.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HAND PROTECTION				
16. Available in sizes matched to employee.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Gloves free of rips tears, abrasions, or holes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Matched to manufacturer's specification for chemicals used onsite.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Electrical gloves matched to hazard and periodically inspected for insulating rating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Maintained in a clean and sanitary condition, decontaminated or disposed properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BODY PROTECTION				
21. Available in sizes matched to employee.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Maintained in a clean and sanitary condition, decontaminated or disposed properly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Vapor-tight fully encapsulated suits tested at required periodic intervals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Flame-resistant clothing matched to electrical hazard and arc flash rating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Welding gear matched to degree of hazard and free of cuts, tears or burn holes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Flotation gear available for work near or on water and in good condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HOT AND COLD BODY PROTECTION				
27. Cooling gear available based on degree of heat stress hazard.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Cooling gear in operable, clean, and sanitary condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Cold-weather gear provided based on needs assessment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Cold-weather gear available in sizes to match employees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Cold-weather gear is in free of tears, rips, or holes and in maintained in a clean condition.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TRAINING				
32. Initial PPE training completed by employees.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Training conducted when new types or styles of PPE are issued.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. PPE selection, use, and maintenance reviewed at daily safety briefings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CH2MHILL

Respiratory Protection

Standard Operating Procedure HSEQ-121

H&S Self-Assessment Checklist: RESPIRATORY PROTECTION

This checklist is provided as a method of verifying compliance with the OSHA respiratory protection standard. It shall be used at locations where CH2M HILL personnel are using respiratory protection, or as a tool to assess subcontractors when CH2M HILL is required to perform oversight of a subcontractor using respiratory protection.

CH2M HILL staff shall not direct the means and methods of subcontractor use of respiratory protection nor direct the details of corrective actions. The subcontractor must determine how to correct deficiencies and CH2M HILL staff must carefully rely on their expertise. Items considered to be imminently dangerous (i.e., possibility of serious injury or death) must be corrected immediately or all exposed personnel must be removed from the hazard until corrected.

Completed checklists must be sent to the Responsible Health and Safety Manager (RHSM) for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to (check only one of the boxes below):

- Evaluate CH2M HILL compliance with its respiratory protection program (SOP HSEQ-121)
- Evaluate a CH2M HILL subcontractor's respiratory protection program
Subcontractor's Name: _____

Check the appropriate box, as follows:

- Check "Yes" if an assessment item is complete or correct.
- Check "No" if an item is incomplete or deficient. Section 2 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-121.

SECTION 1

Yes No N/A N/O

TRAINING (6.0)

- | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. Respirator users have completed appropriate training on the respirator to be used. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Training is current within the past 12 months. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Attachment 1 of SOP HSE-121 distributed to employees using respirators voluntarily. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

MEDICAL EVALUATION (5.2)

- | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 4. Respirator users completed medical evaluation protocol. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Respirator use does not exceed any physician's written recommendation limitations. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Respirator users know to report any medical signs or symptoms related to respirator use. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

FIT TESTING (5.3)

- | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 7. Respirator users of tight-fitting facepieces have passed a fit test. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Fit test is current within the past 12 months. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Respirator users know to have new fit test performed if any change affects respirator fit. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

SECTION 1 (Continued)	Yes	No	N/A	N/O
RESPIRATOR SELECTION (5.4)				
10. All feasible engineering controls have been considered in reducing exposure levels.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Appropriate respiratory protection and limitations are specified in HSP/FSI.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Cartridge or canister change-out schedule is specified in HSP/FSI.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RESPIRATOR USE (5.5)				
13. Respirator uses are limited to those specified in HSP/FSI.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. HSM notified of changes in site conditions that may alter effectiveness of specified respirators.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Respirator users of tight-fitting facepieces are cleanly shaven.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Respirator users of tight-fitting facepieces perform user seal check before each use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Cartridges or canisters replaced according to change-out schedule in HSP/FSI.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Respirator users informed to report any gas or vapor breakthrough to SSC/RHSM.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. SC reports any gas or vapor breakthrough to RHSM.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Personnel not entering IDLH areas until standby-person established with appropriate equipment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RESPIRATOR INSPECTION (5.6)				
21. Respirators in regular use are inspected before each use and during cleaning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Emergency response respirators are inspected and documented monthly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Defective respirators are taken out of service or repaired.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RESPIRATOR CLEANING AND DISINFECTING (5.7)				
23. Respirators in regular use are cleaned and disinfected as necessary.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Emergency and transferred respirators are cleaned and disinfected after use.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RESPIRATOR STORAGE (5.8)				
25. Respirators are properly stored to prevent contamination and deformation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Emergency respirators are accessible and clearly marked as emergency respirators.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RESPIRATOR REPAIRS (5.9)				
27. Respirator repair is limited to routine maintenance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Respirators beyond routine repair are removed from service.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BREATHING AIR SUPPLIED BY CYLINDER (5.10.1)				
29. Cylinders are marked with NIOSH-approval label.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Certificate of analysis meets Grade D specifications.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Certificate of analysis is kept onsite.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BREATHING AIR SUPPLIED BY COMPRESSOR (5.10.2)				
32. Breathing air meets Grade D specifications.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Compressor intake is located away from exhaust gases.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Compressor is provided with sorbent filters.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Sorbent filter change-out documentation is kept on the compressor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. High-temperature or carbon monoxide alarm provided on oil-lubricated compressors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. If high-temperature alarm is used alone, carbon monoxide levels are monitored.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Practical measures taken to control carbon monoxide levels on non oil-lubricated compressors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CH2MHILL

HS&E Self-Assessment Checklist— RIGGING

This checklist shall be used by CH2M HILLCH2M HILL personnel **only** and shall be completed at the frequency specified in the project’s HSP/FSI.

This checklist is to be used at locations where: (1) CH2M HILLCH2M HILL employees are exposed to rigging hazards (complete Section 1) and/or (2) CH2M HILLCH2M HILL provides oversight of subcontractor personnel who are exposed to hoist hazards (complete entire checklist).

SC may consult with subcontractors when completing this checklist, but shall not direct the means and methods of crane, hoist and rigging operations nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Project Name: _____ Project No.: _____
 Location: _____ PM: _____
 Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

Evaluate CH2M HILLCH2M HILL employee exposure to crane, hoist and rigging hazards
 Evaluate a CH2M HILLCH2M HILL subcontractor’s compliance with crane, hoist and rigging requirements
 Subcontractors Name: _____

- Check “Yes” if an assessment item is complete/correct.
 - Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked “No.”
 - Check “N/A” if an item is not applicable.
 - Check “N/O” if an item is applicable but was not observed during the assessment.
- Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-303.

SECTION 1

	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
SAFE WORK PRACTICES (5.1)				
1. All rigging used as intended, inspected, stored, protected and supervised.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. No fabrication, modifications, or additions to rigging made without testing and approval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 2

	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
RIGGING: GENERAL (5.2.1)				
3. The rigging equipment is not used in excess of the rated capacity of the weakest component	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The rigging competent person has inspected all rigging equipment prior to use on each shift and as necessary during its use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Documentation of proof testing is available for rigging equipment that has been repaired	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Rigging equipment has not been shortened with knots, bolts or other makeshift devices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Rigging equipment, when not in use, is removed from the work area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Rigging equipment has been load tested annually by a competent person and documented	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. All hooks used according to manufacturer’s recommendations or tested to twice SWL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Special rigging and hoisting devices are marked and proof- tested prior to initial use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

RIGGING: EQUIPMENT (5.2.2)

- | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 11. Protruding end strands of wire rope have been covered or blunted | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. Wire rope not used if the rope shows any sign of excessive wear, corrosion, or defect | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. No wire rope slings is are used if more than one wire in a lay is broken in the end fitting | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. Splices in rope slings are made in accordance with manufacturer's and regulatory specs | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. Synthetic web slings removed from service if showing any sign of damage | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. No job hooks, links, or makeshift fasteners, formed from bolts, rods, etc., are used | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. Alloy steel chains have identification stating size, grade, rated capacity and reach | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. Manual coupling links or low carbon repair links not used to repair broken lengths of chain | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. Shackles and hooks are constructed of forged alloy steel with the identifiable load rating | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

RIGGING: USE (5.2.3)

- | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| 20. Rigging not pulled from under a resting load | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21. Sling(s) is placed in center bowl of hook. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 22. Sharp edges are "packed" to prevent cutting or damaging the rope or slings | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23. Nylon, polyester, polypropylene web slings or web slings with aluminum fittings will not be used where fumes, vapors, sprays, mists or liquids of acids, caustics or phenolics are present | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 24. Natural or synthetic fiber rope slings used within acceptable operating temperature | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 25. U-bolts used to form wire rope eyes are of proper amount and spacing | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 26. U-bolts are installed so that the "U" section is in contact with the dead end of the rope | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 27. When more than one sling is used, or the sling angle is altered, the load has been calculated to assure that the safe working load is not exceeded. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project’s HSP/FSI.

This checklist is to be used at locations where: (1) CH2M HILL employees are using stairways and ladders and/or (2) CH2M HILL provides oversight of subcontractor personnel who are using stairways and ladders.

SC may consult with subcontractors when completing this checklist, but shall not direct the means and methods of stairway and ladder use nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the HS&E Staff for review.

Project Name: _____ Project No.: _____
 Location: _____ PM: _____
 Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

Evaluate CH2M HILL employee use of stairways and ladders
 Evaluate a CH2M HILL subcontractor’s compliance with stairway and ladder requirements
 Subcontractors Name: _____

- Check “Yes” if an assessment item is complete/correct.
 - Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked “No.”
 - Check “N/A” if an item is not applicable.
 - Check “N/O” if an item is applicable but was not observed during the assessment.
- Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-214.

<u>SECTION 1</u>		<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
PERSONNEL SAFE WORK PRACTICES (3.1)					
1.	CH2M HILL employees have completed stairway and ladder training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Carrying objects on stairs with both hands is avoided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Pan and skeleton metal stairs not used until permanent or temporary treads/landings provided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	Ladders periodically inspected for defects by competent person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Defective ladders tagged and removed from service until repaired	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Ladders used only for purpose for which they were designed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	Ladders not loaded beyond their rated capacity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	Only one person simultaneously climbing or working from an individual ladder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	Personnel face ladder when climbing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	Personnel climbing ladders maintain 3 points of contact with ladder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	Personnel not carrying tools, materials, or equipment while climbing. Tag lines used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	Ladders not moved, shifted or extended while in use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	Stepladders used in open and locked position only	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	Stepladders top and top step not used as a step	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	Stepladders cross-bracing not used for climbing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16.	Fall protection considered when working from ladders over 6’	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 2</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
STAIRWAYS AND LADDERS: GENERAL (3.2.1)				
17. Stairways or ladders provided at breaks in elevation \geq 19 inches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. At least one clear access point provided to elevated levels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STAIRWAY: DESIGN AND CONSTRUCTION (3.2.2)				
19. Stairways maintained free of slippery conditions and dangerous projections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Stairways installed between 30 - 50 degrees with uniform risers and treads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Landings (30" deep x 22" wide) provided every 12' of vertical rise.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Landings extend \geq 20" beyond swing of any doors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Adequate stair rails installed at each unprotected side or edge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Handrails installed as handhold for support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Mid-rails, screens, mesh, or intermediate members installed between top rail and treads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Adequate guardrails installed at each unprotected side or edge of a landing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LADDERS: GENERAL (3.2.3)				
27. Ladder components surfaced to prevent injury from puncture, laceration, or snagging clothing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Ladders maintained free of oil, grease, and other slipping hazards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. The area around the top and bottom of ladders kept free of obstructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PORTABLE LADDERS: DESIGN AND CONSTRUCTION (3.2.4)				
30. Only ANSI approved portable ladders used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Rungs and steps are parallel, level, and uniformly spaced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Ladders not tied or fastened together to create longer sections unless designed for such use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Ladders with non-conductive side rails used near energized electrical equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Extension ladders equipped with positive section stops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Stepladders provided with metal spreader or locking device to hold open when in use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Wood ladders not coated with opaque covering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Double-cleated or two ladders provided if > 25 personnel use ladders as only means of access, or when ladder serves simultaneous two-way traffic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Two or more ladders used to reach elevated work areas offset with platform or landing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PORTABLE LADDER: POSITIONING (3.2.5)				
39. Ladders used only on stable, level, surfaces unless secured to prevent movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Ladders placed in areas where they can be displaced by work activities, secured or barricaded	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Extension ladder section overlap adequate distance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Extension and straight ladders placed with both side rails supported equally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Extension and straight ladders positioned at approximately 75 degree angle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Ladders extend 3' above upper landings or are secured at top	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FIXED LADDERS: DESIGN AND CONSTRUCTION (3.2.6)				
45. Adequate clearances from obstructions maintained behind, in front, and to side of ladder rungs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Ladder step across distance at access point 7-12"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Side rails extend 42" above landing platform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Cages, wells, ladder safety devices, or self-retracting lifelines used for ladders > 24'	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Ladder safety devices operate without the use of hands	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. Ladder safety devices activate within 2' after a fall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Connection between lifeline and harness attachment point \leq 9"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project’s HSP/FSI.

This checklist is to be used at locations where: (1) CH2M HILL employees are exposed to traffic hazards and/or (2) CH2M HILL provides oversight of subcontractor personnel who are exposed to traffic hazards.

SC may consult with subcontractors when completing this checklist, but shall not direct the means and methods of traffic control operations nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies, and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the HS&E Staff for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

Evaluate CH2M HILL employee exposure to traffic hazards.

Evaluate a CH2M HILL subcontractor’s compliance with traffic control requirements.

Subcontractors Name: _____

- Check “Yes” if an assessment item is complete/correct.
 - Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked “No.”
 - Check “N/A” if an item is not applicable.
 - Check “N/O” if an item is applicable but was not observed during the assessment.
- Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HSE-216.

<u>SECTION 1</u>		<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
SAFE WORK PRACTICES (3.1)					
1.	Personnel working on/adjacent to active roadways or in control zones are wearing safety vests.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Traffic control plan (TCP) is consistent with roadway, traffic, and working conditions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	TCP has been approved by regulatory or contractual authority prior to work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	TCP considers all factors that may influence traffic related hazards and controls.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Work areas are protected by rigid barriers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	Lookouts are used when applicable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	Vehicles are parked 40 feet away from work zone or are equipped with hazard beacon/strobe.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	TMCC or TMA vehicle is used where appropriate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	All CH2M HILL traffic control devices conform to MUTCD standards.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	Traffic control devices are inspected continuously.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	Flagging is only used when other means of traffic control are inadequate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	Additional traffic control zone controls have been implemented.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	Cranes do not swing loads/booms over nor do workers enter/cross live roadways (as defined).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 2</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
GENERAL (3.2.1)				
14. Lane closings are performed when required by this SOP.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Traffic control configurations are based on an engineering study of the location.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. If no study, traffic control is performed with approval of the authority having jurisdiction.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. TCP has been prepared and understood by all responsible parties prior to work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Special preparation/coordination with external parties has been conducted where applicable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. All contractor traffic control devices conform to MUTCD standards.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Traffic movement and flow are inhibited or disrupted as little as possible.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Supplemental equipment and activities do not interfere with traffic.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Drivers and pedestrians are considered when entering and traversing traffic control zone.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TRAFFIC CONTROL ZONES (3.2.2)				
23. Traffic control zones are divided into the necessary five areas.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Advances warning area is designed based on conditions of speed, roadways, and driver needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Advanced warning signage is spaced according to roadway type and conditions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Transition areas are used to channelize traffic around the work area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Buffer areas are used to provide a margin of safety for traffic and workers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. The buffer area is free of equipment, workers, materials, and worker vehicles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. The length of the buffer area is two times the posted speed limit in feet.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. All work is contained in the work area and is closed to all traffic.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. A termination area is used to provide traffic to return to normal lanes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. A downstream taper is installed in the termination area.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DEVICE INSTALLATION AND REMOVAL (3.2.3)				
33. All vehicles involved with device installation/removal have hazard beacons/strobes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Devices are installed according to the order established by this SOP.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Devices are removed in the opposite order of installation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Tapers are used to move traffic out of its normal path.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Tapers are created using channelizing devices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. The length of taper is determined by posted speed and width of lane to be closed (see formula).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Local police or highway patrol assist during taper installation and removal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. TMCC/ TMA vehicles are used to protect personnel during installation and removal of devices.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Cone trucks are equipped with platforms and railings.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Cones are the appropriate height for the specific roadway and are reflectorized.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Temporary sign supports are secured using sandbags to prevent movement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Arrow panels are used on lane closures where required.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Concrete barriers are used where required.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Barrels, crash cushions, or energy absorbing terminals are used to protect traffic as required.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Changeable message signs (CMS) are used as required.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. CMS are not used to replace required signage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. No more than two message panels are used in any message cycle on CMS.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FLAGGING (3.2.4)				
50. Flagging is used only when other traffic control methods are inadequate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Only approved personnel with current certification are allowed to be used as flaggers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Flaggers are located off the traveled portion of the roadway.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. A communication system is established when more than one flagger is used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. Hand signaling by flaggers is by means of red flags, sign paddles, or red lights.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Flaggers are alert, positioned close enough to warn work crews, and easily identified from crew.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. An escape plan is established by crew and flaggers prior to traffic control set up.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. Signs indicating a flagger is present are used and removed as required.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 2</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
INSPECTION AND MAINTENANCE (3.2.5)				
58. Traffic control zones are monitored to determine their effectiveness under varying conditions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Traffic control devices are inspected at the beginning and continuously during work shift.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. Traffic control devices are restored to their proper position immediately and continuously.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61. Damaged, old, or ineffective devices are removed and replaced immediately and continuously.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62. Devices using reflected light for illumination are cleaned and monitored continuously.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CH2M HILL Health and Safety Plan

Attachment 5

Key Target Zero Program Elements

(blank forms for field use)

Activity Hazard Analysis

Pre-Task Safety Plans

Safe Behavior Observation

Incident Report and Investigation

(use electronic form when possible)

[HITS](#)

Lessons Learned Template

ACTIVITY HAZARD ANALYSIS

Activity:	Date:
Description of the work:	Project Name:
	Site Supervisor:
	Site Safety Officer:
	Review for latest use: Before the job is performed

Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	Potential Health and Safety Hazards (Analyze each principal step for potential hazards)	Hazard Controls (Develop specific controls for each potential hazard)

ACTIVITY HAZARD ANALYSIS

Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	Potential Health and Safety Hazards (Analyze each principal step for potential hazards)	Hazard Controls (Develop specific controls for each potential hazard)

Equipment to be used (List equipment to be used in the work activity)	Inspection Requirements (List inspection requirements for the work activity)	Training Requirements (List training requirements including hazard communication)

ACTIVITY HAZARD ANALYSIS

PRINT NAME

SIGNATURE

Supervisor Name: _____

Date/Time: _____

Safety Officer Name: _____

Date/Time: _____

Employee Name(s): _____

Date/Time: _____

CH2MHILL

Pre-Task Safety Plan (PTSP) and Safety Meeting Sign-in Sheet

Project: _____ Location: _____ Date: _____		
Supervisor: _____ Job Activity: _____		
Attendees:	Print Name	Sign Name
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
List Tasks and verify that applicable AHAs have been reviewed:		

Tools/Equipment Required for Tasks (ladders, scaffolds, fall protection, cranes/rigging, heavy equipment, power tools):		

Potential H&S Hazards, including chemical, physical, safety, biological and environmental (check all that apply):		
<input type="checkbox"/> Chemical burns/contact	<input type="checkbox"/> Trench, excavations, cave-ins	<input type="checkbox"/> Ergonomics
<input type="checkbox"/> Pressurized lines/equipment	<input type="checkbox"/> Overexertion	<input type="checkbox"/> Chemical splash
<input type="checkbox"/> Thermal burns	<input type="checkbox"/> Pinch points	<input type="checkbox"/> Poisonous plants/insects
<input type="checkbox"/> Electrical	<input type="checkbox"/> Cuts/abrasions	<input type="checkbox"/> Eye hazards/flying projectile
<input type="checkbox"/> Weather conditions	<input type="checkbox"/> Spills	<input type="checkbox"/> Inhalation hazard
<input type="checkbox"/> Heights/fall > 6 feet	<input type="checkbox"/> Overhead Electrical hazards	<input type="checkbox"/> Heat/cold stress
<input type="checkbox"/> Noise	<input type="checkbox"/> Elevated loads	<input type="checkbox"/> Water/drowning hazard
<input type="checkbox"/> Explosion/fire	<input type="checkbox"/> Slips, trip and falls	<input type="checkbox"/> Heavy equipment
<input type="checkbox"/> Radiation	<input type="checkbox"/> Manual lifting	<input type="checkbox"/> Aerial lifts/platforms
<input type="checkbox"/> Confined space entry	<input type="checkbox"/> Welding/cutting	<input type="checkbox"/> Demolition
<input type="checkbox"/> Underground Utilities	<input type="checkbox"/> Security	<input type="checkbox"/> Poor communications
Other Potential Hazards (Describe):		

Hazard Control Measures (Check All That Apply):			
PPE <input type="checkbox"/> Thermal/lined <input type="checkbox"/> Eye <input type="checkbox"/> Dermal/hand <input type="checkbox"/> Hearing <input type="checkbox"/> Respiratory <input type="checkbox"/> Reflective vests <input type="checkbox"/> Flotation device <input type="checkbox"/> Hard Hat	Protective Systems <input type="checkbox"/> Sloping <input type="checkbox"/> Shoring <input type="checkbox"/> Trench box <input type="checkbox"/> Barricades <input type="checkbox"/> Competent person <input type="checkbox"/> Locate buried utilities <input type="checkbox"/> Daily inspections <input type="checkbox"/> Entry Permits/notification	Fire Protection <input type="checkbox"/> Fire extinguishers <input type="checkbox"/> Fire watch <input type="checkbox"/> Non-spark tools <input type="checkbox"/> Grounding/bonding <input type="checkbox"/> Intrinsically safe equipment	Electrical <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Grounded <input type="checkbox"/> Panels covered <input type="checkbox"/> GFCI/extension cords <input type="checkbox"/> Power tools/cord inspected <input type="checkbox"/> Overhead line clearance <input type="checkbox"/> Underground utils ID'd
Fall Protection <input type="checkbox"/> Harness/lanyards <input type="checkbox"/> Adequate anchorage <input type="checkbox"/> Guardrail system <input type="checkbox"/> Covered opening <input type="checkbox"/> Fixed barricades <input type="checkbox"/> Warning system	Air Monitoring <input type="checkbox"/> PID/FID <input type="checkbox"/> Detector tubes <input type="checkbox"/> Radiation <input type="checkbox"/> Personnel sampling <input type="checkbox"/> LEL/O2 <input type="checkbox"/> No visible dust <input type="checkbox"/> Other	Proper Equipment <input type="checkbox"/> Aerial lift/ladders/scaffolds <input type="checkbox"/> Forklift/heavy equipment <input type="checkbox"/> Backup alarms <input type="checkbox"/> Hand/power tools <input type="checkbox"/> Crane with current inspection <input type="checkbox"/> Proper rigging <input type="checkbox"/> Operator qualified	Welding & Cutting <input type="checkbox"/> Cylinders secured/capped <input type="checkbox"/> Cylinders separated/upright <input type="checkbox"/> Flash-back arrestors <input type="checkbox"/> No cylinders in CSE <input type="checkbox"/> Flame retardant clothing <input type="checkbox"/> Appropriate goggles
Confined Space Entry <input type="checkbox"/> Isolation <input type="checkbox"/> Air monitoring <input type="checkbox"/> Trained personnel <input type="checkbox"/> Permit completed <input type="checkbox"/> Rescue	Medical/ER <input type="checkbox"/> First-aid kit <input type="checkbox"/> Eye wash <input type="checkbox"/> FA-CPR trained personnel <input type="checkbox"/> Route to hospital	Heat/Cold Stress <input type="checkbox"/> Work/rest regime <input type="checkbox"/> Rest area <input type="checkbox"/> Liquids available <input type="checkbox"/> Monitoring <input type="checkbox"/> Training	Vehicle/Traffic <input type="checkbox"/> Traffic control <input type="checkbox"/> Barricades <input type="checkbox"/> Flags <input type="checkbox"/> Signs
Permits <input type="checkbox"/> Hot work <input type="checkbox"/> Confined space <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Excavation <input type="checkbox"/> Demolition <input type="checkbox"/> Energized work	Demolition <input type="checkbox"/> Pre-demolition survey <input type="checkbox"/> Structure condition <input type="checkbox"/> Isolate area/utilities <input type="checkbox"/> Competent person <input type="checkbox"/> Hazmat present	Inspections: <input type="checkbox"/> Ladders/aerial lifts <input type="checkbox"/> Lanyards/harness <input type="checkbox"/> Scaffolds <input type="checkbox"/> Heavy equipment <input type="checkbox"/> Drill rigs/geoprobe rigs <input type="checkbox"/> Cranes and rigging <input type="checkbox"/> Utilities marked	Training: <input type="checkbox"/> Hazwaste (current) <input type="checkbox"/> Construction <input type="checkbox"/> Competent person <input type="checkbox"/> Task-specific <input type="checkbox"/> FA/CPR <input type="checkbox"/> Confined Space <input type="checkbox"/> Hazcom
Underground Utilities <input type="checkbox"/> Dig alert called <input type="checkbox"/> 3 rd Party locator <input type="checkbox"/> As-builts reviewed <input type="checkbox"/> Interview site staff <input type="checkbox"/> Client review <input type="checkbox"/> soft locate necessary?	Incident Communications <input type="checkbox"/> Work stops until cleared by TM/CM <input type="checkbox"/> Immediate calls to TM/CM <input type="checkbox"/> Client notification <input type="checkbox"/> 24 hour notification setup <input type="checkbox"/> Clear communications	AHA' s <input type="checkbox"/> reviewed and approved by HSM <input type="checkbox"/> on site and current <input type="checkbox"/> applicable for this day's work <input type="checkbox"/> Communication and incident processes included?	
Field Notes (including observations from prior day, etc.): <hr/> <hr/> <hr/>			

Name (Print): _____

Signature: _____

Date: _____

Safe Behavior Observation Form			
<input type="checkbox"/> Federal or <input type="checkbox"/> Commercial Sector (check one)		<input type="checkbox"/> Construction or <input type="checkbox"/> Consulting (check one)	
Project Number:		Client/Program:	
Project Name:		Observer:	Date:
Position/Title of worker observed:		Background Information/ comments:	
Task/Observation Observed: _____			
<ul style="list-style-type: none"> ❖ Identify and reinforce safe work practices/behaviors ❖ Identify and improve on at-risk practices/acts ❖ Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards ❖ Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?) ❖ Positive, corrective, cooperative, collaborative feedback/recommendations 			
Actions & Behaviors	Safe	At-Risk	Observations/Comments
Current & accurate Pre-Task Planning/Briefing (Project safety plan, STAC, AHA, PTSP, tailgate briefing, etc., as needed)			Positive Observations/Safe Work Practices:
Properly trained/qualified/experienced			
Tools/equipment available and adequate			
Proper use of tools			Questionable Activity/Unsafe Condition Observed:
Barricades/work zone control			
Housekeeping			
Communication			
Work Approach/Habits			
Attitude			
Focus/attentiveness			Observer's Corrective Actions/Comments:
Pace			
Uncomfortable/unsafe position			
Inconvenient/unsafe location			
Position/Line of fire			Observed Worker's Corrective Actions/Comments:
Apparel (hair, loose clothing, jewelry)			
Repetitive motion			
Other...			

For ES Federal Sector projects please email completed forms to: [CH2M HILL ES FED Safe Behavior Observation](#)
 For ES Commercial Sector projects please email completed forms to: [CH2M HILL ES COM Safe Behavior Observation](#)
 For CNR ES staff please email completed forms to: cnressafe@ch2m.com

HITS Incident Report Hardcopy (Phase 1 – Initial Entry)

Phase 1 – Initial Entry

Type of Incident (May select more than one)

- | | | |
|--|---|------------------------------------|
| <input type="checkbox"/> Injury/Illness | <input type="checkbox"/> Spill/Release | <input type="checkbox"/> Near Miss |
| <input type="checkbox"/> Property Damage | <input type="checkbox"/> Environment/Permit | <input type="checkbox"/> Other |

General Information Section

Preparer's Name: _____ Preparer's Phone Number: _____

Date of Incident: _____ Time of Incident: _____ AM / PM

What Business Group is accountable for this incident: _____

What Business Group SubGroup is accountable for this incident: _____

What CH2M HILL Company is accountable for this incident: _____

Where did the Incident occur?

- United States, Geographic Region: _____
- Canada, Province/Territory: _____
- International, County: _____

Location of Incident?

- Company Premises, CH2M HILL Office (use 3 letter office code if available): _____
- Project, Project name: _____
- In Transit
Traveling from: _____
Traveling to: _____
- At Home
- Other, Specify: _____

Describe the incident: _____

Describe how this event could have been prevented: _____

Provide Witness Information:

Name: _____	Phone: _____
Name: _____	Phone: _____
Name: _____	Phone: _____

Personnel Notified of Incident (Provide name, date and time):

CH2M HILL Personnel: _____

Client Personnel: _____

Additional Comments:

Injury/Illness Section [Complete only if Injury/Illness Incident type selected]

Who was injured?

- CH2M HILL Employee or CH2M HILL Temp Employee
- Subcontractor to CH2M HILL (Non-LLC Joint Venture Project)
- LLC Joint Venture Partner Employee
- LLC Joint Venture Project Subcontractor/Contractor
- Other

Name of Injured: _____ Job Title: _____

Employer Name: _____ Supervisor of Employee: _____

Complete for CH2M HILL Employee Injuries

Business Group of Injured Employee: _____

Has the employee called the Injury Management Administrator (1-800-756-1130)?

Yes No Not Sure

Has the injured employee's supervisor been notified of this incident?

Yes No Not Sure

Complete for Non-CH2M HILL Employee Injuries

Has the project safety coordinator been notified of this incident?

Yes No Not Sure

Project Safety Coordinator: _____

Body Part Affected: _____

Injury/Illness (Result): _____

Describe treatment provided (if medication provided, identify whether over-the-counter or prescription): _____

Describe any work restriction prescribed (include dates and number of days): _____

Physician/Health Care Provider Information

Name: _____ Phone: _____

Was treatment provided away from the worksite?

No
 Yes

Facility Name: _____

Address: _____

City: _____ Phone Number: _____

Was injured treated in an emergency room?

No Yes

Was injured hospitalized overnight as an in-patient?

No Yes

General Information Environmental Section [Complete only if Environment/Permit or Spill/Release Incident type selected]

Who had control of the area during the incident?

- CH2M HILL, Company: _____
 - Subcontractor, Company: _____
 - Joint Venture Partner/Contractor/Subcontractor, Company: _____
 - Other, Company: _____
- Relationship to CH2M HILL: _____

Property Damage Section [Complete only if Property Damage Incident type selected]

Property Damaged: _____

Property Owner: _____

Damage Description: _____

Estimated US Dollar Amount: _____

Spill or Release Section [Complete only if Spill/Release Incident type selected]

Substance: _____

Estimated Quantity: _____

Did the spill/release move off the property?: _____

Spill/Release From: _____

Spill/Release To: _____

Environment/Permit Section [Complete only if Environment/Permit Incident type selected]

Describe Environmental or Permit Issue: _____

Permit Type: _____

Permitted Level or Criteria (e.g., discharge limit): _____

Permit Name and Number (e.g., NPDES No. ST1234): _____

Substance and Estimated Quantity: _____

Duration of Permit Exceedence: _____



Lessons Learned

[Date] ESBG LL-11-xx

Subject	[Insert Descriptive Name of Lessons Learned]
CH2M HILL Project?	[Yes or No]
Situation	[Describe incident or situation that occurred in general terms. Try to be brief and avoid unnecessary details such as names of people or projects, business groups, divisions, dates, location, etc.]
Lessons Learned (Recommendations and Comments)	<ul style="list-style-type: none">• Bullet out any lessons learned, recommendations or other important “take away” information that would benefit others. Tie the recommendations to the incident or event, and avoid including information that is not directly tied to the event.
Submitted By	[Name/Office Location/Phone]
Additional Information Contact	[Name/Office Location/Phone]
Keywords/Categories	[Insert any keywords or incident categories that would aid in a search for this lessons learned]

Send completed Lessons Learned to the ESBG HSSE Director for posting and distribution. Please include a recommended distribution list.

CH2M HILL Health and Safety Plan
Attachment 6

Fact Sheets
Tick Fact Sheet
Vehicle Accident Guidance
Working Alone

Tick-Borne Pathogens — A Fact Sheet

Most of us have heard of Lyme disease or Rocky Mountain Spotted Fever (RMSF), but there are actually six notifiable tick-borne pathogens that present a significant field hazard. In some areas, these account for more than half of our serious field incidents. The following procedures should be applied during any field activity—even in places that are predominantly paved with bordering vegetation.

Hazard Recognition

An important step in controlling tick related hazards is understanding how to identify ticks, their habitats, their geographical locations, and signs and symptoms of tick-borne illnesses.

Tick Identification

There are five varieties of hard-bodied ticks that have been associated with tick-borne pathogens. These include:

- Deer (Black Legged) Tick (eastern and pacific varieties)
- Lone Star Tick
- Dog Tick
- Rocky Mountain Wood Tick

These varieties and their geographical locations are illustrated on the following page.

Tick Habitat

In eastern states, ticks are associated with deciduous forest and habitat containing leaf litter. Leaf litter provides a moist cover from wind, snow, and other elements. In the north-central states, is generally found in heavily wooded areas often surrounded by broad tracts of land cleared for agriculture.

On the Pacific Coast, the bacteria are transmitted to humans by the western black-legged (deer) tick and habitats are more diverse. For this region, ticks have been found in habitats with forest, north coastal scrub, high brush, and open grasslands. Coastal tick populations thrive in areas of high rainfall, but ticks are also found at inland locations.

Illnesses and Signs & Symptoms

There are six notifiable tick-borne pathogens that cause human illness in the United States. These pathogens may be transmitted during a tick bite—normally hours after attachment. The illnesses, presented in approximate order of most common to least, include:

- Lyme (bacteria)
- RMSF (bacteria)
- Ehrlichiosis (bacteria)
- STARI (Southern Tick-Associated Rash Illness) (bacteria)
- Tularemia (Rabbit Fever) (bacteria)
- Babesia (protozoan parasite)

Symptoms will vary based on the illness, and may develop in infected individuals typically between 3 and 30 days after transmission. Some infected individuals will not become ill or may develop only mild symptoms. These illnesses present with some or all of the following signs & symptoms: fever, headache, muscle aches, stiff neck, joint aches, nausea, vomiting, abdominal pain, diarrhea, malaise, weakness, small solid, ring-like, or spotted rashes. The bite site may be red, swollen, or develop ulceration or lesions. For Lyme disease, the bite area will sometimes resemble a target pattern. A variety of long-term symptoms may result if the illness is left untreated, including debilitating effects and death.



Deer Tick



Distribution of Deer Tick (dark green)



From Left: adult female, adult male, nymph, and larvae Deer Tick (cm scale)



Distribution of Pacific Deer Tick (dark green)



Lone Star Tick



Distribution of Lone Star Tick (Green)



Dog Tick



Yellow indicates approximate distribution area



Rocky Mountain Wood Tick



Yellow indicates approximate distribution area

Hazard Control

The methods for controlling exposure to ticks include, in order of most- to least-preferred:

- Avoiding tick habitats and ceasing operations in heavily infested areas
- Reducing tick abundance through habitat disruption or application of acaricide
- Personal protection through use of repellants and protective clothing
- Frequent tick inspections and proper hygiene

Vaccinations are not available and preventative antibiotic treatment after a bite is generally not recommended.

Avoidance and Reduction of Ticks

To the extent practical, tick habitats should be avoided. In areas with significant tick infestation, consider stopping work and withdrawing from area until adequate tick population control can be achieved. Stopping and withdrawing should be considered as seriously as entering an area without proper energy control or with elevated airborne contaminants—tick-borne pathogens present risk of serious illness!

In areas where significant population density or infestation exists, tick reduction should be considered. Tick reduction can be achieved by disrupting tick habitats and/or direct population reduction through the use of tick-toxic pesticides (Damminix, Dursban, Sevin, etc.).

Habitat disruption may include only simple vegetative maintenance such as removing leaf litter and trimming grass and brush. Tick populations can be reduced by between 72 and 100 percent when leaf litter alone is removed. In more heavily infested areas, habitat disruption may include grubbing, tree trimming or removal, and pesticide application (Damminix, Dursban, Sevin, etc.). This approach is practical in smaller, localized areas or perimeter areas that require occasional access. Habitat controls are to be implemented with appropriate health and safety controls, in compliance with applicable environmental requirements, and may be best left to the property owner or tenant or to a licensed pesticide vendor. Caution should be exercised when using chemical repellents or pesticides in or around areas where environmental or industrial media samples will be collected for analysis.

Personal Protection

After other prevention and controls are implemented, personal protection is still necessary to control exposure to ticks. Personal protection must include all of the following steps:

- So that ticks may be easily seen, wear light-colored clothing. Full-body New Tyvek (paper-like disposable coveralls) may also be used
- To prevent ticks from getting underneath clothing tuck pant legs into socks or tape to boots
- Wear long-sleeved shirts, a hat, and high boots
- Apply DEET repellent to exposed skin or clothing per product label
- Apply permethrin repellent to the outside of boots and clothing before wearing, per product label
- Frequently check for ticks and remove from clothing
- At the end of the day, search your entire body for ticks (particularly groin, armpits, neck, and head) and shower

- To prevent pathogen transmission through mucous membranes or broken/cut skin, wash or disinfect hands and/or wear surgical-style nitrile gloves any time ticks are handled

Pregnant individuals and individuals using prescription medications should consult with their physician and/or pharmacists before using chemical repellents. Because human health effects may not be fully known, use of chemical repellents should be kept to a minimum frequency and quantity. Always follow manufacturers' use instructions and precautions. Wash hands after handling, applying, or removing protective gear and clothing. Avoid situations such as hand-to-face contact, eating, drinking, and smoking when applying or using repellents.

Remove and wash clothes per repellent product label. Chemical repellents should not be used on infants and children.

Vaccinations are generally not available for tick-borne pathogens. Although production of the LYMERix™ Lyme disease vaccination has been ceased, vaccination may still be considered under specific circumstances and with concurrence from the consulting physician.

Tick Check

A tick check should be performed after field survey before entering the field vehicle (you do not want to infest your field vehicle with ticks). Have your field partner check your back; the backs of your legs, arms, and neck; and your hairline. Shake off clothing as thorough as possible before entering the vehicle. Once the field day is complete, repeat this procedure and perform a thorough self check.

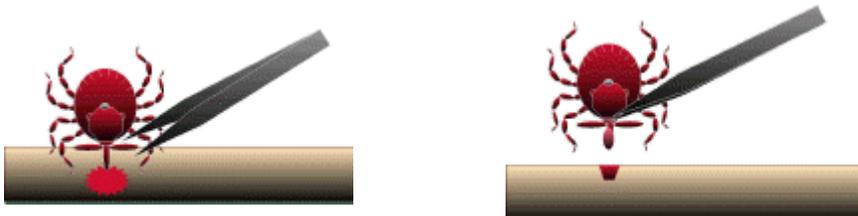
If a tick has embedded itself into the skin, remove the tick as described below.

Tick Removal

1. Use the tick removal kit obtained through the CH2M HILL Milwaukee warehouse, or a fine-tipped tweezers or shield your fingers with a tissue, paper towel, or nitrile gloves.

Error! Objects cannot be created from editing field codes.

2. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with tweezers. Consult your healthcare provider if infection occurs.



3. Avoid squeezing, crushing or puncturing the body of the tick because its fluids (saliva, hemolymph, gut contents) may contain infectious organisms. Releasing these organisms to the outside of the tick's body or into the bite area may increase the chance of infectious organism transmission.

4. Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin. This precaution is particularly directed to individuals who remove ticks from domestic animals with unprotected fingers. Children, elderly persons, and immunocompromised persons may be at greater risk of infection and should avoid this procedure.

5. After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

6. Should you wish to save the tick for identification, place it in a plastic bag, with the date of the tick bite, and place in your freezer. It may be used at a later date to assist a physician with making an accurate diagnosis (if you become ill).

Note: Folklore remedies such as petroleum jelly or hot matches do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva, increasing the chances of transmitting the pathogen. These methods of tick removal should be avoided. In addition, a number of tick removal devices have been marketed, but none are better than a plain set of fine tipped tweezers.

First-Aid and Medical Treatment

Tick bites should always be treated with first-aid. Clean and wash hands and disinfect the bite site after removing embedded tick. Individuals previously infected with Lyme disease does not confer immunity—re-infection from future tick bites can occur even after a person has contracted a tick-borne disease.

The employee should contact the Injury Management/Return To Work provider (IMRTW), WorkCare using the toll-free number 866-893-2514 to report the tick bite. WorkCare will follow-up with each CH2M Hill employee who reports a tick bite and is at risk of developing Lyme disease by monitoring for symptoms up to 45 days, and will refer the employee to a medical provider for evaluation and treatment as necessary.



2011 Vehicle Accident Guidance – ESBG

Remember that if you are **renting** a non-CH2M HILL owned vehicle (short-term rental) in the U.S., you should carry the [insurance card](#) from the state where your driver's license is issued.

If you operate a **fleet vehicle**, carry the [insurance card](#) where the vehicle is registered.

For ALL Vehicles if you are in an accident:

1. If you are injured, call 911 for emergency medical treatment or 1-866-893-2514 to contact the CH2M HILL Occupational Nurse/Physician for minor injuries. If you feel you have not been injured, contact the RHSM for guidance on whether calling the CH2M HILL Occupation Nurse/Physician is applicable.
2. **Call the Police**--For any vehicle accident/ damage, it is recommended that the local police (or site security/emergency services if working on a client site that provides such services) be called to determine if a report needs to be filed. In some instances, a report may not be required (during accident alerts, or in public parking lots). Document that the authorities were called and follow up with any guidance they give you. State requirements vary. If a report is filed, obtain a copy.
3. Notify Supervisor, (and PM/RHSM if working on a project site)
4. Complete a HITS report on the VO.

Additional Steps

To report an auto accident, and before a claim can be taken by telephonic reporting, have available your name (the company name alone is no longer accepted, a driver's name must be provided even for fender benders), location of accident and your office address if different than the accident location, business group and project number. A claim cannot be taken without your name, address, business group and your project number. By location the state where the accident occurred, and which office you are aligned to, i.e., accident occurs in Idaho, but you are out of the Denver office. Advise the claim recorder the accident occurred in ID, but that your office location is Denver. This will assist the claim intake person in identifying location coding for the claims.

Auto accidents involve two different sections of an Auto policy:

- 1) Liability to others due to Bodily Injury and Property Damage
- 2) Physical Damage - Comprehensive and Collision - damage to the vehicle CH employee is driving

CH2M Hill has Liability coverage for any auto - our policy will respond on either a primary or excess basis.

Refer to the table below for additional notifications to make based on the type of accident experienced and type of vehicle being used.



Liability - Bodily Injury or Property Damage to Others

Scenario	Which Coverage Responds	What to do if in an accident
CH2M Hill fleet, pool or project vehicle - long term lease - lower 48	CH2M Hill - Primary	Contact Broadspire (1-800-753-6737); Jennifer Rindahl/DEN (720-286-2449); Linda George/DEN (720-286-2057)
CH2M Hill fleet, pool or project vehicle - long term lease - Alaska (North Slope)	CH2M Hill - Primary	Contact Jennifer Rindahl/DEN (720-286-2449)
Client vehicle driven by CH2M Hill employee	Client's auto policy unless client has made CH2M Hill responsible for vehicle	Contact Broadspire (1-800-753-6737); Contact Jennifer Rindahl/DEN (720-286-2449); contact client;
Short term lease (30 days or less)	Rental car company if rented through Enterprise, Budget or Hertz; CH2M Hill excess	Contact Broadspire (1-800-753-6737); Contact local branch of rental car company where vehicle leased (ERAC includes 24 hour roadside assistance) and Jennifer Rindahl/DEN (720-286-2449)
Short term lease (30 days or less)	CH2M Hill - Primary if rented through company other than our national agreements; \$100,000 deductible	Contact Broadspire (1-800-753-6737); Contact rental car company and Jennifer Rindahl/DEN (720-286-2449)
Personal vehicle used on business	Employee's personal auto policy; CH2M Hill on an excess basis	Contact personal auto insurance company; contact Jennifer Rindahl/DEN (720-286-2449)

Physical Damage - damage to vehicle CH employee was driving

Scenario	Which Coverage Responds	What to do if in an accident
CH2M Hill fleet, pool or project vehicle - long term lease - lower 48	CH2M Hill ONLY if vehicle is scheduled on policy - \$5,000 deductible	Contact Broadspire (1-800-753-6737); Jennifer Rindahl/DEN (720-286-2449); Linda George/DEN (720-286-2057)
CH2M Hill fleet, pool or project vehicle - long term lease - Alaska (North Slope)	CH2M Hill Equipment Schedule if scheduled on policy	Contact Jennifer Rindahl/DEN (720-286-2449)
CH2M Hill fleet, pool or project vehicle - long term lease	ARI if physical damage coverage purchased - \$500 deductible	Contact Jennifer Rindahl/DEN 720.286.2449; call ARI at 1-800-221-1645 give them Client Code and ARI fleet vehicle number; and notify Linda George/DEN - Fleet Coordinator - 720-286-2057
Client vehicle CH2M Hill Employee is driving	Client's auto policy unless client has made CH2M Hill contractually responsible for vehicle	Contact Jennifer Rindahl/DEN (720-286-2449); contact client; contact Broadspire (1-800-753-6737)
Short term lease (30 days or less) using corporate VISA	VISA if corporate credit card used and vehicle is not a pickup, truck, cargo van or used off-road	Contact VISA - 1-800-847-2911 or http://www.visa.com/eclaim
Short term lease (30 days or less) through Enterprise (ERAC) and vehicle is used off-road and physical damage coverage included when vehicle leased	ERAC up to \$3,000 in damage; CH2M Hill's coverage is excess	Notify Rental Car Company; contact Jennifer Rindahl/DEN (720-286-2449) if damage over \$5,000
Short term lease (30 days or less) did not use corporate VISA	CH2M Hill - \$5,000 deductible (project responsibility)	Contact Broadspire (1-800-753-6737); Contact Jennifer Rindahl/DEN 720-286-2449; contact VISA - 1-800-847-2911 or http://www.visa.com/eclaim
Personal vehicle used on business	CH will reimburse the amount of the deductible carried on the employee's policy up to \$500 whichever is less	Contact Jennifer Rindahl/DEN (720-286-2449); contact client; contact Broadspire (1-800-753-6737)

Details for reporting a claim on the CH2M Hill VO are accessed by going to the VO home page and clicking:

GLOBAL ENTERPRISE SERVICES/INSURANCE & BONDING/CLAIMS REPORTING

HOW DO I REPORT A CLAIM TAB or access the following URL:

<https://www.int.ch2m.com/intrnl/voffice/corp/insurance/claims/report.asp?Menu=menu3h>



Insurance & Bonding

How Do I Report a Claim?

Domestic
Definitions of Physical Damage and Auto Liability

Physical Damage = Comprehensive and Collision – damage to the vehicle the CH employee is driving. CH2M Hill has Liability coverage for any auto – our policy will respond on either a primary or excess basis.

Auto Liability = Liability to others due to Bodily Injury and/or Property Damage.

Auto accidents prior to 5/1/11 – complete Automobile Loss Notice [form](#) and report to Zurich; form on the YO, (GLOBAL ENTERPRISE SERVICES/INSURANCE AND BONDING/CLAIMS REPORTING/HOW DO I REPORT A CLAIM/BUSINESS AUTO-ALL).

Phone: +1 (877) 246-3478 or +1 (800) 987-3373
Fax: +1 (877) 962-2567

Accidents that occur after 5/1/11, follow reporting instructions below.

- Business Auto-Owned by Leasing Company, Rental Agency, for Physical Damage

Initial Report: Employee involved in auto accident reports claim as soon as possible, per instructions in Special Reporting Section, to owner of vehicle (i.e., Enterprise, Hertz, Budget, ARI, etc.)

Copy: Jennifer Rindahl/DEN/Legal & Insurance Department
Backup: Carol Dietz/DEN/Legal & Insurance Department
Copy: Broadspire involving any injury or damage to a third party; you will need to call in the claim using the 1-800 number below and advise this is an auto claim involving a rental agency vehicle.

Insurer: Greenwich Insurance Co (an XL company)
TPA: Broadspire
Phone: 800-753-6737 (telephonic reporting for all auto claims, manned 24/7, 365 per year)

For Personally Owned Vehicles (POVs):

CH2M HILL does not provide auto insurance for POVs, it is responsibility of the owner. If you are in a vehicle accident conducting company business, contact the police as above, supervisor, and 911 or CH2M HILL's occupational nurse/physician as stated above. Complete a HITS report. Contact Jennifer Rindahl/DEN for assistance for meeting personal insurance deductibles (up to \$500) with proof of insurance and deductible.

If using your POV for extended project use, notify the PM to make sure a rental car is not needed. Check your insurance policy for guidance on using the POV for business use.

Additional Resources:

[Claims Resource Manual](#)

**WORKING ALONE PROTOCOL
CALL - IN CONTACT FORM**

Date of site work: _____ Expected start time: _____

Name of CH2M HILL employee in the field: _____

Name of CH2M HILL employee responsible to receive contact:

Client Emergency Contact (if any):

CH2M HILL employee's contact numbers:

Radio # _____

Cell Phone # _____

Address and Location of work: _____

Directions/Map:

Planned Activity: _____

Specified Frequency and time for call in: _____

Time

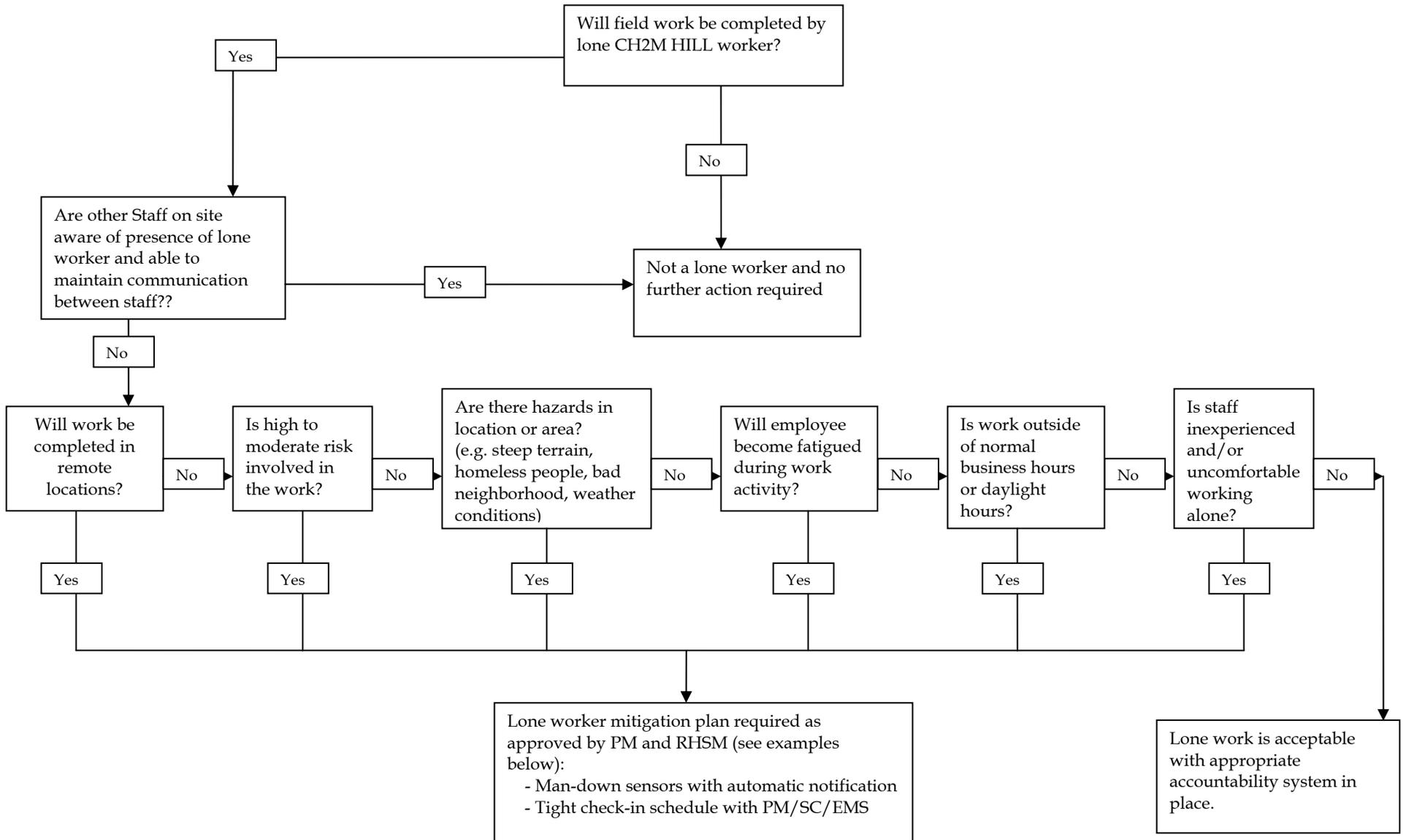
Verified

Location

If lone worker fails to call in at specified frequency/time:

- 1) Call worker's radio and cell to determine if an emergency exists.
- 2) If no reply, immediately call Client security/emergency service if there is one at the site.
- 3) If there is no client security call Emergency Services (911). Inform the dispatcher there is a lone worker that cannot be contacted and there may be an emergency on site. Provide the lone worker's name, their last known location, and your contact information.
- 4) After Emergency Services have been contacted, call the other emergency contacts, Project Manager, and Responsible Health and Safety Manager.

Lone Worker Protocol



CH2M HILL HEALTH AND SAFETY PLAN

Attachment 7

Observed Hazard Form

OBSERVED HAZARD FORM

Name/Company of Observer (*optional*):

Date reported: _____

Time reported: _____

Contractor/s performing unsafe act or creating unsafe condition:

1. _____
2. _____
3. _____

Unsafe Act or Condition:

Location of Unsafe Act or Condition:

Name of CH2M HILL Representative:

Corrective Actions Taken: _____ Date: _____

Project Safety Committee Evaluation: _____ Date: _____

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 8

Stop Work Order Form

CH2MHILL

Stop Work Order

REPORT PREPARED BY:

Name:	Title:	Signature:	Date:

ISSUE OF NONPERFORMANCE:

Description:	Date of Nonperformance:

SUBCONTRACTOR SIGNATURE OF NOTIFICATION:

Name:	Title:	Signature:	Date:

** Corrective action is to be taken immediately. Note below the action taken, sign and return to CCI.* Work may not resume until authorization is granted by CH2M HILL Constructors, Inc. Representative,*

SUBCONTRACTOR'S CORRECTIVE ACTION

Description:	Date of Nonperformance:

SUBCONTRACTOR SIGNATURE OF CORRECTION

Name:	Title:	Signature:	Date:

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 9

Agency Inspection Target Zero Bulletin

TARGET ZERO BULLETIN

Subject: HSSE Agency Inspections (OSHA, EPA, DOT, State Health Department)

Do you know what YOU would do if an agency inspector arrived at your site unannounced?

Recently, a State Occupational Safety and Health Administration (OSHA) inspector made an unannounced visit to one of our Federal project sites. OSHA, U.S. Environmental Protection Agency (EPA), and authorized state or local agencies have authority to inspect any facility that is subject to health, safety, and environmental legislation. Inspections may be announced or unannounced. This particular inspector indicated that the project was targeted for an inspection because the work was funded by the American Recovery and Reinvestment Act (ARRA).

Enterprise Standard Operating Procedure (SOP) HSE-201, *Agency Inspections and Communications*, describes the responsibilities, procedures, and requirements associated with inspections conducted by external regulatory agencies, as well as the methods for communicating information to key individuals. This Target Zero Bulletin is a brief summary of what to do in the event of an agency inspection at your site. Refer to the SOP for more specific guidance.

Notification of Inspections

- If the inspection is an announced regulatory agency inspection, the Project Manager (PM) should notify the Responsible Health and Safety Manager (RHSM) and Responsible Environmental Manager (REM) well in advance of the inspection.
- If an unannounced agency inspector visits one of our projects, Field personnel must immediately notify the project Emergency Response Coordinator (ERC). Typically the ERC is the Safety Coordinator (SC).
- The **ERC must immediately notify the RHSM/REM**, as appropriate, of unannounced inspections, or designate someone to call the RHSM/REM. The RHSM/REMs can provide guidance to the field staff and PM.

Inspector Credential Verification

- Upon arrival, the ERC must request the inspector to provide official credentials. Record the inspector's name and office phone number or obtain the inspector's business card.
- The inspector shall sign the visitors log and be given a site-specific health, safety, and environmental protection briefing.
- The inspector shall meet any site access requirements associated with security clearances, specialized training, and medical monitoring. The CH2M HILL representative shall verify that the inspector possesses these requirements; access will only be granted to those areas where appropriate access requirements are met. Some inspectors have the authority to gain access to any work area at any time, such as an inspector with a search warrant. In these cases, we can stop work operations as necessary to protect the safety of the inspector(s).

Opening Conference

- The CH2M HILL Project Manager, ERC, RHSM, or REM, and the inspector shall determine attendees for the opening conference. The RHSM (for OSHA and other worker health and safety inspections) or REM (for environmental inspections) shall join the opening conference via conference call.
- The inspector shall inform CH2M HILL of the purpose of the inspection and provide a copy of the complaint, if applicable.
- The inspector shall outline the scope of the inspection, including employee interviews conducted in private, physical inspection of the workplace and records, possible referrals, discrimination complaints, and the closing conference(s).

Requests for OSHA Logs

- An OSHA inspector may request to review the project OSHA Injury/Illness log, better known as the OSHA 300 Log. Contact your RHSM for assistance in obtaining the OSHA 300 Log.

-
- Field projects with a continuous duration of one year or longer are considered to be separate establishments and are required to maintain an OSHA 300 log specific to the project. The project OSHA 300 log should be maintained onsite and kept current.
 - Recordable injuries and illnesses sustained on field projects less than one year in duration are maintained on the CH2M HILL office log where the injured employee is based.

The Inspection

- The scope of the inspection shall be limited to that indicated by the inspector in the opening conference. The inspector shall be escorted to relevant areas only. The ERC or other designated by the RHSM or REM must accompany the inspector during the inspection.
- Ensure that the inspection is limited to the scope that the inspector disclosed during the opening conference. The ERC should always take notes which identify: areas inspected, machinery or equipment and materials examined, employees or other persons interviewed, and photographs taken by the inspector.
- The inspector will observe safety, health, and environmental conditions and practices and document the inspection process. The inspector may also take photos and instrument readings, examine records, collect air samples, measure noise levels, survey existing engineering controls, and monitor employee exposure to toxic vapors, gases, and dusts.
- CH2M HILL should gather duplicate information (photographs, readings, samples) in the same manner and condition as the inspector. If the equipment needed to take duplicate samples is not onsite, ask the inspector if the sampling can wait until the equipment is available. If samples are taken, request a description of the tests that the agency intends to perform on the samples and request results as soon as they are available.
- Employees may be questioned during the inspection tour. The employee can refuse to speak to an inspector, can speak to the inspector with a company representative (including management) present, or can speak to the inspector privately. It is CH2M HILL policy that employees who wish to speak to the inspector are not discriminated against, intimidated, or otherwise mistreated for exercising their rights during compliance inspections.
- Copies of documents should not be provided to the inspector without the approval of the RHSM or REM or Legal Insurance Department (LID). **DO NOT** voluntarily release documents. Respond only to inspection team requests.
- During the course of the inspection, the inspector may point out violations. For each violation, the CH2M HILL representative should ask the inspector to discuss possible corrective action. Where possible, violations detected by the inspector should be corrected immediately and noted by the inspector as corrected.
- For those items which cannot be corrected immediately, an action plan shall be formulated for timely correction. In any instance, employees exposed to hazards shall be removed from the area.

Closing Conference

After the inspection, a closing conference is normally held as follows:

- The CH2M HILL PM, ERC, RHSM or REM shall be involved via conference call in the closing conference, at a minimum;
- The inspector shall describe the apparent violations found during the inspection and other pertinent issues as deemed necessary by the inspector. CH2M HILL shall be advised of their rights to participate in any subsequent conferences, meetings or discussions. Any unusual circumstances noted during the closing conference shall be documented by the ERC;
- The inspector shall discuss violations observed during the inspection and indicate for which violations a citation and a proposed penalty may be issued or recommended;
- The ERC shall request receipts for all samples and approved documents photocopied by the inspector, request a photocopy of the inspector's photograph log, and request a copy of the final inspection report; and
- Any documentation from an agency inspection must be transmitted immediately to the RHSM or REM, and LID.

Unannounced regulatory agency inspections may happen at any time on our projects -

Get your RHSM/REM and PM involved immediately if an Inspector arrives.

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 10

Completed CH2M HILL AHAs

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 11

Material Safety Data Sheets

