

Removal Action Work Plan
Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Prepared for:
Santa Monica/Malibu School District
Malibu, California

Prepared by:
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Date:
December 17, 2014

Project Number:
0433980M

ENVIRON

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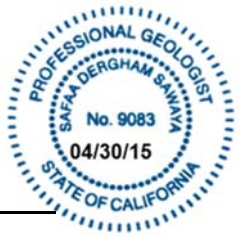

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Acronyms and Abbreviations

Acronym	Definition
4,4'-DDE	4,4'-Dichlorodiphenyldichloroethylene
AOIs	Areas of Interest
ARARs	Applicable Relevant And Appropriate Requirements (Superfund)
bgs	below ground surface
BMP	Best Management Practices
Cal/EPA	California Environmental Protection Agency
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response Compensation And Liability
CFR	Code Of Federal Regulations
District	Santa Monica/Malibu Unified School District
DTSC	Department of Toxic Substances Control
DU	Decision Unit
ENVIRON	ENVIRON International Corporation
EPC	Exposure Point Concentration
HASP	Health and Safety Plan
HAZWOPER	Hazardous Operations and Emergency Response
HHRE	Human Health Risk Evaluation
HI	hazard index
HQ	hazard quotient
HSC	Health and Safety Code
JCES	Juan Cabrillo Elementary School
mg/kg	milligrams per kilogram
mg/m^3	milligrams per cubic meter
MHS	Malibu High School
NCP	National Contingency Plan
NOE	Notice of Exemption
OEEHA	Environmental Health Hazard Assessment
OSHA	Occupational Safety And Health Administration
PCB	polychlorinated biphenyl
PCOC	Potential Chemical of Concern
PEA	Preliminary Environmental Assessment
PEL	Permissible Exposure Limit
PG	Professional Geologist
PM10	Particulate Matter Of Size Less Than Or Equal To 10 Micrometers
QC	quality control
RACR	Removal Action Completion Report

Acronym	Definition
RAOs	Removal Action Objectives
RAW	Removal Action Work Plan
RCRA	Resource Conservation And Recovery
RSL	Regional Screening Level
SCAQMD	South Coast Air Quality Management District
STLC	Soluble Threshold Limit Concentration
TBC	to be considered
TCLP	Toxicity Characteristic Leaching Procedure
TTLC	Total Threshold Limit Concentration
TSCA	Toxic Substance Control Act
TWA	Time-Weighted Average
µg/dl	micrograms per deciliter
µg/kg	microgram per kilogram
$\mu g/m^3$	microgram per cubic meter
USA	Underground Service Alert
USEPA	United States Environmental Protection Agency
yd^3	cubic yards

Executive Summary

ENVIRON International Corporation (ENVIRON), on behalf of the Santa Monica/Malibu School District (the District), has prepared this Removal Action Work Plan (RAW), at the request of the Department of Toxic Substances Control (DTSC), to perform a focused removal action in a planter area east of Building G (Building G Area) of Malibu High School (MHS or site), located at 30215 Morning View Drive, Malibu, California ("site", see Figures 1 and 2; "Building G Area," see Figure 3). The goal of this RAW is to remediate the Building G Area to conditions that allow for future unrestricted (e.g., residential) use.

MHS or the site is comprised of approximately 80 acres (including areas leased to others) and consists of many buildings (Buildings A through K, and New Gymnasium). Construction of most of the buildings occurred in the 1960s and MHS was completed in its current configuration in 2002. Since construction, the site has been used for educational purposes. MHS is owned by the District and is zoned for institutional use.

Subsurface investigations conducted during the summer of 2014 in accordance with the DTSC-approved *Draft Preliminary Environmental Assessment Work Plan* (PEA Work Plan), dated May 23, 2014, indicated that polychlorinated biphenyls (PCBs), specifically Aroclor 1254, were detected in shallow soil in the Building G Area. The soil sampling conducted in the Building G Area revealed a relatively small PCB-impacted area in which two or more adjacent borings contained Aroclor 1254 at a concentration that exceeded its United States Environmental Protection Agency (USEPA) Regional Screening Level (RSL) for residential use. These PCB exceedances were localized and confined to surficial soil in a planter area, directly adjacent to a concrete walkway, located east of Building G. Similar PCB exceedances were not observed in other areas at MHS and thus it appears to be unique to the Building G Area. The extent of Aroclor 1254 impacted soil consists of an approximate 1.5-foot thick surficial layer, measuring approximately 45 feet long by 7 feet wide (Figures 6 and 7).

An evaluation of the potential human health risks to current and potential future on-site populations due to exposure to the chemicals detected in soil in the Building G Area was performed by conducting a Human Health Risk Evaluation (HHRE). Soil Exposure Point Concentrations (EPCs) were calculated as the 95% upper confidence limits on the mean soil concentrations at 0-2 feet below ground surface (bgs) in the Building G Area for school and potential future on-site residential receptors. The data set included 18 borings located within the Building G Area (Figure 6). This HHRE evaluated the potential human health risks to on-site populations both before and after soil excavation. For the after soil excavation scenario, it was assumed that surface soil (0-0.5 feet bgs) at soil samples MH-SB-76 and MH-SB-118, which had the highest detected concentrations of Aroclor 1254, would be removed during excavation, and Aroclor 1254 would not be detected at both locations after excavation with a detection limit of 50 micrograms per kilogram (μg/kg).

Under a residential scenario, the HHRE indicated that before excavation, the estimated excess lifetime cancer risk for hypothetical future on-site residents are 1.5×10^{-6}. For the after excavation scenario (after excavating the two highest Aroclor 1254 detections), the estimated excess lifetime cancer risk for hypothetical future on-site residents will be at the target cancer

risk of $1x10^{-6}$. Under a school scenario, the estimated excess lifetime cancer risks before and after excavation are below the target cancer risk of $1x10^{-6}$. Therefore, although no remediation is recommended under the school scenario, because the District desires to be able to use the Building G Area for any purpose in the future (e.g., unrestricted use), the soil containing the highest Aroclor 1254 concentrations in the Building G Area will be excavated to lower the residential cancer risks estimate to the target risk of $1x10^{-6}$.

Excavation /off-site disposal is the preferred and recommended removal action alternative for addressing the Building G Area. This alternative was selected because it provides the most cost effective methodology to accomplish the Removal Action Objectives (RAOs) identified in this RAW for allowing for unrestricted use of the Building G Area.

1 Introduction

At the request of the Department of Toxic Substances Control (DTSC), ENVIRON International Corporation (ENVIRON) has prepared this Draft Removal Action Work Plan (RAW) on behalf of the Santa Monica/Malibu Unified School District (the District), to perform a focused removal action in a planter area located immediately east of Building G (Building G Area) at Malibu High School (MHS or site) at 30215 Morning View Drive, Malibu, California ("site," Figures 1 and 2; "Building G Area," Figure 3).

1.1 Background

On March 13, 2014, a Voluntary Investigation Agreement (the Agreement) was executed between the DTSC and the District to conduct a Preliminary Environmental Assessment (PEA) at Juan Cabrillo Elementary School (JCES) and MHS to evaluate the environmental condition of soils at the schools. Accordingly, ENVIRON prepared and submitted a "*Draft Preliminary Environmental Assessment Work Plan* (PEA Work Plan) to DTSC on May 23, 2014 detailing the proposed soil, soil gas, and groundwater investigation at JCES and MHS. The PEA Work Plan was conditionally approved by DTSC on June 27, 2014. Initial field activities were conducted between June 30 and August 18, 2014 under DTSC's oversight and in accordance with the DTSC-approved PEA Work Plan. PEA sampling results were presented to the DTSC in two separate data transmittals. The first data transmittal entitled, "*Final Summary of Soil, Soil Vapor, and Groundwater Sampling Results, Juan Cabrillo Elementary School, 30237 Morning View Drive, Malibu, California*," dated September 12, 2014, presented sampling results collected from JCES. The second data transmittal entitled "*Final Summary of Soil, Soil Vapor, and Groundwater Sampling Results, Malibu High School, 30215 Morning View Drive, Malibu, California,"* dated September 23, 2014 presented sampling results collected from MHS. Based on the data collected as part of the PEA investigation, DTSC and the District identified one area for further action at MHS, the Building G Area. This removal action is being performed due to low levels of polychlorinated biphenyl (PCB)-impacted surficial soil documented during the PEA investigation, in the Building G Area.

This RAW has been prepared at the request of the DTSC, pursuant to the Agreement, and in accordance with DTSC's guidance entitled "*Removal Action Work Plans,"* dated September 23, 1998, to perform a removal action in the Building G Area at MHS. A RAW is one of two remedy selection documents that may be prepared for a hazardous substance release site pursuant to California Health and Safety Code (HSC) Section 25356.1, and is appropriate for removal actions that are projected to cost less than $2,000,000.

1.2 Removal Action Process

The following sub-sections describe the regulatory background and objectives for the RAW.

1.2.1 Regulatory Basis for the RAW

In California HSC 25323.1, a RAW is defined as a "*work plan prepared or approved by the DTSC or a California Regional Water Quality Control Board, which is developed to carry out a removal action, in an effective manner, that is protective of the public health and the environment*." A RAW is appropriate when the estimated cost of the removal action does not

exceed $2,000,000. If the estimated capital cost of implementing the chosen action will exceed $2,000,000, a Remedial Action Plan should be prepared.

The estimated cost of the selected removal alternative recommended in this RAW is estimated to be significantly less than $2,000,000.

1.2.2 Objectives

The objectives of this RAW for the Building G Area are to:

- Present and evaluate existing soil conditions at the Building G Area;
- Establish appropriate removal action objectives (RAOs) for protection of human health and the environment; and
- Evaluate alternatives and identify a final recommendation for a removal action at the Building G Area.

1.2.3 Elements of the RAW

To accomplish the objectives stated in Section 1.2.2 in accordance with DTSC's guidance, this RAW includes the following elements:

- A description of the nature and extent of potential chemicals of concern (PCOCs) at the Building G Area;
- The goals to be achieved by the removal action;
- An analysis of the alternatives considered and rejected, and the basis for the rejection, including a discussion of effectiveness, implementability, and cost of each alternative; and
- A description of the recommended alternative and an implementation plan.

1.3 Site Description

MHS is located in the Zuma Beach Area, in the City of Malibu, on the southern flank of the western portion of the Santa Monica Mountains, at 30215 Morning View Drive (Figure 2), 0.2 miles north of Pacific Coast Highway. MHS is comprised of approximately 80 acres (including areas leased to others) and consists of many buildings (Buildings A through K, and New Gymnasium). Construction of most of the buildings occurred in the 1960s, except for Building K and the New Gymnasium, which were built in 2002. Most buildings at MHS are bordered by an approximately 8- to 10- foot wide concrete walkway and a concrete and/or vinyl siding overhang. Two large metal barn-like structures that are used for equipment storage and vehicle maintenance, including a bus washing station ("Bus Barn") are located in the northwestern portion of MHS. The terrain generally consists of rolling hills with a maximum topographic relief of approximately 90 feet and elevations ranging from approximately 80 to 170 feet above mean sea level. The topography at the site and its vicinity slopes gently southwesterly to the Pacific Ocean.

1.3.1 Location and Description of the Building G Area

The Building G Area, within the MHS footprint, is comprised of the planters located immediately east of Building G and north of Building I. The area is composed of planters varying in width

from 2 feet (east of Building G) to approximately 5 feet (north of Building I) as depicted on Figure 3. Building G is bordered to the east by an 8-10 foot wide concrete walkway, followed by a 2-foot planter. The north side of Building I does not have a concrete walkway; therefore the planter abuts the edge of Building I. Both Building G and Building I are bordered to the north and east by an open grassy area, surrounded by approximately 20-foot high hills and the Amphitheatre stairs. Building G and Building I are used for art/ woodshop and graphic arts, respectively (see Figure 3).

1.3.2 Land Use

MHS is owned by the District and is zoned for institutional use. Since construction, MHS has been used for educational purposes.

1.3.3 Historic Uses

In the late 1940s through early 50s, MHS appears to be mostly undeveloped and may have been used for activities related to dry land farming. MHS was used for educational purposes starting in the early 60s. Building H (the Auditorium and Kitchen), Building E (Middle School/Blue Building), Building F (Music), Building I (Graphic Arts), and the Bus Barn were developed from early to mid-1960s. Buildings A (Library), B/C (Administration), D (Science), G (Art, Woodshop), and the Old Gymnasium were completed by mid-70s.

1.3.4 Adjacent Properties

MHS is located in the Zuma Beach Area, in the City of Malibu, California MHS is comprised of Assessor Parcel Numbers 4469-017-900 (out of which 6.4 acres are shared with JCES), 4469-017-901, 4469-017-902, and 4469-017-903. The Building G Area is located within Parcel Number 4469-017-900. The following border MHS (Figure 2):

- To the north: residential properties;
- To the west: JCES;
- To the south: across from Mountain View Drive, is the Malibu United Church and Nursery School. Zuma Beach and the Pacific Coast Highway are located approximately 1,000 feet and 1,500 feet south of MHS; and
- To the east: residential properties and the Malibu Equestrian Center.[1]

1.4 Site Owner

MHS is owned by the District.

1.5 Purpose

Based on the information developed during the PEA investigation, further action will be conducted in the Building G Area due to the presence of Aroclor 1254-impacted surface soil. Following completion of the public comment period, DTSC will consider and respond to the comments received. The RAW will be revised as necessary, in response to the comments received. If significant changes are not required, DTSC will then approve the RAW for

[1] The Malibu Equestrian Center leases property from the District.

implementation. After the remedy has been implemented, a Removal Action Completion Report (RACR) will be submitted to DTSC for review and certification.

2 Site Characterization

2.1 MHS Hydrology and Geology

Geology

Based on previous subsurface investigations and the United States Geologic Society Geologic Map (Yerkes and Campbell, 2005), the geology beneath MHS consists of two main units: the Young Non-Marine Terrace Deposits (Qyd) and the Monterey Shale (Tmt). These geologic units are further described below:

Young Non-Marine Terrace Deposits

This unit consists primarily of very stiff to stiff silty to sandy clay, interbedded with bedrock clasts. Non-marine terrace deposits are encountered from the surface or below surface fill to a maximum depth of 20 feet below ground surface (bgs) (Leighton, 2009).

Monterey Shale

Interbedded claystone and siltstone of the Monterey Shale formation are encountered at depths ranging from 10 to 20 feet bgs (Leighton, 2009). The unit is described as light brown, moderately hard to hard, fractured, oxidized, and weathered, with calcite staining.

Two other geologic units are exposed at MHS: the Trancas Formation (Tr) and Zuma Volcanics (Tz). The Trancas Formation is aerially limited to a small portion on the northwest corner of MHS. The Zuma Volcanics geological unit is sporadically exposed in the north-northeastern half of MHS and appears to contact with the Young Non-Marine Terrace and the Monterey Shale in the center of MHS.

Hydrogeology

MHS lies within the Malibu Hydrological Unit and the Truncas Canyon Hydrologic Sub-Area (Los Angeles Regional Water Quality Control Board, Basin Plan). There is no groundwater basin designated in the area and groundwater is not assigned any beneficial uses according to the Basin Plan. Zuma Beach Coastal Waters are designated for recreational uses. MHS is bounded to the northwest by an ephemeral stream, designated by the City of Malibu as an Endangered Species Habitat Area.

During the PEA investigation, groundwater at MHS was encountered at depths ranging from approximately 51feet bgs to 62 feet bgs. The calculated groundwater gradient from the existing monitoring wells (MW-1 through MW-11) indicates that groundwater flows to the southwest, toward the Pacific Ocean.

2.2 Site Characterization

The PEA Work Plan identified 18 Areas of Interest (AOIs), AOI-1 through AOI-4, located at JCES and AOI-5 though AOI-18 located at MHS. The scope of the PEA Work Plan included soil, soil gas, and groundwater sampling. The results of sampling conducted during execution of the PEA Work Plan are provided in the final data transmittals for JCES and MHS. The final data transmittals were presented to the DTSC on September 5 and 23, respectively, and are also available electronically on DTSC's EnviroStor website.

This RAW focuses on the Building G Area, located within AOI-5 at MHS. AOI-5 addresses buildings constructed prior to 1981 at MHS. During implementation of the PEA Work Plan, 46 borings were advanced within AOI-5, out of which 7 were located in the "Building G Area." Upon review of initial soil sampling results, soil step-out sampling was conducted in the Building G Area. A description of the initial and step-out sampling conducted in the Building G Area is provided below.

2.2.1 Characterization of the Building G Area

The Building G Area is depicted on Figure 3. In July 2014, as part of implementation of the PEA Work Plan, four borings (MH-SB-10, MH-SB-76, MH-SB-77, and MH-SB-79) were advanced in the planter area, abutting the concrete walkway, immediately east of Building G and three borings (MH-SB-11, MH-SB-13, MH-SB-14) were advanced in the planter area north of Building I (Figure 4). Soil samples were collected from the surface (0 – 0.5 feet bgs) and from 1.5 to 2 feet bgs and were analyzed for pesticides (organochlorine and organophosphates), herbicides, lead, and PCBs, using USEPA Methods 8081A, 8141A, 8151A, 6010, and 8082, respectively. Soil sampling results are presented on Tables 1 through 5 and soil boring locations are depicted on Figure 4. In summary:

- Of the organochlorine pesticides, 4,4'-dichlorodiphenyldichloroethylene (4,4'-DDE) was detected at concentrations ranging from 6 micrograms per kilograms (µg/kg) in surface soil sample MH-SB-11 to 59 µg/kg in surface sample MH-SB-10 and total chlordane was detected in one surface soil sample, MH-SB-13, at a concentration of 88 µg/kg. Detections of 4,4'-DDE and total chlordane were well below their respective Residential DTSC-Modified RSL or USEPA RSL for residential soil of 1,600 µg/kg and 1,800 µg/kg, respectively (Table 1).
- Herbicides and organophosphates pesticides were not detected above their respective laboratory reporting limits in any of the soil samples (Tables 2 and 3).
- Lead was detected at concentrations ranging from 3.1 milligrams per kilogram (mg/kg) in MH-SB-76 at a depth of 1.5 feet bgs to 42 mg/kg in surface soil sample MH-SB-10. Lead detections were well below the DTSC-Modified RSL for residential soil of 80 mg/kg (Table 4).
- Of the PCBs, Aroclor 1254 was the only PCB detected. Aroclor 1254 was detected at concentrations ranging from 130 µg/kg in soil sample MH-SB-77 at a depth of 2 feet bgs to 1,500 µg/kg in soil sample MH-SB-76 at the ground surface. Five soil samples, MH-SB-10 at the surface and 1.5 feet bgs, and surface samples MH-SB-76, MH-SB-77, and MH-SB-79, contained Aroclor 1254 at concentrations of 590 µg/kg, 270 µg/kg, 1,500 µg/kg, 720 µg/kg, and 700 µg/kg, respectively. These concentrations exceeded the USEPA RSL for residential soil of 240 µg/kg for Aroclor 1254.
- Based on the results of the initial PEA investigation, 11 step out soil borings, MH-SB-114 through MH-SB-124, were advanced within the Building G Area (Figure 5). Twenty-two soil samples were collected from borings MH-SB-114 through MH-SB-124 and were analyzed for PCBs. Five of the 22 step-out soil samples, MH-SB-114, MH-SB-116, MH-SB-118, MH-SB-119, and MH-SB-120, contained Aroclor 1254 at concentrations of 800 µg/kg, 410 µg/kg, 1,100 µg/kg, 340 µg/kg, and 430 µg/kg, respectively, exceeding the USEPA RSL

for residential soil. The step-out soil sampling results, combined with the original soil sampling results, were used to delineate the extent of Aroclor 1254 in soils in this area.

2.3 Nature and Extent of PCB-containing Soil in the Building G Area

Eighteen soil borings were advanced in the "Building G Area," and 36 soil samples were analyzed for PCBs (18 soil samples from 0 to 0.5 feet bgs and 18 soil samples from 1.5 to 2 feet bgs). Soil sample results in the "Building G Area" are illustrated on Figure 6 and PCB analytical results are presented on Table 5.

Initial soil sampling results for PCBs and subsequent soil step-out sampling conducted immediately east of Building G, indicated that PCB detections were limited to Aroclor 1254. Maximum concentrations of Aroclor 1254, were detected in surface soil samples collected from borings MH-SB-76 (1,500 µg/kg) and MH-SB-118 (1,100 µg/kg) located adjacent to one another in the planter directly adjacent to the concrete walkway that abuts Building G. These exceedances were localized and confined to surficial soil in the planter. Similar exceedances were not observed in other areas at MHS and thus this situation appears to be unique to the Building G Area. PCB concentrations in this area are unlikely to pose a significant risk to public health because the concentrations are fairly low and access to the area is restricted. The average concentration (i.e., 95 per cent upper confidence limit [UCL] on the mean concentration) in the Building G Area is below the risk-based concentration for staff and students in a school-based scenario, as further discussed in Section 2.4.

2.4 Human Health Risk Assessment

To evaluate the potential human health risks to current and potential future on-site populations due to exposure to the chemicals detected in soil in the Building G Area, a human health risk evaluation (HHRE) was performed. The HHRE approach consisted of: 1) calculating cancer risks and non-cancer hazards for hypothetical future on-site residents exposed to soil through direct contact using established regulatory screening levels (i.e. California Environmental Protection Agency [Cal/EPA] [DTSC]-modified [RSLs] [Cal/EPA 2014] or USEPA RSLs [USEPA 2014] for residential soil; and, 2) calculating cancer risks and non-cancer hazards for school receptors (i.e. middle/high school students and teachers/staff) exposed to soil through direct contact using the Cal/EPA Office of Environmental Health Hazard Assessment Schools Risk Screening Model (Cal/EPA 2010).

For each chemical, the relationship between the magnitude of exposure and the likelihood of adverse health effects is dependent on whether a chemical acts by a threshold or non-threshold mechanism. For carcinogens (non-threshold mechanism), the likelihood of adverse effects is quantified by the estimation of cancer risk. The cancer risk represents the upper-bound incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to a potential carcinogen in a medium (i.e., excess lifetime cancer risk). For non-carcinogens (threshold mechanism), the likelihood of adverse effects is quantified by development of a hazard quotient (HQ). The HQ represents the ratio of the estimated dose from exposure to a non-carcinogen in a medium to a value that is believed to not produce non-cancer adverse health effects.

The National Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] § 300) is commonly cited as the basis for target risk and hazard levels. According to the NCP, excess lifetime cancer risks posed by a site should not exceed one in a million (1×10^{-6}) to one hundred in a million (1×10^{-4}), and noncarcinogenic chemicals should not be present at levels expected to cause adverse health effects (i.e., HQ greater than 1). As a risk management policy, the Cal/EPA generally considers 1×10^{-6} to be a point of departure for purposes of making risk management decisions, with most approved remediation achieving incremental risk levels of ten in a million (1×10^{-5}) or lower.

2.4.1 Identification of Potential Chemicals of Concern

All chemicals detected in one or more soil samples in the Building G Area were identified as PCOCs and were included for evaluation in the HHRE. These chemicals include chlordane (total) (detected in 1 out of 14 samples), 4,4'- DDE (detected in 9 out of 14 samples), Aroclor 1254 (detected in15 out of 36 samples), and lead (detected in all the 14 samples).

2.4.1.1 Exposure Point Concentrations

An exposure point concentration (EPC) of a chemical is the estimated concentration of that chemical to which a receptor is exposed over an assumed duration of exposure. In this HHRE, soil EPCs were calculated as the 95% UCLs on the mean soil concentrations at 0-2 feet bgs in the Building G Area for both resident and school receptors. This data set included 18 borings: MH-SB-10, MH-SB-11, MH-SB -13, MH-SB-14, MH-SB-76, MH-SB-77, MH-SB-79, and MH-SB-114 through MH-SB-124.

This HHRE evaluated the potential human health risks to current and potential future on-site populations both before and after soil excavation. For the after soil excavation scenario, it was assumed that surface soil (0-0.5 feet bgs) at soil borings MH-SB-76 and MH-SB-118, which had the highest detected concentrations of Aroclor 1254, were removed and replaced with clean fill, and Aroclor 1254 will not be detected at both locations with a detection limit of 50 µg/kg.

School students and teachers/staff as well as hypothetical future on-site residents were identified as the potentially exposed populations who could be potentially exposed to soil through direct contact.

The HHRE methodology is presented in detail in Appendix A, and the HHRE risk/hazard results for hypothetical future on-site residents and school receptors are discussed below.

2.4.2 Residential Scenario

The estimated excess lifetime cancer risks and non-cancer HQs for chlordane (total), 4,4'-DDE, and Aroclor 1254 for hypothetical future on-site residents exposed to soil through direct contact are presented in Table 6.

The cumulative excess lifetime cancer risk and non-cancer hazard index (HI) were conservatively calculated by summing the cancer risks and non-cancer HQs across all chemicals. For both the before and after excavation scenarios, the estimated cumulative excess lifetime cancer risks for hypothetical future on-site residents were within the NCP risk range (1.5×10^{-6} and 1.0×10^{-6}, respectively), and the cumulative HIs for hypothetical future

on-site residents were below the non-cancer threshold of one (0.31 and 0.21, respectively). Therefore, chemicals in soil are not expected to result in adverse health effects to hypothetical future on-site residents through direct contact both before and after excavation. However, to achieve a target excess lifetime cancer risk of $1x10^{-6}$, the District agreed to conduct a removal action to address the highest concentrations of Aroclor 1254 in shallow soil in the Building G Area.

2.4.3 School Scenario

The estimated excess lifetime cancer risks and non-cancer HQs for chlordane (total), 4,4'-DDE, and Aroclor 1254 for students exposed to soil through direct contact are presented by exposure route in Table 7a for middle school students, Table 7b for high school students, Table 7c for middle/high school students, and Table 8 for teachers/staff.

The cumulative excess lifetime cancer risk and non-cancer HI were conservatively calculated by summing the cancer risks and non-cancer HQs across all chemicals. As shown in Table 7c, for both the before and after excavation scenarios, the estimated cumulative excess lifetime cancer risks for students were below the target cancer risk of $1x\ 10^{-6}$ (1.5×10^{-7} and 1.0×10^{-7}, respectively, and the cumulative HIs for students were below the non-cancer threshold of one (0.042 and 0.029, respectively).As shown in Table 8, for both the before and after excavation scenarios, the estimated cumulative excess lifetime cancer risks for teachers/staff were below the target threshold of $1x\ 10^{-6}$ (4.4×10^{-7} and 3.1×10^{-7}, respectively), and the cumulative HIs for teachers/staff were below the non-cancer threshold of one (0.030 and 0.020, respectively).

Therefore, chemicals in soil are not expected to result in adverse health effects to students and teachers/staff through direct contact both before and after excavation.

2.4.4 Lead

For lead, the soil EPC at 0-2 feet bgs of 18 mg/kg was below the DTSC-modified RSL of 80 mg/kg for lead in residential soil (Cal/EPA 2014). The DTSC-modified RSL for residential soil was derived using LeadSpread 8 and corresponds to a concentration in soil that will result in a 90th percentile estimate of 1 microgram per deciliter (µg/dL) increase in blood lead in a child. According to Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA), 1 µg/dL is the estimated incremental increase in children's blood lead that would reduce an intelligence quotient (IQ) by up to one point (Cal/EPA 2007). The LeadSpread 8 model conservatively attributed the incremental increase in children's blood lead to the exposure only related to soil without considering other environmental media. Also, since a resident child is the most sensitive receptor in terms of adverse health effects from lead exposure, the DTSC-modified RSL of 80 mg/kg is a conservative screening value when used to evaluate the exposure scenarios for adult receptors who are less sensitive to lead toxicity or school children who are less frequently exposed. Therefore, lead in soil is not expected to result in adverse health effects to hypothetical future on-site residents, students, and teachers/staff through direct contact in the Building G Area.

2.4.5 Uncertainties in Risk Assessments

The USEPA (1989) notes that the conservative assumptions used in risk assessments are intended to assure that the estimated risks do not underestimate the actual risks posed by a site

and that the estimated risks do not necessarily represent actual risks experienced by population at or near a site. By using standardized conservative assumptions in a risk assessment, USEPA further states that:

> *"These values are upperbound estimates of excess cancer risk potentially arising from lifetime exposure to the chemical in question. A number of assumptions have been made in the derivation of these values, many of which are likely to over-estimate exposure and toxicity. The actual incidence of cancer is likely to be lower than these estimates and may be zero."*

The HHRE in this RAW was based primarily on a series of conservative assumptions. The use of conservative assumptions tends to produce upper-bound estimates of risk. Although it is difficult to quantify the uncertainties associated with all the assumptions used in this assessment, the use of conservative assumptions is likely to result in a substantial overestimate of exposure, and hence, risk.

3 Removal Action Objectives

Data obtained during the PEA Investigation revealed the presence of one localized area, the Building G Area, where Aroclor 1254 detections in shallow soil exceeded the residential RSL in two or more adjacent borings. RAOs have been developed based upon the current environmental conditions and current and anticipated future uses of MHS and the Building G Area.

Based on the RAOs, an Area of Excavation, depicted on Figure 7, has been defined at and in proximity to the impacted shallow soil. The extent of the proposed excavation has been determined from: (1) information obtained during the PEA investigation and subsequent soil step-out sampling at the Building G Area and (2) risk management decisions based upon the current and anticipated future use of MHS and the Building G Area. Information used to develop the extent and dimensions of the excavation area included validated laboratory analytical results, historical uses and operations at the Building G Area, and a Building G Area specific-risk evaluation.

In addition, a review of pertinent laws, regulations, and other criteria was performed to identify applicable or relevant and appropriate requirements (ARARs) and other criteria to be considered (TBC) for remediating the Building G Area. ARARs and TBCs are presented in Section 3.2.

3.1 Removal Action Objectives

RAOs have been established that are protective of human health and the environment and reduce the potential for exposure to Aroclor 1254 in soil at the Building G Area. The RAOs are presented below:

- Reduce concentrations of Aroclor 1254 in soil to minimize the human health-based risks associated with soil in the Building G Area to achieve unrestricted land use; and
- Provide a site that is acceptable for regulatory closure under unrestricted scenario.

3.2 Applicable or Relevant and Appropriate Requirements

ARARs are considered in this RAW evaluation of remedial alternatives. ARARs include federal or state promulgated numerical cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations. ARARs can be action-specific, location-specific, or chemical-specific. When ARARs are not available or are determined to be impracticable, other information that does not qualify as an ARAR (i.e., not legally enforceable) but could be identified as TBC criteria may be considered. TBC criteria may include federal, state, and local standards, limits, and guidance that have not been promulgated.

Development of short-and-long term measures for addressing impacts in soil need to consider ARARs and TBCs. The definition of ARARs is derived from the NCP (40 CFR Part 300, Paragraph 300.5):

> Applicable Requirements: Cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or

state law that specifically address a hazardous substance, pollutant, remedial action, location, or other circumstances at a site.

Relevant and Appropriate Requirements: Cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site.

ARARs are separated into three categories in this RAW:

Chemical-specific ARARs: Health-based or risk-based standards that define the allowable limits of specific chemical compounds found in or discharged to the environment. Chemical-specific ARARs provide target cleanup and discharge levels that are used to identify the extent of site remediation.

Action-specific ARARs: Technology-based or activity-based limitations that set performance and design restrictions. For example, action-specific ARARs can specify permit requirements and engineering controls that must be instituted during site activities, or restrict particular activities.

Location-specific ARARs: Consider both natural site features, such as wetlands, flood plains, and endangered species, and man-made features, including landfills, city zoning, and places of historical or archaeological significance. Location-specific ARARs may restrict the types of remedial actions that can be implemented based on the location-specific characteristics of the site.

Potential chemical-, action-, and location-specific ARARs for the Building G Area are identified and evaluated in the Tables 9 through 12, respectively to guide the evaluation of remedial alternatives. Federal and state non-promulgated standards, policies, or guidance documents, and local requirements are not ARARs. However, according to the NCP [40 CFR Part 300 Paragraph 300.430(d)(3)], these factors are also to be considered when evaluating and selecting remedial actions. These non-promulgated, non-binding factors are designated TBCs. TBC factors are listed in Tables 13 and 14.

3.2.1 Potential Chemical-Specific ARARs

Chemical-specific ARARs are promulgated health or risk-based numerical standards or criteria that, when applied to site-specific conditions, result in the establishment of acceptable concentrations of a chemical that may be found in, or discharged to, an environmental medium.

The potential chemical-specific ARARs for soil are listed in Table 9 and include federal regulations for cleanup and management of PCB-contaminated soil and debris (40 CFR Part 761; Subpart D), federal Toxicity Characteristic Leaching Procedure (TCLP) (40 CFR 261.24), and state Soluble Threshold Limit Concentration (STLC) and Total Threshold Limit Concentration (TTLC) (California Code of Regulations [CCR], Title 22, Chapter 11, Article 3).

Federal regulations for cleanup, management, and disposal of PCB-contaminated soil and debris under the Toxic Substance Control Act (TSCA) are listed on Table 9.

TCLP, TTLC, and STLC are potential ARARs for the Building G Area to characterize wastes that are subject to regulation as a Resource Conservation and Recovery Act (RCRA) or California hazardous waste. Excavated contaminated soil must be classified using knowledge of the timing and nature of the release as well as waste toxicity characteristic testing. If, after good faith effort, it is determined that the contaminated soil contains a listed RCRA or California hazardous waste or fails the Federal or state toxicity characteristic tests, then the excavated soil is considered hazardous based on USEPA's "contained-in policy" and must be managed as hazardous remediation waste. Contaminated soils that are treated in situ are not subject to the identification or classification requirements. Federal TCLPs and state TTLCs and STLCs for chemicals detected in soil in the excavation area are listed in Table 10.

3.2.2 Potential Location-Specific ARARs

Location-specific ARARs are restraints placed on activities to be conducted in specific locations. Types of location-specific ARARs include requirements restricting actions or protecting floodplains, wetlands, historic places, archeological sites, and sensitive ecosystems.

Potential location-specific ARARs at the Site are listed in Table 11 and include:

- Federal migratory bird protection requirements under the Migratory Bird Treaty Act;
- Federal Endangered Species Act;
- Archaeological and Historic Preservation Act; and
- California Hazardous Waste Control Act.

Requirements for floodplains and historic preservation do not appear to be applicable or relevant and appropriate to the excavation area.

3.2.2.1 Federal Protection of Migratory Birds

The Migratory Bird Treaty Act requires that all species of native migratory birds in the United States be protected from unregulated “take.”

3.2.2.2 Federal Endangered Species Act

The Endangered Species Act protects listed threatened and endangered species birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees.

3.2.2.3 Archaeological and Historic Preservation Act

The Archaeological and Historic Preservation Act requires action to recover and preserve artifacts if alteration of terrain may threaten significant scientific, prehistoric, historic, or archaeological data.

3.2.2.4 California Hazardous Waste Control Act

California Health and Safety Code, Division 20, Chapter 6.5, Article 2, Section 25100 authorizes the DTSC to regulate facilities that generate or treat hazardous waste. This regulation is

applicable to generators of hazardous waste and persons operating pursuant to a permit-by-rule, conditional authorization or conditional exemption set forth in Health and Safety Code Section 25404(c)(1).

3.2.3 Potential Action-Specific ARARs

Action-specific ARARs are technology- or activity-based requirements or standards that apply to remedial activities conducted as part of a selected remedy. Action-specific ARARs identified for the Building G Area are listed in Table 12 and described below.

3.2.3.1 Emergency Planning and Community Right to Know Act

Federal requirements for community notification of certain hazardous wastes and chemical storage activities under the Emergency Planning and Community Right to Know Act of 1986 (40 CFR 355, 370 and 372) may be potentially applicable or relevant and appropriate to the storage and treatment of site wastes at on-site treatment compounds. Federal requirements are administered by the state under the Health and Safety Code §25503.

3.2.3.2 Hazardous Materials Transportation Act

Regulations pertaining to the transport of hazardous materials under the Department of Transportation Hazardous Materials Transportation Act (40 CFR 171-178) are potentially applicable to any excavated soil.

3.2.3.3 OSHA Regulation for Remediation Activities at CERCLA Sites

Regulations pertaining to worker training, safety and inspection at hazardous waste facilities and during Comprehensive Environmental Response Compensation And Liability (CERCLA) cleanups under the Occupational Safety and Health Administration (OSHA, 29 CFR 1910.20) are potentially applicable to remedial actions at the Building G Area.

These federal requirements are also implemented by the state of California under the Title 22 CCR promulgated under the Hazardous Waste Control Act.

3.2.4 To-Be-Considered Criteria

In addition to chemical, location, and action-specific ARARs, other federal and state advisories, criteria, and guidance developed by USEPA and/or state agencies may, as appropriate, be considered. These additional advisories, criteria, and guidance are referred to as TBC criteria.

Potential TBC criteria consistent with the chemical, location, and action-specific ARARs for the Building G Area include the DTSC-modified RSLs (Cal/EPA 2014) and USEPA RSLs (USEPA 2014) for residential soil, based on the District's desire to be able to use the site for any purpose in the future. A further discussion of the basis for these TBC criteria and their potential applicability to the removal action at the Building G Area are provided in Table 13. The DTSC--modified RSLs and USEPA RSLs for chemicals detected in soil in the excavation area are listed in Table 14.

3.3 Extent of Area of Excavation

In order to achieve the RAOs listed in Section 3.1, soil containing the highest Aroclor 1254 concentrations will be excavated. Therefore, borings MH-SB-76 and MH-SB-118 where Aroclor

1254 was detected in surface soils at concentrations of 1,500 µg/kg and 1,100 µg/kg, respectively, will be excavated. The proposed excavation will extend north to include MH-SB-120 where Aroclor 1254 was detected in surface soil at a concentration of 430 µg/kg, and south to the edge of concrete ramp, approximately 20 feet south of boring MH-SB-76. The excavation will be extended east to include soil step-out sampling locations MHS-SB-119 and MH-SB-121 where Aroclor 1254 was detected at concentrations of 340 µg/kg and 140 µg/kg, respectively. The excavation will be extended as far west as the edge of the concrete walkway. Based on the results of existing and step-out sampling locations collected from 1.5 feet bgs, the proposed excavation will be extended vertically to 1.5 feet, where Aroclor 1254 was not detected in most samples and was detected in only one sample at a concentration of 64 µg/kg. Figure 7 illustrates the lateral extent of the proposed excavation in the Building G Area, which measures approximately 45 feet long by 7 feet wide and is confined to the upper 1.5 feet bgs.

4 Alternative Evaluation

The purpose of this Section of the RAW is to identify and screen possible removal action alternatives that may best achieve the RAOs discussed in Section 3. The removal action alternatives were screened and evaluated on the basis of their effectiveness, implementability, and cost.

4.1 Identification and Analysis of Removal Action Alternatives

The response actions to address PCBs in shallow soil include no further action, capping in place, and excavation and off-site disposal. These response actions have been assembled into candidate removal alternatives for the Building G Area. Screening of several technology types using the above criteria was conducted to select removal actions for further evaluation. Based on this screening, the three removal actions identified and developed are:

- Alternative 1 – no further action
- Alternative 2 – containment/capping in place
- Alternative 3 – excavation/off-site disposal

4.1.1 Alternative 1 – No Further Action

As required by DTSC, the “No Further Action” alternative has been included to provide a baseline for comparisons among other removal alternatives. The “No Further Action” alternative would not require implementing any measures at the Building G Area, and no costs would be incurred. This action includes no institutional controls, no treatment of soil, and no monitoring.

4.1.2 Alternative 2 – Soil Containment/Capping in Place

This alternative would consist of capping the surface of the impacted area with six inches of engineered soil cover, asphalt, or asphalt/concrete pavement. The cap would be used to minimize the potential for receptors to contact the impacted soil. If capping were selected for the Building G Area, a total of approximately 315 square feet of soil would be covered. A land use restriction would be executed between DTSC and the District and recorded to ensure that the future uses of the Building G Area are consistent with the operation and maintenance of the cap. An operation and maintenance plan would be submitted and approved by DTSC. There would be an operation and maintenance agreement signed with DTSC specifying the operation and maintenance requirements and providing financial assurance for future operation and maintenance of the cap.

4.1.3 Alternative 3 – Soil Excavation/Off-site Disposal

The excavation/off-site disposal alternative would consist of removing and transporting PCB-impacted soil to an appropriate, permitted off-site facility for disposal. Due to access restrictions and the limited size of the excavation, excavation would be conducted with a mini-excavator. Excavation operations may generate dust emissions. Suppressant, water spray, or other forms of dust control may be implemented during excavation. Post-excavation soil sampling and PCB analysis would be conducted to confirm removal of impacted soil. Excavation would not require soil stockpiling prior to disposal. To achieve the RAOs, a total of approximately 315 square feet (45 feet long by 7 feet wide) of soil in the Building G Area would

be removed to a maximum depth of 1.5 feet bgs. The estimated volume of soil removed would be approximately 473 cubic feet or 18 cubic yards (yd^3).

4.2 Evaluation Criteria

Each removal action alternative was independently analyzed without consideration of the other alternatives. Each of the removal action alternatives was screened based on effectiveness, implementability, and cost.

4.2.1 Effectiveness

In the effectiveness evaluation, the following factors were considered:

- *Overall Protection of Human Health and the Environment* - This criterion evaluates whether the removal alternative provides adequate protection to human health and the environment and is able to meet the RAOs.
- *Compliance with ARARs/TBCs* – This criterion evaluates the ability of the removal alternative to comply with ARARs and TBCs.
- *Short - Term Effectiveness* – This criterion evaluates the effects of the removal alternative during the construction and implementation phase until removal objectives are met. It accounts for the protection of workers and the community during removal activities and environmental impacts from implementing the removal action.
- *Long-Term Effectiveness and Permanence* – This criterion addresses issues related to the management of residual risk remaining in soil in the Building G Area after a removal action has been performed and has met its objectives. The primary focus is on the controls that may be required to manage risk posed by treatment residuals and/or untreated wastes.
- *Reduction of Toxicity, Mobility, or Volume* – This criterion evaluates whether the removal technology employed results in significant reduction in toxicity, mobility, or volume of the hazardous substances.

4.2.2 Implementability

This criterion evaluates the technical and administrative feasibility of implementing the alternative, as well as the availability of the necessary equipment and services. This includes the ability to design and perform a removal alternative, ability to obtain services and equipment, ability to monitor the performance and effectiveness of technologies, and the ability to obtain necessary permits and approvals from the agencies, and acceptance by the State and the community.

4.2.3 Cost

This criterion assesses the relative cost of each technology based on estimated fixed capital for construction or initial implementation and ongoing operational and maintenance costs. The actual costs will depend on true labor and material cost, competitive market conditions, final project scope, and the implementation schedule.

4.3 Analysis of Removal Action Alternatives

Each alternative is discussed in the following sections.

4.3.1 Alternative 1 - No Further Action

4.3.1.1 Effectiveness

Assessment of overall protection of human health and the environment is based largely on the degree of certainty that an alternative can meet the established RAOs, meet the short- or long-term effectiveness criteria, or reduce toxicity, mobility, or volume of PCBs in soil. Alternative 1, “No Further Action” does not include any active removal steps; therefore, the existing conditions will remain in the soil. Therefore, Alternative 1 does not address the RAOs, meet the short- or long-term effectiveness criteria, or reduce toxicity, mobility, or volume of PCBs in the Building G Area.

4.3.1.2 Implementability

Because there is no action under Alternative 1,”No Further Action,” the criterion of technical implementability does not apply. The criterion of administrative implementability is not met because feasible removal actions have not yet been taken to address the PCB-impacted soil in the Building G Area.

4.3.1.3 Cost

The “No Further Action” alternative would not require implementing any measure at the Building G Area, and no cost would be incurred.

4.3.2 Alternative 2 – Soil Containment/Capping in Place

4.3.2.1 Effectiveness

The containment/capping in place alternative would involve minimal disturbance of the impacted soil. Therefore, there would be very little exposure and the short term risks would be low. The installation of a surface cap would require long-term inspection and maintenance to meet the ARARs and provide long term effectiveness. Periodic inspections would be required for settlement, cracking, ponding of liquids, and erosion. Additionally, precautions would have to be taken to ensure that the integrity of the cap was not compromised by land use activities.

Containment through surface capping would not lessen the toxicity of the PCBs in soil or reduce the volume of impacted soil, but would limit mobility and potential exposure.

4.3.2.2 Implementability

Containment is a relatively simple technology that is easily implemented and can be easily installed. Obtaining community and regulatory approval for unrestricted land use could be difficult since the Aroclor 1254 would remain in shallow soil at the Building G Area.

4.3.2.3 Cost

The estimated cost for capping including operation and maintenance for the next 30 years is approximately $150,000.

4.3.3 Alternative 3 – Soil Excavation/Off-site Disposal

4.3.3.1 Effectiveness

Potential short-term risks to workers within the exclusion zone, public health, and the environment could result from dust or particulates that may be generated during excavation and

soil handling activities. These risks could be mitigated using personal protective equipment for workers within the exclusion zone and engineering controls, such as dust suppression and equipment operating safety procedures, for protection of the surrounding community and to meet all ARARs. Excavation and disposal would remove Aroclor 1254-impacted soil from the Building G Area, and therefore, reduce the long term risks and accomplish the RAOs. Excavation and off-site land disposal of the impacted soil will result in the reduction of the overall volume of impacted soil. Impacted soil will be transported off-site to an engineered landfill suitable for receiving the reported concentrations of Aroclor 1254.

4.3.3.2 Implementability

Excavation/off-site disposal is a well-known proven technology that is a common method for cleaning up impacted soil. It is a relatively simple process, with proven results. Equipment and labor required to implement this alternative are uncomplicated and readily available. The shallow depth and the small size of the identified impacted area make excavation readily implementable. It is anticipated that regulatory approval would be granted since it is a proven and permanent technology. Acceptance by the State and the community for this alternative is considered high.

4.3.3.3 Cost

The estimated cost for excavation, transportation, and disposal of the Class III PCB-impacted soils is approximately $250,000. This estimate includes planning, permitting, excavation/removal, transportation, and disposal of impacted soil at an approved off-site disposal facility, post-excavation sampling, and reporting.

4.4 Comparative Analysis of Removal Action Alternatives

A comparative analysis was conducted to identify the advantages and disadvantages of each removal alternative. The comparative analysis of the removal alternatives was conducted to address the criteria listed is Section 4.2.

4.4.1 Effectiveness

Under the no further action alternative, the impacts associated with the Aroclor 1254 would not be addressed. Consequently, there would be no reduction in the concentrations and the overall RAOs would not be achieved.

The containment/capping in place reduces potential exposure to Aroclor 1254. Once implemented, the containment/capping in place alternative would require long term monitoring to ensure its effectiveness. In addition, the District would like to be able to maintain the existing landscape and layout (planter and grassy area) for the enjoyment of students and staff. Furthermore, the District would like to be able to use the area for any use over the long term, including residential; therefore, its risk management decisions consider future unrestricted use. Consequently, capping is not considered feasible given the current and potential future land use.

The excavation/off-site disposal alternative would remove Aroclor 1254 from the Building G Area, would not require any further management or site controls, and would achieve the RAOs. The excavation/off-site disposal alternative would require removing, handling, and transporting

the impacted soil, resulting in potential higher short-term exposure risks. However, considering the low -Aroclor 1254 concentrations being excavated, the size of the excavation (315 square feet), and the volume of the soil excavated, it is expected that these risks can be sufficiently mitigated through site control measures.

Based upon the evaluation, Alternative 3 is recommended.

4.4.2 Implementability

No measures will be implemented for the no further action alternative. The containment/capping in place and excavation/off-site disposal alternatives are both well proven, readily implementable technologies. However, only Alternative 3 would achieve the RAOs. Accordingly, Alternative 3 is recommended.

4.4.3 Cost Effectiveness

Since Alternative 1 is unsuitable for use at the Building G Area, and Alternative 2 does not meet the RAOs, Alternative 3 is the most effective solution for the Building G Area. The RAW cost estimate is presented below.

Removal Action Cost Estimate	
Preparation of a RAW	$ 75,000
Field Excavation and Testing	$ 100,000
Transport and Disposal of Excavated Soils	$ 5,000
Site Restoration	$ 15,000
Preparation of a Removal Action Completion Report	$ 55,000
Total	**$ 250,000**
Notes: Based on previous soil sampling results, it is assumed that all soil will be disposed of at a Class III landfill	

4.5 Recommended Removal Action Alternative

Based on the comparative analysis described in Section 4.4, Alternative 3 is the preferred and recommended removal action alternative for addressing the Building G Area. This alternative is recommended because it meets the RAOs, is protective of human health and the environment, and is cost effective.

5 Removal Action Implementation

Implementation of the RAW is planned during Winter Break 2014, while school is not in session. ENVIRON anticipates that soil removal activities will be completed within five working days. Backfilling activities and restoration of the excavated area to its original condition are anticipated to be completed in two working days. To meet the RAOs, the most effective remedial action has been determined to be soil removal, consisting of soil excavation and off-site disposal. Upon receipt of DTSC's approval, removal activities will be performed by a California-licensed contractor with supervision by a California-professional geologist or professional Civil Engineer.

Soil removal, transportation, and disposal will be performed in accordance with applicable federal, state, and local laws, regulations, and ordinances. Existing soil data will be used to characterize the excavated soil for disposal purposes. Field operations will follow the suggested operational guidelines to prevent cross-media transfer of contaminants, as specified in *"Best Management Practices (BMP) for Soils Treatment Technologies"* (U. S. EPA 530-R-97-007). Figure 7 illustrates the proposed excavation area for PCBs in the Building G Area as well as the sampling results for the previous investigations at each of those locations.

5.1 Health and Safety Plan

All contractors will be responsible for operating in accordance with the most current requirements of Title 8, CCR, section 5192 (8 CCR 5192) and Title 29, Code of Federal Regulations (CFR), section 1910.120 (29 CFR 1910.120), Standards for Hazardous Waste Operations and Emergency Response (HAZWOPER). On-site personnel are responsible for operating in accordance with all applicable regulations of the Occupational Safety and Health Administration (OSHA) outlined in 8 CCR General Industry and Construction Safety Orders and 29 CFR 1910 and 29 CFR 1926, Construction Industry Standards, as well as other applicable federal, state and local laws and regulations. All personnel shall operate in compliance with all California OSHA requirements.

An existing Health and Safety Plan (HASP) was prepared for the site and was used during the execution of the PEA Work Plan. The existing HASP has been modified to include excavation of the Building G Area. A copy of the revised HASP is included in Appendix B.

The provisions of the HASP are mandatory for all MHS personnel and its contractors who are at the site. All subcontractors conducting fieldwork in association with this RAW will either adopt and abide by the HASP or develop their own safety plans, which, at a minimum, meet the requirements of the HASP. All on-site personnel shall read the HASP and sign a log to be provided by the site Health and Safety Officer before initiating activities at the Building G Area.

5.2 Field Documentation

ENVIRON will be responsible for maintaining Field Investigation Daily Reports (Daily Reports) during the excavation activities. The Daily Reports will serve to document observations, personnel in the Building G Area, equipment arrival and departure times, and other vital project information.

5.2.1 Field Investigation Daily Reports

Daily Reports will document where, when, how, and from whom any vital project information was obtained. Daily Report entries will be complete and accurate enough to permit reconstruction of field activities. Daily Reports will be consecutively numbered. Each page will be dated and the time of entry noted. All entries will be legible, written in ink, and signed by the individual making the entries. Language will be factual, objective, and free of personal opinions or other terminology, which might prove inappropriate. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Corrections will be dated and initialed. No entries will be obliterated or rendered unreadable.

Entries in the Daily Reports will include at a minimum the following for each fieldwork date:

- Site name and address
- Recorder's name
- Team members and their responsibilities
- Time of site arrival/entry on Site and time of site departure - Other personnel on-site
- A summary of any on-site meetings
- Quantity of impacted soils (in terms of RCRA hazardous wastes, non-RCRA hazardous waste, and non-hazardous wastes) excavated
- Quantity of impacted soils (in terms of RCRA hazardous wastes, non-RCRA hazardous waste, and non-hazardous wastes) temporarily stored on-site, if any.
- Quantity of excavated soils in truckloads (in terms of RCRA hazardous wastes non-RCRA hazardous waste, and non-hazardous wastes) transported off-site
- Names of waste transporters and proposed disposal facilities
- Copies or numbers of manifests or other shipping documents (such as bill of lading) for waste shipments
- Quantity of import fill material in truckloads, if any
- Deviations from this RAW
- Changes in personnel and responsibilities as well as reasons for the changes
- Levels of safety protection
- Calibration readings for any equipment used and equipment model and serial number

At a minimum, the following information will be recorded each day of sample collection:

- Sampler's name(s)
- Sample locations and general description
- Type of sampling equipment used
- Field observations and details important to analysis or integrity of samples (e.g., heavy rains, odors, colors, etc.)

- Instrument readings (e.g., photoionization detector, etc.)
- Chain-of-custody form numbers and chain-of-custody seal numbers
- Transport arrangements (courier delivery, lab pickup, etc.)
- Recipient laboratories

5.2.2 Chain of Custody

Chain-of-custody records are used to document sample collection and shipment to the laboratory for analysis. All sample shipments for analyses will be accompanied by a chain-of-custody record. Form(s) will be completed and sent with the samples for each laboratory and each shipment. If multiple coolers are sent to a single laboratory on a single day, chain-of-custody form(s) will be completed and sent with the samples in each cooler. The chain-of-custody record will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until receipt by the laboratory, the custody of the samples will be the responsibility of the sample collector.

The shipping containers in which samples are stored (usually sturdy picnic cooler or ice chest) also will be sealed with self-adhesive custody seals any time they are not in someone's possession or view before shipping. All custody seals will be signed and dated.

The following information will be recorded on the sample labels and on the chain-of-custody record:

- Sample identification number
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or grab
- Type of sample (i.e., matrix)
- Type of preservation, if any

5.2.3 Photographs

Photographs will be taken of the excavation area, post-excavation sample locations, and other areas of interest at the Building G Area to document the removal action. Photographs will serve to verify information entered on the Daily Report. When a photograph is taken, the following information will be written on the Daily Report or will be recorded in a separate field photography log:

- Time, date, location, and, if appropriate, weather conditions
- Description of the subject photographed
- Name of person taking the photograph

5.3 Site Preparations and Security Measures

Prior to equipment mobilization for the proposed removal action, preparation activities may include inspections, surveying, boundary staking, and fencing installation around the Exclusion Zone.

5.3.1 Delineation of Excavation Area

The areal limits of the excavation will be delineated by ENVIRON, in consultation with DTSC representatives, before commencement of removal activities. The area to be excavated shall be called the "Excavation Area" and it will be marked in the field by ENVIRON with stakes and/or high visibility paint.

5.3.2 Utility Clearance

Prior to commencement of excavation, ENVIRON will notify Underground Service Alert (USA) of its intent to conduct excavations, in accordance with California State law (Assembly Bill AB 73). The proposed excavation location will be clearly marked with white paint or surveyors flagging, as required by USA. USA will contact all utility owners of record within the vicinity of the Building G Area and notify them of ENVIRON's intention to conduct excavation in proximity to buried utilities. All utility owners of record, or their designated agents, will be expected to clearly mark the position of their utilities on the ground surface up to the Building G Area boundary. ENVIRON also will work with the District to identify any buried utilities. ENVIRON will also contract a private utility locating service to survey the areas to be excavated using subsurface geophysical methods to avoid any underground pipes, utilities, or other metallic features that may potentially be present.

5.3.3 Security Measures

Appropriate barriers will be installed prior to beginning the excavation process to ensure that all work areas are secure and safe. To ensure trespassers or unauthorized personnel are not allowed near work areas, security measures will be implemented, including fencing around the Building G Area, as depicted on Figure 8. Fencing locations may be adjusted slightly in the field, therefore depicted locations are approximate. If access to work areas is planned, visitors will be briefed regarding the site-specific HASP (see Appendix B). A safe and secure work area will be maintained, including in areas where equipment is stored or placed, at the close of each workday.

5.3.4 Control Of PCB-Impacted Soil

Measures will be implemented during soil excavation activities to prevent potential exposure of excavated soil to the adjacent areas. The nearest occupied and/or residential areas in the vicinity of the area addressed by this RAW are located uphill and at least a mile way away from the area to be excavated. Excavation will take place during winter break, when school is not in session, to minimize exposure to faculty and students. Based on these factors, and because air monitoring procedures (see Section 5. 5) and measures to reduce dust emissions (see Section 5.6) will be implemented during excavation activities, particulate migration of Aroclor 1254 outside the excavation area is not expected.

5.3.5 Permits and Plans

All necessary permits or approvals will be obtained prior to the implementation of the removal action.

5.4 Excavation

All fieldwork will be completed by properly trained and equipped hazardous waste workers. Impacted soil will be removed with a mini-excavator. As soil is excavated, it will be transferred into a bobcat bucket. The bobcat will then transport the soil from the excavation area, north and around of Building G, and will load it directly into roll-off bins temporarily stored at the westernmost perimeter fencing. Areas traversed by the bobcat carrying the excavated soil will be lined with Visqueen plastic sheeting overlain with plywood. These areas include the concrete walkway east of Building G and directly adjacent to the proposed excavation area, the concrete area north of Building G, and the asphalt and a portion of the parking lot where the roll off bins will be stored. Dust generation will be controlled through wetting the soil and air monitoring will be conducted at locations depicted on Figure 8 to confirm particulate concentrations are acceptable. A portion of the hillside north of Building G, the lower half of the wall in proximity to the westernmost perimeter, and the grass and picnic areas, in proximity to the roll off bins and excavation area will be covered with Visqueen plastic sheeting during excavation activities to reduce the potential deposition of dust and soil particulates during soil loading procedures. Excavation will not be conducted during times of high wind conditions (e.g., wind speed in excess of 25 miles per hour). Visqueen plastic lining and plywood will be taken down and removed from the Building G Area and site immediately after completion of excavation activities.

5.4.1 Confined Space Entry Requirements

For the proposed removal action, confined-space entry procedures do not apply.

5.4.2 Soil Staging and Storage Operations

Excavated soil is anticipated to be stored on-site only during excavation activities. The excavated soil will be staged in covered roll-off bins, at the westernmost fenced off area, as depicted on Figure 8, until appropriate arrangements have been made for licensed trucks to transport the excavated soils off-site.

5.4.3 Decontamination Area

Each piece of equipment used for excavation will have a clean-out bucket or continuous edge across the cutting face of its bucket. Unless otherwise approved by DTSC for hard or rocky soils, or other site-specific conditions, no excavation will be permitted with equipment utilizing teeth across the cutting edge of its bucket.

Entry to the impacted area will be fenced off and limited to avoid unnecessary exposure and related transfer of PCBs. Equipment that comes into direct contact with PCB-impacted soil or water will be decontaminated to assure the quality of samples collected and/or to avoid cross contamination. Disposable equipment intended for one time use will not be decontaminated, but will be packaged for appropriate disposal. Decontamination will

occur prior to and after each designated use of a piece of equipment, using the following procedures:

- Non-phosphate detergent and tap water wash, using a brush if necessary.
- Tap-water rinse.
- Initial deionized/distilled water rinse.
- Final deionized/distilled water rinse.

Trucks that come into direct contact with potentially impacted soil will be decontaminated prior to leaving the Exclusion Zone to prevent the off-site tracking of impacted soil. Trucks will be visually inspected before leaving the Exclusion Zone and any dirt adhering to the exterior surfaces will be brushed off and collected on plastic sheeting. The storage bins or beds of the trucks will be inspected to ensure the loads are properly covered and secured. Excavation equipment surfaces also will be brushed off over plastic sheeting prior to removing it from the exclusion zone.

Equipment will be decontaminated in a pre-designated area on pallets or plastic sheeting. Clean bulky equipment will be stored on plastic sheeting in uncontaminated areas. Cleaned small equipment will be stored in plastic bags. Materials to be stored for more than a few hours will also be covered.

5.4.4 Excavation Plan

The initial excavation consists of the Building G Area discussed in Section 3.3 and shown on Figure 7. The initial excavation will produce approximately 18yd^3 of soil, or approximately 26 tons using a conversion factor of 1.5 tons per yd^3.

5.5 Air and Metrological Monitoring

Air and meteorological monitoring are designed to achieve several goals:

- Identify and measure the particulates generated during the soil removal and decontamination activities to assign the appropriate personal protective equipment and safety systems specified for those activities.
- Provide feedback to site operations personnel regarding potential hazards from exposure to hazardous air contaminants generated through excavation activities.
- Identify and measure particulates at points outside of the soil removal and exclusion zones.

Air monitoring will be conducted during work activities to measure potential exposure of sensitive receptors to site chemical constituents, as a result of removal activities.

5.5.1 Air Monitoring

Air monitoring will be performed during excavation activities in which impacted or potentially impacted soils are being disturbed or handled:

- Monitoring dust levels around the perimeter of the Exclusion Zone (fenced area) as depicted on Figure 8. ENVIRON will also monitor dust levels within the work zone using a hand-held air monitor. ENVIRON will have the authority to stop work in the event that on-site activities generate dust levels that exceed the site or community action levels (see the chart below). ENVIRON will monitor on-site meteorological instrumentation and/or coordinate with off-site meteorological professionals to identify conditions that require cessation of work, (e.g., winds in excess of 25 miles per hour [mph], which is defined as high wind condition by the South Coast Air Quality Management District [SCAQMD]).
- Assuring that all real-time aerosol monitors and hand-held industrial hygiene air sampling equipment and media are properly calibrated and in good working condition. Real-time, data-logging aerosol monitors (e.g., MIE DataRAM or equivalent) will be used to measure dust levels around the fenced perimeter of the Building G Area. These monitors will measure particles with an aerodynamic diameter of 0.1 to 10 µm (micrometer). Real-time information will be posted daily, and discussed with site workers. Hand held air monitors such as the Thermo Personal Data RAM will be used in the work zone to monitor potential worker exposure during excavation activities.
- Coordinating general site safety activities including all daily hazard communication, safety practices, and procedure briefings.
- Oversight of personal decontamination practices.
- Performing general site safety leadership, support, and recordkeeping activities.
- Developing air monitoring strategy and methodologies.
- Implementing the overall strategy for controlling both on-site and off-site exposures to control the respirable dust levels around the fenced perimeter of the Building G Area. Up to four MIE DataRAM (or equivalent) monitors will be placed along the fence lines as depicted on Figure 8.

Air monitoring will be conducted over an 8 -10 hour period each day when the RAW activities are conducted. The air-monitoring professional will check the worker exposure monitor every 15 minutes during operation. In consultation with DTSC, this frequency may be changed based on site conditions and newly available data.

Due to the fact that Aroclor 1254 is not volatile, ENVIRON will focus on monitoring and controlling the airborne respirable dust levels generated by the removal activities. If the respirable dust levels are limited to the Action Level or less as specified in the chart below, the exposure levels to the Aroclor 1254 is expected to be negligible.

Exposure Guidelines for Site Chemical Hazards

Chemical Name	Odor Threshold	CAL/OSHA PEL[a]	ACGIH TLV[b]	Site Action Levels[c]	Community Action Level (Fence Line)
Respirable Dust	Not Applicable	5 mg/m^3	5 mg/m^3	2.5 mg/m^3	0.05 mg/m^3 [d] (Measured as the difference between upwind and downwind, simultaneous monitoring over a 5-hour period)

Notes:

mg/m^3 – milligrams per cubic meter

[a] Permissible Exposure Limits (Cal/OSHA Article 107, Table AC1).

[b] 1990-1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists.

[c] Site Action Level is based on 50% of the 8-hour Time Weighted Average (TWA) Permissible Exposure Limit (PEL). Since the air concentrations are being monitored continuously and read every 15 minutes, and actions will be taken immediately to reduce the dust levels if the action level is met or exceeded, the 8-hour exposure is not expected to exceed the TWA PEL.

[d] Community action level for Particulate Matter Of Size Less Than Or Equal To 10 Micrometers (PM_{10}) is based on the SCAQMD Rule 403. It should be noted that the SCAQMD does not require monitoring or sampling. The SCAQMD may, however, choose to conduct the simultaneous sampling itself, as the difference between upwind and downwind samples collected on high-volume particulate matter samplers or using other USEPA-approved equivalent method for PM_{10} monitoring.

5.5.2 Meteorological Monitoring

From January through November, the reported prevailing wind direction in Malibu is from the southwest to the northeast. In December, the prevailing wind direction is reported to be from the south to the north. To confirm the wind direction and other metrological data during excavation activities, ambient weather conditions (wind speed and direction, and relative humidity) will be monitored by the following methods: an on-site meteorological station, real-time weather websites, or the National Weather Service (if a local station can provide data relevant to the site). Meteorological monitoring will be performed simultaneously with the excavation activities to ensure that all necessary precautions have been taken.

5.6 Dust Control Plan

If required, in consultation with DTSC, ENVIRON will implement appropriate procedures to control the airborne dusts generated by soil removal activities. Such procedures will include but will not be limited to the following:

- The air monitoring professional will monitor dust levels at the locations depicted on Figure 8. Locations of air monitoring stations may be adjusted in the field depending on the prevailing wind direction observed and recorded during excavation activities. The air monitoring professional will have the authority to stop work in the event that activities within the work zone or Exclusion Zone generate dust levels in excess of the on-site PM_{10} action level of 2.5 mg/m^3 or in a high wind condition. The PM_{10} data from the fence line monitors will log

continuously, will be checked manually every 15 minutes, will be downloaded at the end of each work day, and will be analyzed as differential upwind/ downwind 5-hour rolling average concentrations. The results will be compared to 50 micrograms per cubic meter ($\mu g/m^3$) and will be largely used to gauge the excavation activities and to modify the PM_{10} action level, if necessary. Generation of dust during the removal operations will be minimized on an as-needed basis with the use of water as a dust suppressant. The water will be available via a water truck filled with water from a metered discharge from a fire hydrant located proximate to the Building G Area. The excavation contractor will control dust generation by spraying water prior to daily work activities, during excavation/loading activities (as necessary to maintain concentrations below action levels), and at truck staging locations. Watering equipment will be continuously available to provide proper dust control.

- Real-time dust monitors will be calibrated daily and will be set to log dust levels over 5-minute periods. Monitors will be set to collect particulates of size range PM 2.5 to PM 10. Perimeter air monitoring will be conducted using MIE DataRAM (or equivalent). Air monitoring of the work zone will conducted using a hand held monitor such as a Thermo Personal Data Ram. Respirator selection criteria for the on-site workers can be found in Appendix B – Health and Safety Plan.

5.7 Field Variances

Variances from the RAW will be discussed with DTSC prior to any action being taken except for emergencies (when an immediate response is required). The DTSC will be notified if an emergency response is implemented. The field variances will be documented in the RACR.

6 Sampling and Analysis Plan

6.1 Post-Excavation Incremental Soil Sampling of Excavated Areas

Post-excavation soil sampling will be conducted using the DTSC-approved incremental sampling methodology that previously was used in implementation of the PEA Work Plan. Two Decision Units (DU) have been identified for the post-excavation soil samples: 1) DU-1 is comprised of the bottom of the excavation and 2) DU-2 is comprised of the sidewalls (northern, eastern, and part of the southern wall where soil is exposed) of the excavation. Each DU will be divided into 30 grids for a total of 60 grids. Following the same procedures used during implementation of the PEA Work Plan, three incremental soil sampling borings (i.e., A, B, and C) will be randomly selected within each grid in a given DU for a total of 180 borings (90 borings in DU-1 and 90 borings in DU-2). At each boring location, one soil sample will be collected from the surface. For each DU, soil sample increments will be combined in the laboratory (i.e., into A, B, and C increments) and will be analyzed for PCBs, specifically Aroclor 1254, using USEPA Method 8082 on an expedited turn-around time for incremental sample analysis (4 working days).

6.2 Data Quality Assurance/Quality Control

6.2.1 Field QC Procedures

Quality control (QC) samples will consist of a laboratory duplicate. A laboratory duplicate is a subsample of one of the increments, after processing the soil for the increment as described above, and will be analyzed and handled in the same manner as the primary incremental sample. The laboratory duplicate will serve to assess the precision of the laboratory processing of the incremental sampling.

6.2.2 Validation and Verification Methods

Initial data reduction, validation, and reporting will be performed by the laboratory as described in the laboratory SOPs included in Appendix J of the PEA Work Plan. Data validated outside the laboratory will be performed by Laboratory Data Consultants at Level III, as described in the USEPA Contract Laboratory Program National Functional Guidelines for both organic and inorganic data review (USEPA 2008, USEPA 2010).

6.3 Waste Disposal Classification Sampling

Existing soil data collected from the excavation area within Building G Area will be used to evaluate appropriate off-site disposal of excavated soil.

7 Transportation Plan

Existing soil data will be used to profile the excavated soil before it is transported off-site for disposal (see Section 6.3). Based on the analytical results gathered during previous investigations, the soil excavated from the Building G Area will be handled as non-hazardous waste, and will be transported to a Class III landfill to be recycled for alternate daily cover. Currently, the removal action contractor plans to transport the excavated soil to the Waste Connections - Chiquita Canyon Landfill for disposal.

7.1 Truck Transportation

ENVIRON estimates that up to 26 tons of soil will be removed from the Building G Area. Assuming each truck carries up to 15 tons, two trucks will be needed to transport the impacted soil to the off-site disposal facility. All permitted disposal facilities operate a certified weight station at their facility. As such, each truck will be weighed before off-loading its payload. Weight tickets or bills of lading will be provided to the removal action subcontractor after all the soil has been shipped off-site.

7.2 Site Traffic Control

During soil transport activities, trucks will enter the site from Morning View Drive as depicted on Figure 10. The trucks will then make a right on a gated alley way that separates MHS from JCES, and then turn right onto the parking lot north of Building K through a chain linked fence and stop at the western most perimeter fenced area where the roll-off bins will be stored and where they will be loaded onto the trucks. Transportation will be coordinated in such a manner that at any given time, on-site trucks will be in communication with the removal action contractor. In addition, trucks will be required to maintain slow speeds (i.e. less than 5 miles per hour) for safety and dust control purposes.

Prior to exiting the loading/fenced area, the trucks will be swept to remove any extra soil or dust to minimize transport of potentially impacted soil. Prior to off-site transport, the trucks will be inspected to ensure that the roll-off bins are securely covered and cleaned of excess soil, properly placarded, and that the truck manifest has been completed and signed by the generator and the transporter. Once loaded, the trucks will leave the loading fenced area and exit the site through the same alley they used to come to the site, back to Morning View Drive, to Pacific Coast Highway.

7.3 Backfill and Site Restoration

There are no current plans to redevelop the Building G Area; therefore, the area will be backfilled with clean soil and restored to its original condition. Imported fill material will be sampled prior to the start of the field work and the results will be submitted to the DTSC for approval. Sampling of the fill material will be conducted in accordance with DTSC's guidelines entitled "*Information Advisory, Clean Imported Fill Material*," dated October 2001.

7.4 Record Keeping

The removal action contractor will be responsible for maintaining daily field reports, which will serve to document observations, personnel within the Exclusion Zone, equipment arrival and departure time, and other important project information. Report entries will be complete and

accurate enough to permit reconstruction of field activities. Report entries will be consecutively numbered and each page will indicate the date and time of the entry. All entries will be legible and wet signed by the author. Language will be factual and objective. If an error is made, corrections will be made by crossing a line through the error and entering the correct information. Corrections will be detailed and initialed.

Based on existing soil data, excavated soils are expected to be profiled as non-hazardous and sent off-site for disposal. Soil disposal will be documented using a Non-Hazardous Waste Manifest. At a minimum, this form will include the following information:

- Generator name and address
- Transportation Company
- Receiving facility name and address
- Waste shipping name and description
- Quantity shipped

Prior to transporting the excavated soil off-site, an authorized representative of the District will sign the non-hazardous waste manifest.

8 Public Participation

The public participation requirements and activities for the RAW process include:

1. The development of a community profile);
2. Conducting community interviews;
3. Publishing a notice of the availability of the RAW for public review and comments;
4. Making the RAW and other supporting documents available at DTSC's office and in a local information repository; and
5. Responding to public comments received on the RAW and California Environmental Quality Act (CEQA) documents.
6. A community update will be sent out to the site mailing list describing the Building G Area and the proposed removal action;
7. The length of the public review and comment period will be 30 calendar days; and
8. Produced final documents will be available in electronic format on DTSC's publicly accessible EnviroStor database and at the MHS Library and Malibu Public Library.

DTSC may hold a workshop, based on significant community interest, during the public review comment period. Once the public review comment period has expired, DTSC will review and respond to the comments received. The RAW will be revised as necessary, to address the comments received. If significant changes to the RAW are required, the RAW will be revised and resubmitted for public review and comments. If significant changes are not required to the RAW, the RAW will be modified and DTSC will approve the modified RAW for implementation.

9 California Environmental Quality Act Documentation

CEQA requires public agencies to evaluate the potential effects of projects on a full-range of physical environmental conditions, including land, air, water, mineral, flora, fauna, noise, and objects of historical or aesthetic significance. CEQA applies to all discretionary projects proposed to be carried out or approved by California public agencies, unless an exemption applies. DTSC has considered the potential impacts of the selected removal action alternative activities upon existing environmental conditions and concluded that the environmental safeguards and monitoring procedures included as part of this RAW, which are a condition of project approval, will ensure that impact to the environment will be less than significant. As a result, DTSC has found that the project is exempt from further environmental review under CEQA and has prepared a Notice of Exemption (NOE) that DTSC intends to file with the State at the time the final RAW is approved.

10 Project Schedule and Report of Completion

The District is prepared to proceed with removal activities upon receiving approval for this RAW. The RAW will be implemented in accordance with the schedule included in Appendix C. A RACR, documenting all activities conducted pursuant to the approved RAW and certifying that all activities have been conducted consistent with this RAW, will be prepared as expeditiously as possible upon completion of the remedial action and submitted to DTSC for review and approval.

Note that ENVIRON currently plans to conduct the removal action during Winter Break, weather permitting. If, for some unforeseen circumstances, the removal action cannot be conducted during that time, it will be conducted during the next interval during which the school is closed (e.g., Spring Break). The removal action will be conducted outside of school hours when school is not in session for a period of at least one week.

11 References

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CFR. National Oil and Hazardous Substances Pollution Contingency Plan. (40 CFR 300).

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Tables

Table 1. AOI-5 Organochlorine Pesticides in Soil - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Area of Interest (AOI)	Sample ID	Sample Date	Depth (feet bgs)	Pesticides (Organochlorine) in µg/kg										
				4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	alpha-BHC	beta-BHC	Chlordane (total)	delta-BHC	Dieldrin	Endosulfan I	Endosulfan II
Residential DTSC-Modified RSL or USEPA RSL				**2,200**	**1,600**	**1,900**	**31**	**85**	**300**	**1,800**	**NA**	**33**	**370,000**	**370,000**
AOI-5 - Buildings Constructed Prior to 1981	MH-SB-10	7/9/2014	0	< 5.0	59	< 5.0	< 5.0	< 5.0	< 5.0	< 50	< 9.9	< 5.0	< 5.0	< 5.0
	MH-SB-10	7/9/2014	1.5	< 5.0	26 J	< 5.0	< 5.0	< 5.0	< 5.0	< 50	< 9.9	< 5.0	< 5.0	< 5.0
	MH-SB-11	7/9/2014	0	< 4.9	6.0	< 4.9	< 4.9	< 4.9	< 4.9	< 49	< 9.9	< 4.9	< 4.9	< 4.9
	MH-SB-11	7/9/2014	1.5	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 49	< 9.9	< 4.9	< 4.9	< 4.9
	MH-SB-13	7/9/2014	0	< 4.9	22	< 4.9	< 4.9	< 4.9	< 4.9	88	< 9.9	< 4.9	< 4.9	< 4.9
	MH-SB-13	7/9/2014	1.5	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 49	< 9.9	< 4.9	< 4.9	< 4.9
	MH-SB-14	7/9/2014	0	< 5.0	7.0	< 5.0	< 5.0	< 5.0	< 5.0	< 50	< 9.9	< 5.0	< 5.0	< 5.0
	MH-SB-14	7/9/2014	1.5	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 49	< 9.9	< 4.9	< 4.9	< 4.9
	MH-SB-76	7/9/2014	0	< 5.0	46	< 5.0	< 5.0	< 5.0	< 5.0	< 50	< 9.9	< 5.0	< 5.0	< 5.0
	MH-SB-76	7/9/2014	1.5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 50	< 9.9	< 5.0	< 5.0	< 5.0
	MH-SB-77	7/9/2014	0	< 4.9	50	< 4.9	< 4.9	< 4.9	< 4.9	< 49	< 9.9	< 4.9	< 4.9	< 4.9
	MH-SB-77	7/9/2014	1.5	< 5.0	11	< 5.0	< 5.0	< 5.0	< 5.0	< 50	< 9.9	< 5.0	< 5.0	< 5.0
	MH-SB-79	7/9/2014	0	< 5.0	23	< 5.0	< 5.0	< 5.0	< 5.0	< 50	< 9.9	< 5.0	< 5.0	< 5.0
	MH-SB-79	7/9/2014	1.5	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 49	< 9.9	< 4.9	< 4.9	< 4.9

Notes:
µg/kg - micrograms per kilogram
DTSC - Department of Toxic Substances Control
USEPA - United States Environmental Protection Agency
RSLs - Regional Screening Levels
bgs - below ground surface
NA - not available
J - Results and/or reporting limits are estimated
Field duplicates are shown in italics
Pesticides by USEPA Method 8081A

Table 1. AOI-5 Organochlorine Pesticides in Soil - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Area of Interest (AOI)	Sample ID	Sample Date	Depth (feet bgs)	Pesticides (Organochlorine) in µg/kg								
				Endosulfan Sulfate	Endrin	Endrin aldehyde	Endrin ketone	gamma-BHC	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene
Residential DTSC-Modified RSL or USEPA RSL				**370,000**	**18,000**	**18,000**	**18,000**	**560**	**120**	**59**	**310,000**	**480**
AOI-5 - Buildings Constructed Prior to 1981	MH-SB-10	7/9/2014	0	< 9.9	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 200
	MH-SB-10	7/9/2014	1.5	< 9.9	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 200
	MH-SB-11	7/9/2014	0	< 9.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 200
	MH-SB-11	7/9/2014	1.5	< 9.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 200
	MH-SB-13	7/9/2014	0	< 9.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 200
	MH-SB-13	7/9/2014	1.5	< 9.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 200
	MH-SB-14	7/9/2014	0	< 9.9	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 200
	MH-SB-14	7/9/2014	1.5	< 9.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 200
	MH-SB-76	7/9/2014	0	< 9.9	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 200
	MH-SB-76	7/9/2014	1.5	< 9.9	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 200
	MH-SB-77	7/9/2014	0	< 9.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 200
	MH-SB-77	7/9/2014	1.5	< 9.9	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 200
	MH-SB-79	7/9/2014	0	< 9.9	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 200
	MH-SB-79	7/9/2014	1.5	< 9.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 200

Notes:
µg/kg - micrograms per kilogram
DTSC - Department of Toxic Substances Control
USEPA - United States Environmental Protection Agency
RSLs - Regional Screening Levels
bgs - below ground surface
NA - not available
J - Results and/or reporting limits are estimated
Field duplicates are shown in italics
Pesticides by USEPA Method 8081A

Table 2. AOI-5 Organophosphate Pesticides in Soil - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Area of Interest (AOI)	Sample ID	Sample Date	Depth (feet bgs)	Pesticides (Organophosphates) in µg/kg											
				2-Butenoic acid, 3-[(dimethoxy-phosphinyl)oxy]-, m	Chlorpyrifos	Co-Ral	Dasanit	Demeton (Demeton O + Demeton S)	Diazinon	Dichlorovos	Dimethoate	Disulfoton	Ethoprop	Ethyl P-Nitorphenyl Benzenethio-phosphate	Famphur
Residential DTSC-Modified RSL or USEPA RSL				**NA**	**62,000**	**NA**	**NA**	**2,500**	**43,000**	**1,800**	**12,000**	**2,500**	**NA**	**620**	**NA**
AOI-5 - Buildings Constructed Prior to 1981	MH-SB-10	7/9/2014	0	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-10	7/9/2014	1.5	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-11	7/9/2014	0	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-11	7/9/2014	1.5	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-13	7/9/2014	0	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-13	7/9/2014	1.5	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-14	7/9/2014	0	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-14	7/9/2014	1.5	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-76	7/9/2014	0	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-76	7/9/2014	1.5	< 33	< 33	< 33	< 33 J	< 65 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-77	7/9/2014	0	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-77	7/9/2014	1.5	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-79	7/9/2014	0	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33
	MH-SB-79	7/9/2014	1.5	< 33	< 33	< 33	< 33 J	< 66 J	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33

Notes:
µg/kg - micrograms per kilogram
DTSC - Department of Toxic Substances Control
USEPA - United States Environmental Protection Agency
RSLs - Regional Screening Level
bgs - below ground surface
NA - not available
J - Results and/or reporting limits are estimated
Field duplicates are shown in italics
Pesticides by USEPA Method 8141A

Table 2. AOI-5 Organophosphate Pesticides in Soil - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Area of Interest (AOI)	Sample ID	Sample Date	Depth (feet bgs)	Pesticides (Organophosphates) in µg/kg													
				Fenthion	Guthion	Malathion	Methyl parathion	O,O,O-Triethyl phosphorothioate	O-Ethyl O-2,4,5-trichlorophenyl ethyl-phosphonothioate	Parathion	Phorate	Prothiophos	Ronnel	Stirophos	Sulfotepp	Sulprofos	Thionazin
Residential DTSC-Modified RSL or USEPA RSL				**NA**	**NA**	**1,200,000**	**15,000**	**NA**	**NA**	**370,000**	**12,000**	**NA**	**3,100,000**	**22,000**	**31,000**	**NA**	**NA**
AOI-5 - Buildings Constructed Prior to 1981	MH-SB-10	7/9/2014	0	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-10	7/9/2014	1.5	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-11	7/9/2014	0	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-11	7/9/2014	1.5	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-13	7/9/2014	0	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-13	7/9/2014	1.5	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-14	7/9/2014	0	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-14	7/9/2014	1.5	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-76	7/9/2014	0	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-76	7/9/2014	1.5	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-77	7/9/2014	0	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-77	7/9/2014	1.5	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-79	7/9/2014	0	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33
	MH-SB-79	7/9/2014	1.5	< 33	< 33 J	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33	< 33

Notes:
µg/kg - micrograms per kilogram
DTSC - Department of Toxic Substances Control
USEPA - United States Environmental Protection Agency
RSLs - Regional Screening Level
bgs - below ground surface
NA - not available
J - Results and/or reporting limits are estimated
Field duplicates are shown in italics
Pesticides by USEPA Method 8141A

Table 3. AOI-5 Herbicides in Soil - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Area of Interest (AOI)	Sample ID	Sample Date	Depth (feet bgs)	Herbicides in µg/kg		
				2,4,5-T	2,4,5-TP	2,4-D
Residential DTSC-Modified RSL or USEPA RSL				**620,000**	**490,000**	**690,000**
AOI-5 - Buildings Constructed Prior to 1981	MH-SB-10	7/9/2014	0	< 20	< 20	< 80
	MH-SB-10	7/9/2014	1.5	< 20	< 20	< 80
	MH-SB-11	7/9/2014	0	< 20	< 20	< 80
	MH-SB-11	7/9/2014	1.5	< 20	< 20	< 80
	MH-SB-13	7/9/2014	0	< 20	< 20	< 79
	MH-SB-13	7/9/2014	1.5	< 20 J	< 20	< 80
	MH-SB-14	7/9/2014	0	< 20 J	< 20	< 80
	MH-SB-14	7/9/2014	1.5	< 20 J	< 20	< 80
	MH-SB-76	7/9/2014	0	< 20	< 20	< 80
	MH-SB-76	7/9/2014	1.5	< 20	< 20	< 80
	MH-SB-77	7/9/2014	0	< 20	< 20	< 80
	MH-SB-77	7/9/2014	1.5	< 20	< 20	< 80
	MH-SB-79	7/9/2014	0	< 20	< 20	< 80
	MH-SB-79	7/9/2014	1.5	< 20	< 20	< 80

Notes:
µg/kg - micrograms per kilogram
DTSC - Department of Toxic Substances Control
USEPA - United States Environmental Protection Agency
RSLs - Regional Screening Levels
bgs - below ground surface
J - Results and/or reporting limits are estimated
Field duplicates are shown in italics
Herbicides by USEPA Method 8151A

Table 4. AOI-5 Lead in Soil - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Area of Interest (AOI)	Sample ID	Sample Date	Depth (feet bgs)	Lead in mg/kg
Residential DTSC-Modified RSL or USEPA RSL				**80**
AOI-5 - Buildings Constructed Prior to 1981	MH-SB-10	7/9/2014	0	42
	MH-SB-10	7/9/2014	1.5	18
	MH-SB-11	7/9/2014	0	21
	MH-SB-11	7/9/2014	1.5	17
	MH-SB-13	7/9/2014	0	15
	MH-SB-13	7/9/2014	1.5	4.5 J
	MH-SB-14	7/9/2014	0	8.7
	MH-SB-14	7/9/2014	1.5	3.6 J
	MH-SB-76	7/9/2014	0	15
	MH-SB-76	7/9/2014	1.5	2.0
	MH-SB-77	7/9/2014	0	12
	MH-SB-77	7/9/2014	1.5	5.6
	MH-SB-79	7/9/2014	0	4.7
	MH-SB-79	7/9/2014	1.5	3.1 J

Notes:
mg/kg - milligrams per kilogram
DTSC - Department of Toxic Substances Control
USEPA - United States Environmental Protection Agency
J - Results and/or reporting limits are estimated
bgs - below ground surface
RSLs - Regional Screening Levels
Field duplicates are shown in italics
Lead by USEPA Method 6010

Table 5. AOI-5 PCBs in Soil - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Area of Interest (AOI)	Sample ID	Sample Date	Depth (feet bgs)	PCBs in µg/kg						
				Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
Residential DTSC-Modified RSL or USEPA RSL				**4,000**	**150**	**150**	**240**	**240**	**240**	**240**
AOI-5 - Buildings Constructed Prior to 1981	MH-SB-10	7/9/2014	0	< 99	< 99	< 99	< 99	< 99	590	< 99
	MH-SB-10	7/9/2014	1.5	< 50	< 50	< 50	< 50	< 50	270 J	< 50
	MH-SB-11	7/9/2014	0	< 49	< 49	< 49	< 49	< 49	< 49	< 49
	MH-SB-11	7/9/2014	1.5	< 49	< 49	< 49	< 49	< 49	< 49	< 49
	MH-SB-13	7/9/2014	0	< 49	< 49	< 49	< 49	< 49	230	< 49
	MH-SB-13	7/9/2014	1.5	< 49	< 49	< 49	< 49	< 49	< 49	< 49
	MH-SB-14	7/9/2014	0	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	MH-SB-14	7/9/2014	1.5	< 49	< 49	< 49	< 49	< 49	< 49	< 49
	MH-SB-76	7/9/2014	0	< 500	< 500	< 500	< 500	< 500	1500	< 500
	MH-SB-76	7/9/2014	1.5	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	MH-SB-77	7/9/2014	0	< 99	< 99	< 99	< 99	< 99	720	< 99
	MH-SB-77	7/9/2014	1.5	< 50	< 50	< 50	< 50	< 50	130 J	< 50
	MH-SB-79	7/9/2014	0	< 99	< 99	< 99	< 99	< 99	700	< 99
	MH-SB-79	7/9/2014	1.5	< 49	< 49	< 49	< 49	< 49	< 49	< 49
	Soil Step-Out Samples									
	MH-SB-114	8/15/2014	0	< 250	< 250	< 250	< 250	< 250	800 J	< 250
	MH-SB-114	8/15/2014	1.5	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	MH-SB-115	8/15/2014	0	< 49	< 49	< 49	< 49	< 49	< 49	< 49
	MH-SB-115	8/15/2014	1.5	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	MH-SB-116	8/15/2014	0	< 140	< 140	< 140	< 140	< 140	410	< 140
	MH-SB-116	8/15/2014	1.5	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	MH-SB-117	8/15/2014	0	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	MH-SB-117	8/15/2014	1.5	< 49	< 49	< 49	< 49	< 49	< 49	< 49
	MH-SB-118	8/15/2014	0	< 250	< 250	< 250	< 250	< 250	1100	< 250
	MH-SB-118	8/15/2014	1.5	< 140	< 140	< 140	< 140	< 140	< 140	< 140
	MH-SB-119	8/15/2014	0	< 50	< 50	< 50	< 50	< 50	340	< 50
	MH-SB-119	8/15/2014	1.5	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	MH-SB-120	8/15/2014	0	< 49	< 49	< 49	< 49	< 49	430	< 49
	MH-SB-120	8/15/2014	1.5	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	MH-SB-121	8/15/2014	0	< 49	< 49	< 49	< 49	< 49	140	< 49
	MH-SB-121	8/15/2014	1.5	< 50	< 50	< 50	< 50	< 50	64	< 50
	MH-SB-122	8/15/2014	0	< 49	< 49	< 49	< 49	< 49	< 49	< 49
	MH-SB-122	8/15/2014	1.5	< 49	< 49	< 49	< 49	< 49	< 49	< 49
	MH-SB-123	8/15/2014	0	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	MH-SB-123	8/15/2014	1.5	< 50	< 50	< 50	< 50	< 50	< 50	< 50
	MH-SB-124	8/18/2014	0	< 50	< 50	< 50	< 50	< 50	72	< 50
	MH-SB-124	8/18/2014	1.5	< 50	< 50	< 50	< 50	< 50	< 50	< 50

Notes:
µg/kg - micrograms per kilogram
DTSC - Department of Toxic Substances Control
USEPA - United States Environmental Protection Agency
RSLs - Regional Screening Levels
bgs - below ground surface
J - Results and/or reporting limits are estimated
Field duplicates are shown in italics
PCBs - Polychlorinated biphenyls
PCBs by USEPA Method 8082A

Table 6. Estimated Cancer Risks and Non-Cancer Hazards for Hypothetical Future On-Site Residents Exposed to Soil Through Direct Contact - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Chemical Group	Chemical	Residential Soil RSL (USEPA 2014) Cancer (µg/kg)	Residential Soil RSL (USEPA 2014) Non-Cancer (µg/kg)	Soil EPC (µg/kg)[b,c]		Cancer Risk	HQ
Organochlorine Pesticide	Chlordane (total)	1800	35,000	88		4.9E-08	0.0025
Organochlorine Pesticide	4,4'-DDE[a]	1600	36,000	28		1.8E-08	0.00079
PCB	Aroclor 1254	240	1,100	Before Excavation	337	1.4E-06	0.31
				After Excavation	231	9.6E-07	0.21
Cumulative Cancer Risk/HI				**Before Excavation**		**1.5E-06**	**0.31**
				After Excavation		**1.0E-06**	**0.21**

Notes:

µg/kg = microgram per kilogram

bgs = below ground surface

DDE = Dichlorodiphenyldichloroethylene

DDT = Dichlorodiphenyltrichloroethane

EPC = Exposure Point Concentration

HI = Hazard Index

HQ = Hazard Quotient

PCB = Polychlorinated Biphenyl

RSL = Regional Screening Level

UCL = Upper Confidence Limit

USEPA = United States Environmental Protection Agency

[a] DDT was used as a surrogate for DDE for the noncancer RSL.

[b] Soil EPCs were calculated as the 95% UCL on the mean soil concentration at 0-2 feet bgs for 4,4'-DDE and PCB Aroclor 1254. Chlordane (total) was detected at only one location (MH-SB-13) at 0-0.5 feet bgs, and therefore, a 95% UCL cannot be calculated. The detected concentration of 88 µg/kg was used as the soil EPC for chlordane (total).

[c] It was assumed that the surface soil (0-0.5 feet bgs) at MH-SB-76 and MH-SB-118, which had the highest detected concentrations of PCB Aroclor 1254, will be removed during excavation, and PCB Aroclor 1254 will not be detected at both locations after excavation with a detection limit of 50 µg/kg. The concentrations for all the other chemicals will remain the same after excavation.

Source:

United States Environmental Protection Agency (USEPA). 2014. Regional Screening Levels. May.

Table 7a. Estimated Cancer Risks and Non-Cancer Hazards for Middle School Students (11 to <14 Years) Exposed to Soil Through Direct Contact - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Chemical Group	Chemical	Soil EPC (µg/kg)[a,b]		Outdoor Soil Ingestion		Indoor Dust Ingestion[c]		Outdoor Soil Dermal Contact		Indoor Dust Dermal Contact[c]		Outdoor Soil Particulate Inhalation		Indoor Dust Particulate Inhalation[c]		Total Cancer Risk	Total HQ
				Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ		
Organochlorine Pesticide	Chlordane (total)	88		2.2E-10	0.000035	1.8E-09	0.00026	4.0E-11	0.0000060	3.3E-10	0.000044	1.3E-13	0.000000049	4.4E-13	0.00000014	2.4E-09	0.00034
Organochlorine Pesticide	4,4'-DDE	28		6.8E-11	0.000011	5.5E-10	0.000083	1.3E-11	0.0000019	1.0E-10	0.000014	4.2E-14	0.0000000062	1.4E-13	0.000000019	7.4E-10	0.00011
PCB	Aroclor 1254	Before Excavation	337	4.8E-09	0.0033	3.9E-08	0.025	2.5E-09	0.0016	2.0E-08	0.012	2.9E-12	0.0000019	9.5E-12	0.0000055	6.6E-08	0.042
		After Excavation	231	3.3E-09	0.0023	2.7E-08	0.017	1.7E-09	0.0011	1.4E-08	0.0082	2.0E-12	0.0000013	6.5E-12	0.0000038	4.5E-08	0.029
Cumulative Cancer Risk/HI		**Before Excavation**		**5.1E-09**	**0.0034**	**4.1E-08**	**0.025**	**2.5E-09**	**0.0016**	**2.0E-08**	**0.012**	**3.1E-12**	**0.0000019**	**1.0E-11**	**0.0000057**	**6.9E-08**	**0.042**
		After Excavation		**3.6E-09**	**0.0023**	**2.9E-08**	**0.017**	**1.7E-09**	**0.0011**	**1.4E-08**	**0.0082**	**2.2E-12**	**0.0000013**	**7.1E-12**	**0.0000039**	**4.8E-08**	**0.029**

Notes:
µg/kg = microgram per kilogram
bgs = below ground surface
Cal/EPA = California Environmental Protection Agency
DDE = Dichlorodiphenyldichloroethylene
EPC = Exposure Point Concentration
HI = Hazard Index
HQ = Hazard Quotient
PCB = Polychlorinated Biphenyl
UCL = Upper Confidence Limit

[a] Soil EPCs were calculated as the 95% UCL on the mean soil concentration at 0-2 feet bgs for 4,4'-DDE and PCB Aroclor 1254. Chlordane (total) was detected at only one location (MH-SB-13) at 0-0.5 feet bgs, and therefore, a 95% UCL cannot be calculated. The detected concentration of 88 µg/kg was used as the soil EPC for chlordane (total).

[b] It was assumed that the surface soil (0-0.5 feet bgs) at MH-SB-76 and MH-SB-118, which had the highest detected concentrations of PCB Aroclor 1254, will be removed during excavation, and PCB Aroclor 1254 will not be detected at both locations after excavation with a detection limit of 50 µg/kg.

[c] According to Cal/EPA (2010), a transfer factor from outdoor soil to indoor dust of two (2) was used.

Source:
California Environmental Protection Agency (Cal/EPA). 2010. Schools Risk Screening Model. March.

Table 7b. Estimated Cancer Risks and Non-Cancer Hazards for High School Students (14 to <18 Years) Exposed to Soil Through Direct Contact - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Chemical Group	Chemical	Soil EPC (µg/kg)[a,b]		Outdoor Soil Ingestion		Indoor Dust Ingestion[c]		Outdoor Soil Dermal Contact		Indoor Dust Dermal Contact[c]		Outdoor Soil Particulate Inhalation		Indoor Dust Particulate Inhalation[c]		Total Cancer Risk	Total HQ
				Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ		
Organochlorine Pesticide	Chlordane (total)	88		2.2E-10	0.000023	1.9E-09	0.00020	4.9E-11	0.0000050	4.2E-10	0.000043	1.7E-13	0.000000042	5.8E-13	0.00000015	2.5E-09	0.00027
Organochlorine Pesticide	4,4'-DDE	28		6.8E-11	0.0000074	5.8E-10	0.000064	1.5E-11	0.0000016	1.3E-10	0.000014	5.3E-14	0.0000000055	1.8E-13	0.000000019	7.9E-10	0.000086
PCB	Aroclor 1254	Before Excavation	337	4.7E-09	0.0022	4.1E-08	0.019	3.0E-09	0.0013	2.5E-08	0.011	3.7E-12	0.0000016	1.3E-11	0.0000056	7.4E-08	0.034
		After Excavation	231	3.2E-09	0.0015	2.8E-08	0.013	2.0E-09	0.00091	1.7E-08	0.0078	2.5E-12	0.0000011	8.7E-12	0.0000038	5.1E-08	0.023
Cumulative Cancer Risk/HI		**Before Excavation**		**5.0E-09**	**0.0022**	**4.3E-08**	**0.019**	**3.0E-09**	**0.0013**	**2.6E-08**	**0.011**	**3.9E-12**	**0.0000017**	**1.3E-11**	**0.0000057**	**7.7E-08**	**0.034**
		After Excavation		**3.5E-09**	**0.0015**	**3.0E-08**	**0.013**	**2.1E-09**	**0.00092**	**1.8E-08**	**0.0079**	**2.8E-12**	**0.0000012**	**9.5E-12**	**0.0000040**	**5.4E-08**	**0.024**

Notes:

µg/kg = microgram per kilogram

bgs = below ground surface

Cal/EPA = California Environmental Protection Agency

DDE = Dichlorodiphenyldichloroethylene

EPC = Exposure Point Concentration

HI = Hazard Index

HQ = Hazard Quotient

PCB = Polychlorinated Biphenyl

UCL = Upper Confidence Limit

[a] Soil EPCs were calculated as the 95% UCL on the mean soil concentration at 0-2 feet bgs for 4,4'-DDE and PCB Aroclor 1254. Chlordane (total) was detected at only one location (MH-SB-13) at 0-0.5 feet bgs, and therefore, a 95% UCL cannot be calculated. The detected concentration of 88 µg/kg was used as the soil EPC for chlordane (total).

[b] It was assumed that the surface soil (0-0.5 feet bgs) at MH-SB-76 and MH-SB-118, which had the highest detected concentrations of PCB Aroclor 1254, will be removed during excavation, and PCB Aroclor 1254 will not be detected at both locations after excavation with a detection limit of 50 µg/kg.

[c] According to Cal/EPA (2010), a transfer factor from outdoor soil to indoor dust of two (2) was used.

Source:

California Environmental Protection Agency (Cal/EPA). 2010. Schools Risk Screening Model. March.

Table 7c. Estimated Cancer Risks and Non-Cancer Hazards for Middle/High School Students Exposed to Soil Through Direct Contact - Building G Area

Malibu High School
30215 Morning View Drive
Malibu, California

ChemicalGroup	Chemical	Soil EPC (µg/kg)[a,b]		Middle School Student (11 to <14 years)		High School Student (14 to <18 years)		Middle and High School Student (11 to <18 years)	
				Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ
Organochlorine Pesticide	Chlordane (total)	88		2.4E-09	0.00034	2.5E-09	0.00027	4.9E-09	0.00034
Organochlorine Pesticide	4,4'-DDE	28		7.4E-10	0.00011	7.9E-10	0.000086	1.5E-09	0.00011
PCB	Aroclor 1254	Before Excavation	337	6.6E-08	0.042	7.4E-08	0.034	1.4E-07	0.042
		After Excavation	231	4.5E-08	0.029	5.1E-08	0.023	9.6E-08	0.029
Cumulative Cancer Risk/HI		**Before Excavation**		**6.9E-08**	**0.042**	**7.7E-08**	**0.034**	**1.5E-07**	**0.042**
		After Excavation		**4.8E-08**	**0.029**	**5.4E-08**	**0.024**	**1.0E-07**	**0.029**

Notes:

µg/kg = microgram per kilogram

bgs = below ground surface

DDE = Dichlorodiphenyldichloroethylene

EPC = Exposure Point Concentration

HI = Hazard Index

HQ = Hazard Quotient

PCB = Polychlorinated Biphenyl

UCL = Upper Confidence Limit

[a] Soil EPCs were calculated as the 95% UCL on the mean soil concentration at 0-2 feet bgs for 4,4'-DDE and PCB Aroclor 1254. Chlordane (total) was detected at only one location (MH-SB-13) at 0-0.5 feet bgs, and therefore, a 95% UCL cannot be calculated. The detected concentration of 88 µg/kg was used as the soil EPC for chlordane (total).

[b] It was assumed that the surface soil (0-0.5 feet bgs) at MH-SB-76 and MH-SB-118, which had the highest detected concentrations of PCB Aroclor 1254, will be removed during excavation, and PCB Aroclor 1254 will not be detected at both locations after excavation with a detection limit of 50 µg/kg.

Table 8. Estimated Cancer Risks and Non-cancer Hazards for Teacher/Staff Exposed to Soil through Direct Contact - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

ChemicalGroup	Chemical	Soil EPC (µg/kg)[a,b]		Outdoor Soil Ingestion		Indoor Dust Ingestion[c]		Outdoor Soil Dermal Contact		Indoor Dust Dermal Contact[c]		Outdoor Soil Particulate Inhalation		Indoor Dust Particulate Inhalation[c]		Total Cancer Risk	Total HQ
				Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ	Cancer Risk	HQ		
Organochlorine Pesticide	Chlordane (total)	88		1.1E-09	0.000018	1.0E-08	0.00017	2.7E-10	0.0000043	2.4E-09	0.000039	1.1E-12	0.000000042	3.9E-12	0.00000016	1.4E-08	0.00023
Organochlorine Pesticide	4,4'-DDE	28		3.6E-10	0.0000059	3.3E-09	0.000054	8.3E-11	0.0000014	7.6E-10	0.000013	3.3E-13	0.0000000055	1.2E-12	0.000000020	4.5E-09	0.000074
PCB	Aroclor 1254	Before Excavation	337	2.5E-08	0.0018	2.3E-07	0.016	1.6E-08	0.0011	1.5E-07	0.010	2.3E-11	0.0000016	8.5E-11	0.0000059	4.2E-07	0.029
		After Excavation	231	1.7E-08	0.0012	1.6E-07	0.011	1.1E-08	0.00078	1.0E-07	0.0072	1.6E-11	0.0000011	5.8E-11	0.0000041	2.9E-07	0.020
Cumulative Cancer Risk/HI		**Before Excavation**		**2.7E-08**	**0.0018**	**2.4E-07**	**0.016**	**1.7E-08**	**0.0012**	**1.5E-07**	**0.011**	**2.5E-11**	**0.0000017**	**9.0E-11**	**0.0000061**	**4.4E-07**	**0.030**
		After Excavation		**1.9E-08**	**0.0012**	**1.7E-07**	**0.011**	**1.2E-08**	**0.00079**	**1.1E-07**	**0.0072**	**1.7E-11**	**0.0000012**	**6.3E-11**	**0.0000043**	**3.1E-07**	**0.020**

Notes:

µg/kg = microgram per kilogram

bgs = below ground surface

Cal/EPA = California Environmental Protection Agency

DDE = Dichlorodiphenyldichloroethylene

EPC = Exposure Point Concentration

HI = Hazard Index

HQ = Hazard Quotient

PCB = Polychlorinated Biphenyl

UCL = Upper Confidence Limit

[a] Soil EPCs were calculated as the 95% UCL on the mean soil concentration at 0-2 feet bgs for 4,4'-DDE and PCB Aroclor 1254. Chlordane (total) was detected at only one location (MH-SB-13) at 0-0.5 feet bgs, and therefore, a 95% UCL cannot be calculated. The detected concentration of 88 µg/kg was used as the soil EPC for chlordane (total).

[b] It was assumed that the surface soil (0-0.5 feet bgs) at MH-SB-76 and MH-SB-118, which had the highest detected concentrations of PCB Aroclor 1254, will be removed during excavation, and PCB Aroclor 1254 will not be detected at both locations after excavation with a detection limit of 50 µg/kg.

[c] According to Cal/EPA (2010), a transfer factor from outdoor soil to indoor dust of two (2) was used.

Source:

California Environmental Protection Agency (Cal/EPA). 2010. Schools Risk Screening Model. March.

Table 9. Summary of Potential Chemical-Specific ARARs - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Requirement	Citation	ARAR Determination	Comments
Federal ARARs			
Toxicity Characteristic Leaching Procedure (TCLP)	40 CFR 261.24	Potentially applicable	Defines wastes that are subject to regulation as a RCRA. Excavated contaminated soil must be classified using knowledge of the timing and nature of the release as well as waste toxicity characteristic testing. If, after good faith effort, it is determined that the contaminated soil contains a listed RCRA or fails the Federal toxicity characteristic tests, then the excavated soil is considered hazardous based on USEPA's "contained-in policy" and must be managed as hazardous remediation waste. Contaminated soils that are treated in situ are not subject to the identification or classification requirements.
Toxic Substances Control Act			
Requirements for cleanups of PCB-contaminated solids Requirements for disposal of PCB-contaminated waste	40 CFR Part 761.61 (c) 40 CFR Part 761.61 (a)5	Potentially applicable or relevant and appropriate	Specific provisions of these regulations regarding cleanup goals and management of PCB-contaminated soils and debris may be applicable to site closure.
State ARARs			
Soluble Threshold Limit Concentration (STLC) and Total Threshold Limit Concentration (TTLC)	California Code of Regulations, Title 22, Chapter 11, Article 3	Potentially applicable	Defines wastes that are subject to regulation as a California hazardous waste. Excavated contaminated soil must be classified using knowledge of the timing and nature of the release as well as waste toxicity characteristic testing. If, after good faith effort, it is determined that the contaminated soil contains a listed California hazardous waste or fails the state toxicity characteristic tests, then the excavated soil is considered hazardous based on USEPA's "contained-in policy" and must be managed as hazardous remediation waste. Contaminated soils that are treated in situ are not subject to the identification or classification requirements.

Table 10. Listing of Potential Chemical-Specific ARARs - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Chemical	Federal	State	
	TCLP (mg/L)	TTLC (mg/kg)	STLC (mg/L)
Chlordane (total)	0.03	2.5	0.25
4,4-DDE	--	1	0.1
Lead	5	1,000	5
PCB Arolcor 1254	--	--	--

Notes:

-- = Not available

mg/kg = milligram per kilogram

mg/L = milligram per liter

ARARs = Applicable or Relevant and Appropriate Requirements

DDE = Dichlorodiphenyldichloroethylene

PCB = Polychlorinated Biphenyl

STLC = Soluble Threshold Limit Concentration

TCLP = Toxicity Characteristic Leaching Procedure

TSCA = Toxic Substances Control Act

TTLC = Total Threshold Limit Concentration

Table 11. Summary of Potential Location-Specific ARARs – Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Requirement	Citation	ARAR Determination	Comments
Federal ARARs			
Migratory Bird Treaty Act			
Migratory Bird Protection	16 United States Code 703	Potentially applicable	Protects almost all species of native birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.
Endangered Species Act			
Endangered Species Act	7 United States Code 136; 16 United States Code 460 et seq. (1973)	Potentially applicable	Protects listed birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees.
Archaeological and Historic Preservation Act			
Archaeological and Historic Preservation Act	16 United States Code §§469, et seq.; 36 CFR Part 65	Potentially applicable	Requires action to recover and preserve artifacts if alteration of terrain may threaten significant scientific, prehistoric, historic, or archaeological data.
State ARARs			
California Hazardous Waste Control Act			
California Hazardous Waste Control Act	California Health and Safety Code, Division 20, Chapter 6.5, Article 2, Section 25100	Potentially relevant and appropriate	DTSC regulates facilities that generate or treat hazardous waste. Applicable to generators of hazardous waste and persons operating pursuant to a permit-by-rule, conditional authorization or conditional exemption set forth in Health and Safety Code Section 25404(c)(1).

Table 12. Summary of Potential Action-Specific ARARs – Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Requirement	Citation	ARAR Determination	Comments
Federal ARARs			
Emergency Planning and Community Right to Know Act of 1986			
Community Notification	40 CFR 355, 370 and 372	Potentially applicable or relevant and appropriate	Potential notification requirements for hazardous waste and chemical storage activities related to implementation of certain remedial actions. Most of these requirements are administered by local emergency response organizations under the state business plan requirements specified in California H&SC, Section 25503, and the remaining requirements are administered by the USEPA.
Hazardous Materials Transportation Act			
DOT Hazardous Materials Transportation Regulations	40 CFR 171-178	Potentially applicable	Regulates working conditions to ensure safety and health of transportation workers (i.e., specifies containers, labeling, and transportation required for hazardous materials).
Occupational Safety and Health Act (OSHA)			
Requirement for workers involved at hazardous waste facilities with certain remedial activities	29 CFR 1910.20	Potentially applicable	OSHA requirements are applicable to worker exposures during hazardous substances response actions. California equivalent requirements also apply. OSHA specifies three components of an information program: (1) the site health and safety plan itself, (2) site safety briefings, and (3) site inspections. These components define the policies and procedures by which the health and safety program are implemented.

Table 13. Summary of Potential TBCs – Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

TBC Criterion	Citation	Comments
Federal TBCs		
USEPA RSLs for Residential Soil	USEPA Regional Screening Levels, May 2014	RSLs are risk-based concentrations used in initial screening-level evaluations for evaluating sites that are considered for unrestricted residential use. They are Agency guidelines, not legally enforceable standards. RSLs are not cleanup levels, and the presence of chemical concentrations exceeding these levels does not indicate a hazardous condition without consideration of other factors such as actual exposure conditions.
State TBCs		
DTSC-Modified RSLs for soil	Cal/EPA. 2014. Human Health Risk Assessment (HHRA) Note Number 3, Issue: DTSC recommended methodology for use of U.S. EPA RSLs in the Human Health Risk Assessment process at hazardous waste sites and permitted facilities. July.	DTSC Office of Human and Ecological Risk (HERO) recommended methodology for use of USEPA RSLs at hazardous waste sites and permitted facilities.

Table 14. Listing of TBC Criteria - Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

Chemical (mg/kg)	USEPA RSL for Residential Soil (USEPA 2014)	DTSC-Modified RSLs for Residential Soil (Cal/EPA 2014)
Chlordane (total)	1.8	--
4,4-DDE	1.6	--
Lead	400	80
PCB Aroclor 1254	0.24	--

Notes:
-- = Not available
mg/kg = miligram per kilogram
Cal/EPA = California Environmental Protection Agency
DDE = Dichlorodiphenyldichloroethylene
DTSC = Department of Toxic Substances Control
PCB = Polychlorinated Biphenyl
RSL = Regional Screening Level
TCB = To be Considered
USEPA = United States Environmental Protection Agency

Sources:
California Environmental Protection Agency (Cal/EPA). 2014. Human Health Risk Assessment (HHRA) Note Number 3, Issue: DTSC recommended methodology for use of USEPA Regional Screening Levels (RSLs) in the Human Health Risk Assessment process at hazardous waste sites and permitted facilities. July.
United States Environmental Protection Agency (USEPA). 2014. Regional Screening Levels (RSLs) Summary Table. May.

Figures

Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\Figure 1 - Site Vicinity Map - 2014-10-08.mxd

ENVIRON

Site Vicinity Map

Malibu High School
30215 Morning View Drive
Malibu, California

Figure
1

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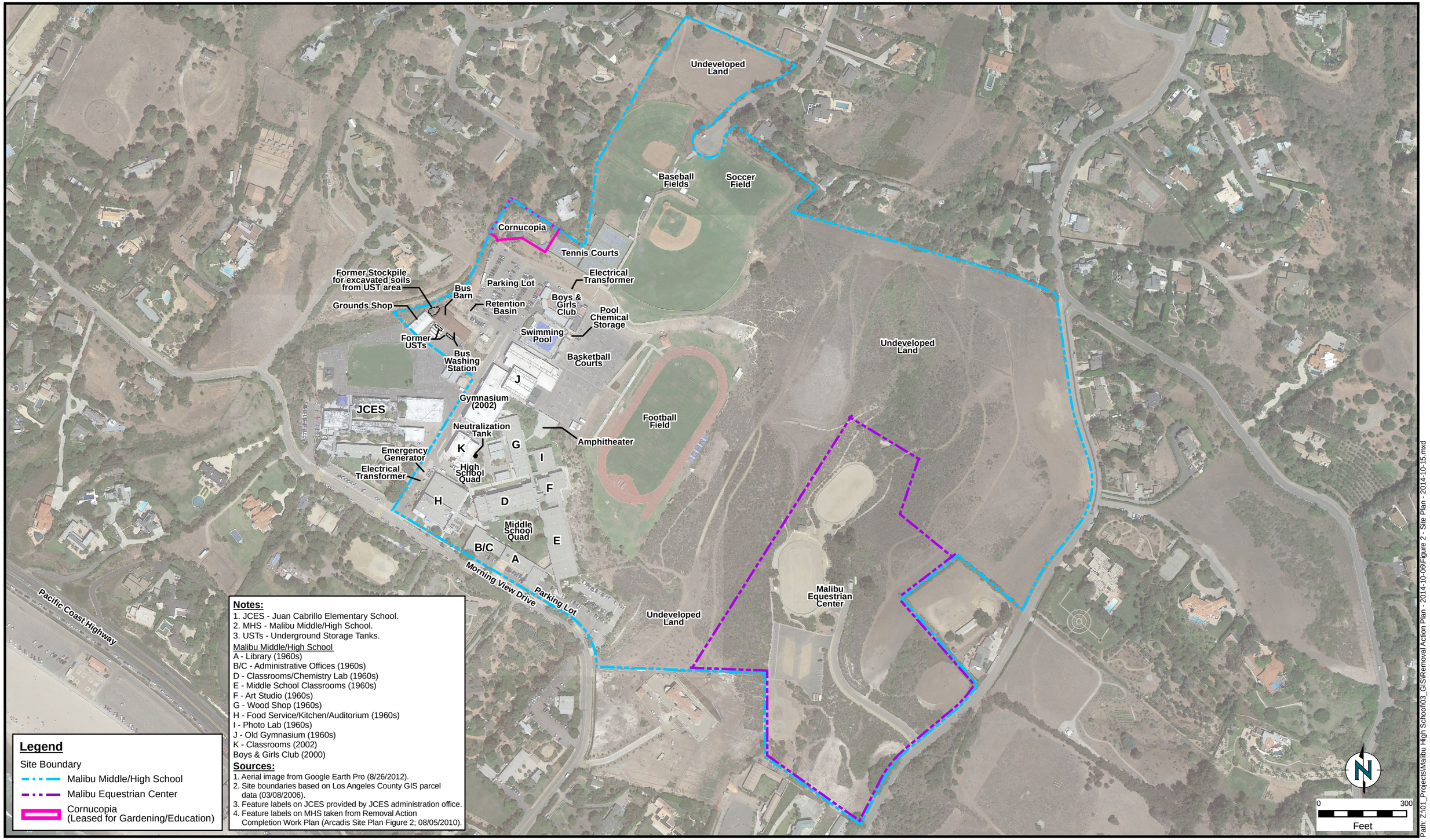

Legend

Site Boundary
- Malibu Middle/High School
- Malibu Equestrian Center
- Cornucopia (Leased for Gardening/Education)

Notes:

1. JCES - Juan Cabrillo Elementary School.
2. MHS - Malibu Middle/High School.
3. USTs - Underground Storage Tanks.

Malibu Middle/High School
A - Library (1960s)
B/C - Administrative Offices (1960s)
D - Classrooms/Chemistry Lab (1960s)
E - Middle School Classrooms (1960s)
F - Art Studio (1960s)
G - Wood Shop (1960s)
H - Food Service/Kitchen/Auditorium (1960s)
I - Photo Lab (1960s)
J - Old Gymnasium (1960s)
K - Classrooms (2002)
Boys & Girls Club (2000)

Sources:

1. Aerial image from Google Earth Pro (8/26/2012).
2. Site boundaries based on Los Angeles County GIS parcel data (03/08/2006).
3. Feature labels on JCES provided by JCES administration office.
4. Feature labels on MHS taken from Removal Action Completion Work Plan (Arcadis Site Plan Figure 2; 08/05/2010).

Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\Figure 2 - Site Plan - 2014-10-15.mxd

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Site Plan

Malibu High School
30215 Morning View Drive, Malibu, California

Figure 2

PROJECT: 04-33980J

Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\Figure 3 - Building G Area - 2014-10-15.mxd

ENVIRON

Building G Area

Malibu High School
30215 Morning View Drive, Malibu, California

Figure
3

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Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\Figure 4 - Soil Sampling Locations - Building G Area - 2014-10-15.mxd

ENVIRON

PEA Soil Sampling Locations
Building G Area

Malibu High School
30215 Morning View Drive, Malibu, California

Figure
4

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Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\Figure 5 - Step-Out Soil Sampling Location - Building G Area - 2014-10-15.mxd

ENVIRON

Step-Out Soil Sampling Locations
Building G Area

Malibu High School
30215 Morning View Drive, Malibu, California

Figure
5

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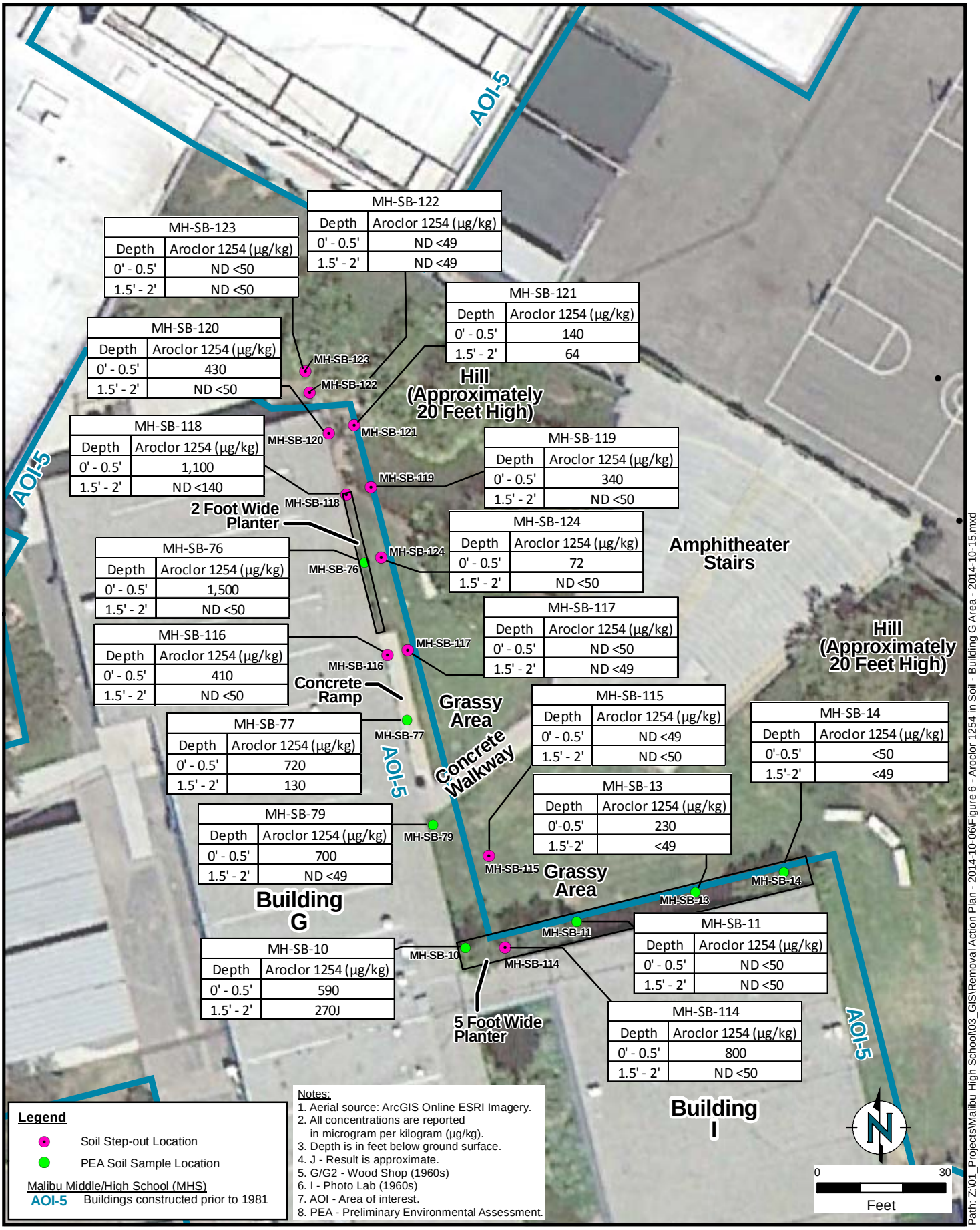

ENVIRON

Aroclor 1254 in Soil
Building G Area

Malibu High School
30215 Morning View Drive, Malibu, California

Figure
6

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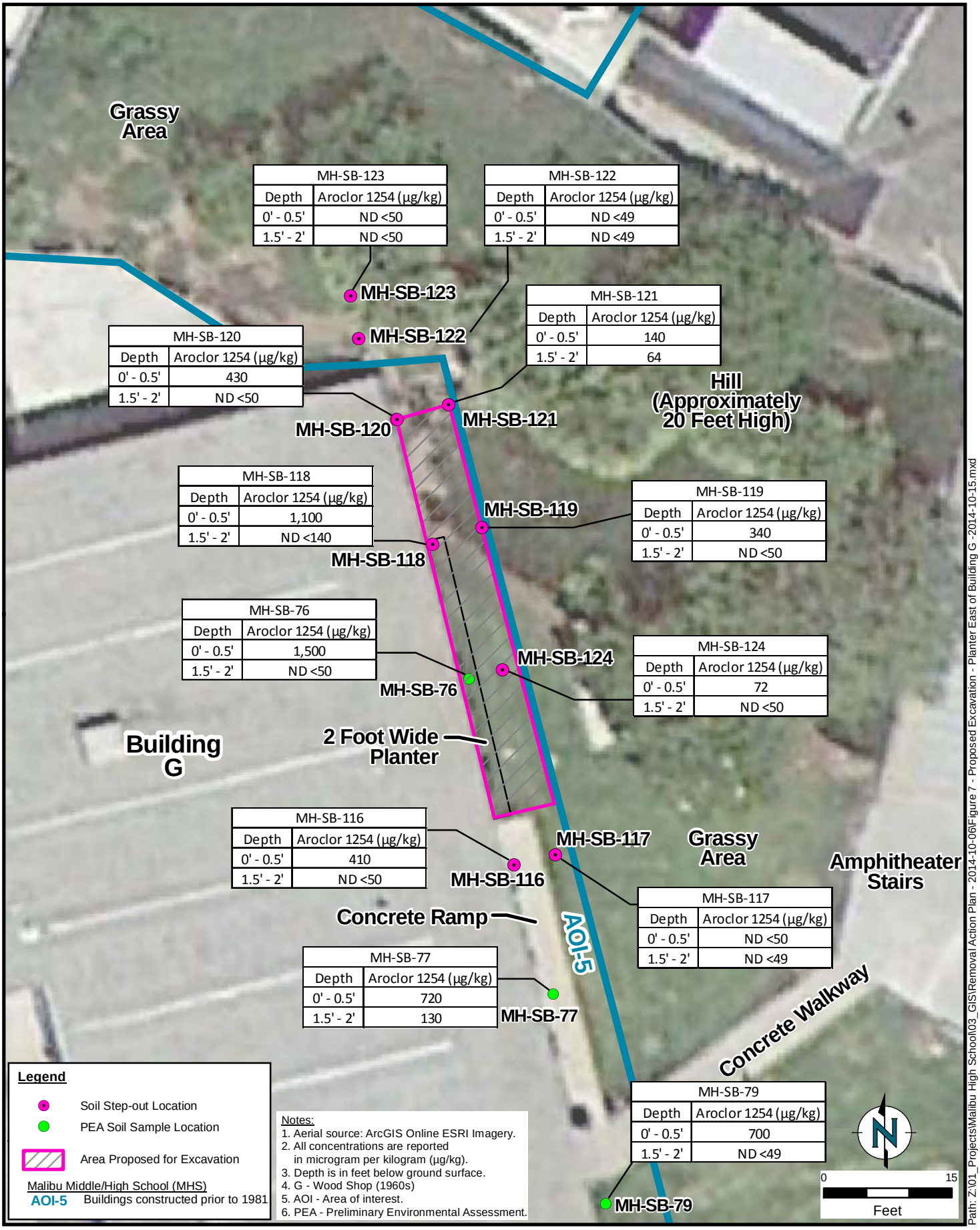

Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\Figure 7 - Proposed Excavation - Planter East of Building G -2014-10-15.mxd

ENVIRON

Proposed Excavation Building G Area

Malibu High School
30215 Morning View Drive, Malibu, California

Figure 7

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J

Septic Tank 6

AOI-12

Gymnasium
(2002)

Existing
Fencing

Hill
(Approximately
20 Feet High)

Proposed
Perimeter
Fencing

2 Foot Wide
Planter

Amphitheater
Stairs

Existing
Fencing

Grassy
Area

Truck
Loading
Zone

Concrete Ramp

Hill
(Approximately
20 Feet High)

Concrete Walkway

Proposed
Perimeter
Fencing

Building
G

Grassy
Area

Proposed
Perimeter
Fencing

Proposed
Perimeter
Fencing

K

5 Foot Wide
Planter

Building
I

Legend

- Proposed Area to be Covered With Plastic Sheeting
- Proposed Area to be Covered With Plastic Sheeting and Plywood
- Proposed Perimeter Fencing
- Existing Fencing
- Area Proposed for Excavation
- Building G Area
- Air Monitoring Locations

Notes:
1. Aerial source: ArcGIS Online ESRI Imagery.
2. Elevation difference between top and bottom of hill or amphitheater is approximately 20 feet.
3. Fencing is proposed in areas where access is possible.
4. G - Wood Shop (1960s)
5. I - Photo Lab (1960s)
6. J - Old Gymnasium (1960s)
7. K - Classrooms (2002)

N

0 30
Feet

Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\Figure 8 - Proposed Fencing and Air Monitoring Locations - 2014-10-15.mxd

ENVIRON

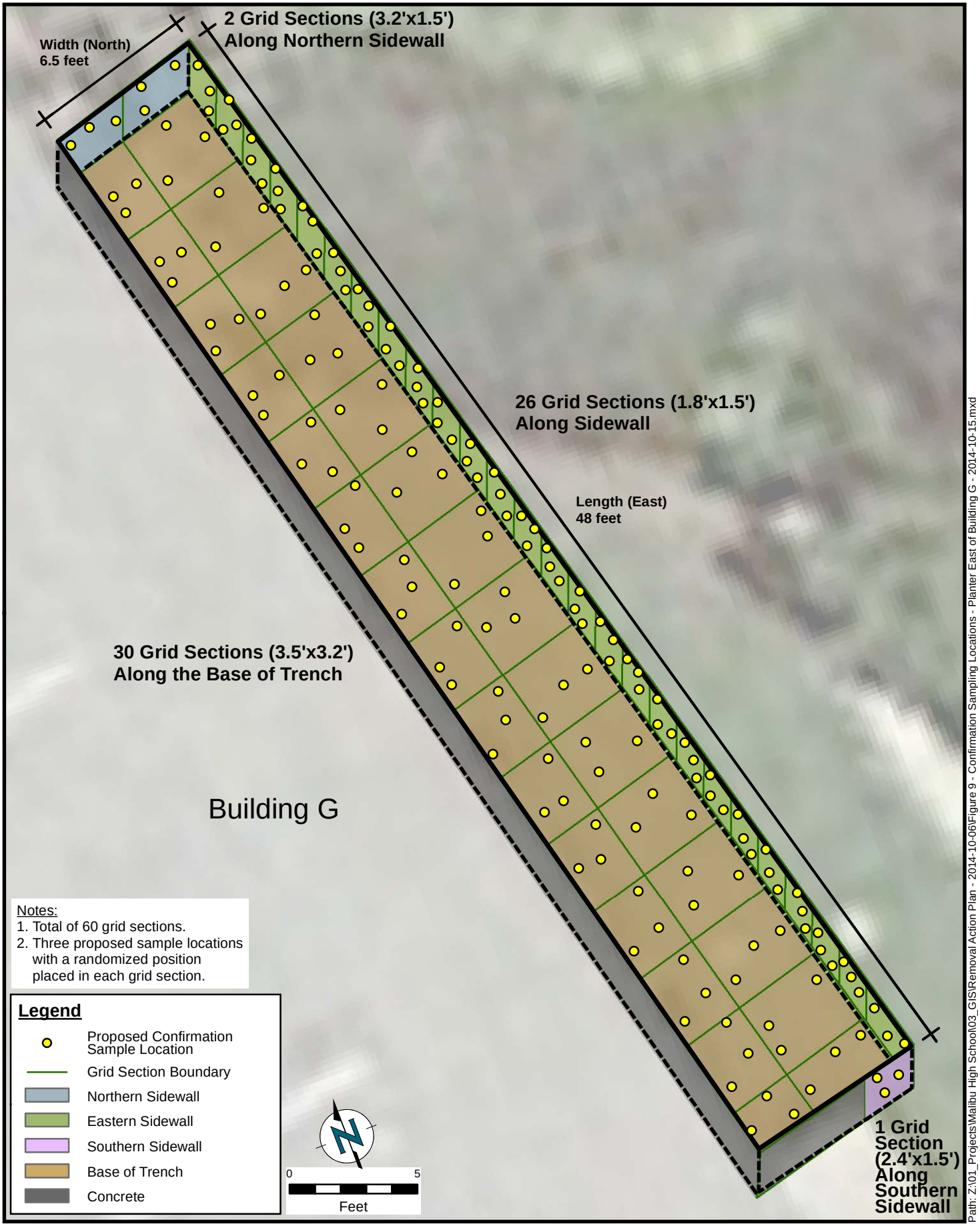
DRAFTED BY: SShin | Date: 11/6/2014

Proposed Fencing and Air Monitoring Locations
Building G Area

Malibu High School
30215 Morning View Drive, Malibu, California

Figure
8

PROJECT: 04-33980J



Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\Figure 9 - Confirmation Sampling Locations - Planter East of Building G - 2014-10-15.mxd

ENVIRON

Post-Excavation Incremental Soil Sampling Locations Building G Area

Malibu High School
30215 Morning View Drive, Malibu, California

Figure 9

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Baseball Fields
Soccer Field
Cornucopia
Tennis Courts
Former Stockpile for excavated soils from UST area
Parking Lot
Electrical Transformer
Bus Barn
Grounds Shop
Retention Basin
Boys & Girls Club
Pool Chemical Storage
Swimming Pool
Former USTs
Bus Washing Station
Basketball Courts
J
Gymnasium (2002)
JCES
Truck Loading Zone
Football Field
Amphitheater
G
K
Emergency Generator
Neutralization Tank
I
Electrical Transformer
High School Quad
F
H
D
Middle School Quad
E
B/C
A
Truck Route Entrance onto MHS Campus from Morning View Drive
Morning View Drive
Parking Lot
Undeveloped Land
Google Street View
Pacific Coast Highway
Morning View Drive
Truck Route Entrance onto Morning View Drive from Pacific Coast Highway

Notes:
1. JCES - Juan Cabrillo Elementary School.
2. MHS - Malibu Middle/High School.
3. USTs - Underground Storage Tanks.

Malibu Middle/High School
A - Library (1960s)
B/C - Administrative Offices (1960s)
D - Classrooms/Chemistry Lab (1960s)
E - Middle School Classrooms (1960s)
F - Art Studio (1960s)
G - Wood Shop (1960s)
H - Food Service/Kitchen/Auditorium (1960s)
I - Photo Lab (1960s)
J - Old Gymnasium (1960s)
K - Classrooms (2002)
Boys & Girls Club (2000)

Sources:
1. Aerial image from Google Earth Pro (8/26/2012).
2. Site boundaries based on Los Angeles County GIS parcel data (03/08/2006).
3. Feature labels on JCES provided by JCES administration office.
4. Feature labels on MHS taken from Removal Action Completion Work Plan (Arcadis Site Plan Figure 2; 08/05/2010).

Legend
- Truck Route
- Site Boundary
- Malibu Middle/High School
- Malibu Equestrian Center
- Cornucopia (Leased for Gardening/Education)

N

0 200
Feet

Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\Figure 10 - Truck Route - 2014-10-15.mxd

ENVIRON

Truck Route

Malibu High School
30215 Morning View Drive, Malibu, California

Figure
10

DRAFTED BY: SShin | Date: 10/15/2014 | PROJECT: 04-33980J

Appendix A

Human Health Risk Assessment

Contents

List of Tables

List of Appendices

Appendix A – Methodology of Human Health Risk Assessment

To evaluate the potential human health risks to on-site populations due to exposure to chemicals detected in soil in a planter area east of Building G (Building G Area), a human health risk assessment (HHRA) was performed. The HHRA approach consisted of 1) calculating cancer risks and non-cancer hazards for hypothetical future on-site residents exposed to soil through direct contact using established regulatory screening levels (i.e. California Environmental Protection Agency [Cal/EPA] Department of Toxic Substances Control [DTSC]-modified regional screening levels [RSLs] or United States Environmental Protection Agency [USEPA] RSLs for residential soil; and, 2) calculating cancer risks and non-cancer hazards for school receptors (i.e. middle/high school students and teachers/staff) exposed to soil through direct contact using the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) Schools Risk Screening Model (Cal/EPA 2010). The methodology used in this HHRA is consistent with Cal/EPA and USEPA risk assessment guidance as follows:

- Cal/EPA. 2004. Guidance for School Site Risk Assessment Pursuant to Health and Safety Code Section 901(f): Guidance for Assessing Exposures and Health Risks at Existing and Proposed School Sites;
- Cal/EPA. 2010. Schools Risk Screening Model;
- Cal/EPA. 2013. Preliminary Endangerment Assessment (PEA) Guidance Manual;
- Cal/EPA. 2014. HHRA Note Number 3, Issue: DTSC recommended methodology for use of USEPA RSLs in the Human Health Risk Assessment process at hazardous waste sites and permitted facilities; and
- USEPA. 2014. Regional Screening Levels (RSLs).

For each chemical, the relationship between the magnitude of exposure and the likelihood of adverse health effects is dependent on whether a chemical acts by a threshold or non-threshold mechanism. For carcinogens (non-threshold mechanism), the likelihood of adverse effects is quantified by the estimation of cancer risk. The cancer risk represents the upper-bound incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to a potential carcinogen in a medium (i.e., excess lifetime cancer risk). For non-carcinogens (threshold mechanism) the likelihood of adverse effects is quantified by development of hazard quotient (HQ). The HQ represents the ratio of the estimated dose from exposure to a non-carcinogen in a medium to a value that is believed to not produce non-cancer adverse health effects.

The National Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] § 300) is commonly cited as the basis for target risk and hazard levels. According to the NCP, excess lifetime cancer risks posed by a site should not exceed one in a million (1×10^{-6}) to one hundred in a million (1×10^{-4}), and noncarcinogenic chemicals should not be present at levels expected to cause adverse health effects (i.e., HQ greater than one). As a risk management policy, the Cal/EPA generally considers 1×10^{-6} to be a point of departure for purposes of making risk management decisions, with most approved remediation achieving excess lifetime cancer risk levels of ten in a million (1×10^{-5}) or lower.

The following sections discuss the various components of the HHRA. Section A.1 identifies the potential chemicals of concern. Section A.2 discusses the exposure assessment. The toxicity of the chemicals evaluated is discussed in Section A.3. Section A.4 explains the methodology for calculation of cancer risks and non-cancer hazards.

A.1 Identification of Potential Chemicals of Concern

All chemicals detected in one or more soil samples in the Building G Area were identified as potential chemicals of concern (PCOCs) and were included for evaluation in the HHRA. These chemicals included chlordane (total) (detected in 1 out of 14 samples), 4,4'-dichlorodiphenyldichloroethylene (DDE) (detected in 9 out of 14 samples), polychlorinated biphenyl (PCB) Aroclor 1254 (detected in15 out of 36 samples), and lead (detected in 14 out of 14 samples).

A.2 Exposure Assessment

To evaluate the human health risks posed by a site, it is necessary to identify the populations that may potentially be exposed to the chemicals present and to determine the pathways by which these exposures may occur.

A.2.1 Potentially Exposed Human Populations

The Building G Area is part of Malibu Middle/High School (MHS) and there are no plans to use the area for other purposes. Therefore, the HHRA identified school students and teachers/staff as the potentially exposed populations, which is consistent with the OEHHA guidance for school sites (Cal/EPA 2004). In addition, consistent with the DTSC PEA Guidance Manual (Cal/EPA 2013), future unrestricted/residential land use was considered as the most health-protective and conservative land use for the purposes of this HHRA. Therefore, hypothetical future on-site residents were also identified as a potentially exposed population.

A.2.2 Exposure Pathways

Hypothetical future on-site residents could potentially be directly exposed to chemicals in soil in the Building G Area through incidental ingestion, dermal contact, and inhalation of soil particulates in ambient air. These are the exposure routes on which the DTSC-modified RSLs (Cal/EPA 2014) and the USEPA RSLs (USEPA 2014) for residential soil are based. For school receptors, to be consistent with the OEHHA Schools Risk Screening Model, in addition to soil, indoor dust direct contact exposure routes, including incidental ingestion, dermal contact, and inhalation of dust particulates in indoor air, were also considered. Since none of the chemicals of concern are volatile, exposure through inhalation of volatile chemicals in ambient air was not evaluated.

A.2.3 Exposure Assumptions

Since the cancer risks and non-cancer hazards for hypothetical future on-site residents exposed to soil through direct contact were evaluated by directly comparing the Building G Area data with the DTSC-modified RSLs or the USEPA RSLs for residential soil, the exposure assumptions used to develop these screening levels were applied. For a resident, exposure is assumed to occur 7 days/week for 350 days/year (or approximately 96 percent of the time). The exposure

duration for the resident is assumed to be 26 years (USEPA 2014). According to USEPA (2011), this is the 90th percentile for time spent at one residence.

For school receptors, ENVIRON used a set of exposure parameters for each year until age 18, per the OEHHA Schools Risk Screening Model (Cal/EPA 2010), to take into consideration the rapid anatomical, physiological and behavioral changes for growing children. The exposure parameters for teachers/staff recommended by OEHHA (Cal/EPA 2004, 2010) were also used in this HHRA. Exposure assumptions for the school scenario are presented in Table A.1.

A.2.4 Intake Estimation

In order to quantify exposures, upper-bound estimates of the theoretical intakes were developed for the school receptors via each of the six exposure routes indicated in Section A.2.2. This section provides the equations and assumptions used to develop the intake factors used in the risk calculations, which are consistent with the OEHHA Schools Risk Screening Model. The calculated intake factors are presented in Table A.1.

Ingestion of Outdoor Soil

The intake factor for outdoor soil ingestion was calculated using the following equation:

$$IF_{soil.ing} = \frac{IR_{S/D} * F_O * EF * ED * CF}{BW * AT}$$

Where:

$IF_{soil.ing}$	=	Intake factor for outdoor soil ingestion (kilogram [kg] of soil/kg body weight/day)
$IR_{S/D}$	=	Soil/dust ingestion rate (milligram [mg] of soil/day)
F_o	=	Fraction of time outdoor at school during waking hours (unitless)
EF	=	Exposure frequency (day/year)
ED	=	Exposure duration (year)
BW	=	Body weight (kg)
AT	=	Averaging time (day)
CF	=	Conversion factor (kg of soil/mg of soil)

Ingestion of Indoor Dust

The intake factor for indoor dust ingestion was calculated using the following equation:

$$IF_{dust.ing} = \frac{IR_{S/D} * F_I * EF * ED * CF}{BW * AT}$$

Where:

$IF_{dust.ing}$	=	Intake factor for indoor dust ingestion (kg of soil/kg body weight/day)
IR_s	=	Soil/dust ingestion rate (mg of soil/day)
F_I	=	Fraction of time indoor at school during waking hours (unitless)
EF	=	Exposure frequency (day/year)
ED	=	Exposure duration (year)
BW	=	Body weight (kg)
AT	=	Averaging time (day)
CF	=	Conversion factor (kg of soil/mg of soil)

Dermal Contact with Outdoor Soil

The intake factor for dermal contact with outdoor soil was calculated using the following equation:

$$IF_{soil.derm} = \frac{\Sigma\ (AF * SA * F) *\ F_O *\ EF * ED * CF}{BW * AT}$$

Where:

$IF_{soil.derm}$	=	Intake factor for dermal contact with outdoor soil (kg of soil/kg body weight/day)
AF	=	Body-part-specific adherence factor (mg of soil/square centimeter [cm^2])
SA	=	Skin surface area (cm^2/day)
F	=	Body-part-specific fraction of skin surface area (unitless)
F_o	=	Fraction of time outdoor at school during waking hours (unitless)
EF	=	Exposure frequency (day/year)
ED	=	Exposure duration (year)
BW	=	Body weight (kg)
AT	=	Averaging time (day)
CF	=	Conversion factor (kg of soil/mg of soil)

Dermal Contact with Indoor Dust

The intake factor for dermal contact with indoor dust was calculated using the following equation:

$$IF_{dust.derm} = \frac{\Sigma\ (AF * SA * F) *\ F_I *\ EF * ED * CF}{BW * AT}$$

Where:

$IF_{dust.derm}$	=	Intake factor for dermal contact with indoor dust (kg of soil/kg body weight/day)
AF	=	Body-part-specific adherence factor (mg of soil/cm^2)
SA	=	Skin surface area (cm^2/day)
F	=	Body-part-specific fraction of skin surface area (unitless)
F_o	=	Fraction of time indoor at school during waking hours (unitless)
EF	=	Exposure frequency (day/year)
ED	=	Exposure duration (year)
BW	=	Body weight (kg)
AT	=	Averaging time (day)
CF	=	Conversion factor (kg of soil/mg of soil)

Inhalation of Outdoor Soil Particulates

The intake factor for inhalation of outdoor soil particulates was calculated using the following equation:

$$IF_{soil.part.inh} = \frac{BR_O *\ ET_O * EF * ED}{AT}$$

Where:

$IF_{soil.part.inh}$	=	Intake factor for inhalation of outdoor soil particulates (cubic meter [m^3] of air/kg of body weight/day)
BR_O	=	Breathing rate, outdoor (m^3 of air/kg of body weight/hour)
ET_O	=	Exposure time, outdoor (hour/day)
EF	=	Exposure frequency (day/year)
ED	=	Exposure duration (year)
AT	=	Averaging time (day)

Inhalation of Indoor Dust Particulates

The intake factor for inhalation of indoor dust particulates was calculated using the following equation:

$$IF_{dust.part.inh} = \frac{BR_I * ET_I * EF * ED}{AT}$$

Where:

$IF_{dust.part.inh}$ = Intake factor for inhalation of indoor dust particulates (m^3 of air/kg of body weight/day)

BR_I = Breathing rate, indoor (m^3 of air/kg of body weight/hour)

ET_I = Exposure time, indoor (hour/day)

EF = Exposure frequency (day/year)

ED = Exposure duration (year)

AT = Averaging time (day)

A.2.5 Exposure Point Concentrations

An exposure point concentration (EPC) of a chemical is the estimated concentration of that chemical to which a receptor is exposed over an assumed duration of exposure. In this HHRA, soil EPCs were calculated as the 95% upper confidence limits (UCLs) on the mean soil concentrations at 0-2 feet below ground surface (bgs) in the Building G Area for both resident and school receptors. This data set included 18 borings: MH-SB-10, MH-SB 11, MH-SB 13, MH-SB 14, MH-SB 76, MH-SB 77, MH-SB 79, and MH-SB 114 through MH-SB 124.

The 95% UCLs were calculated using the ProUCL software (Version 5.0), and the bias-corrected accelerated (BCA) bootstrap method using the Kaplan-Meier (KM) estimator was selected as the most appropriate method. In cases where a dataset consisted of only detected results (i.e. lead), the 95% BCA Bootstrap UCL was used. In cases where a dataset consisted of both detects and non-detects (i.e. 4,4'-DDE, Aroclor 1254), the 95% KM (BCA) UCL was used. Chlordane (total) was detected at only one location (MH-SB-13) at 0-0.5 feet bgs, and therefore, a 95% UCL could not be calculated. The detected concentration of 88 micrograms per kilogram (µg/kg) was used as the soil EPC for chlordane (total).

This HHRA evaluated the potential human health risks to on-site populations in the Building G Area both before and after soil excavation. It was assumed that the surface soil (0-0.5 feet bgs) at soil borings MH-SB-76 and MH-SB-118, which had the highest detected concentrations of Aroclor 1254, was removed during excavation, and Aroclor 1254 will not be detected at both locations after excavation, with a detection limit of 50 µg/kg.

According to Cal/EPA (2010), a transfer factor from outdoor soil to indoor dust of two (2) was used for the school model, which means the indoor dust EPC is twice that of the outdoor soil EPC.

A.3 Toxicity Assessment

The toxicity values used in this HHRA are consistent with those used to develop the DTSC-modified RSLs or the USEPA RSLs for residential soil. For chlordane (total), 4,4'-DDE, and Aroclor 1254, which are not on the DTSC HHRA Note 3 chemical list (Cal/EPA 2014), toxicity values were selected from the USEPA (2014) RSL table. The toxicity values used in this HHRA are summarized in Table A.2.

Inhalation unit risks (IURs) and inhalation reference concentrations (RfCs) are listed in the USEPA RSL (USEPA 2014) table for carcinogenic and non-carcinogenic effects through the inhalation pathway. To take into account different body weights and breathing rates of different age groups, IURs and RfCs were converted to inhalation cancer slope factors (CSFs) and inhalation reference doses (RfDs) in the calculation of inhalation risk and hazard using the underlying body weight and breathing rate for the IUR, that is 70 kg and 20 m^3/day.

In 2007, Cal/EPA OEHHA developed a toxicity evaluation for lead with a benchmark change in children's blood lead concentration of one (1) microgram per deciliter (µg/dL), which would reduce an intelligence quotient (IQ) by up to one point (Cal/EPA 2007). In light of the Cal/EPA lead toxicity criterion, the DTSC-modified RSL for lead in residential soil (80 mg/kg) was developed using LeadSpread 8 and corresponds to a concentration in soil that will result in a 90th percentile estimate of 1 µg/dL increase in blood lead in a child resident (Cal/EPA 2014).

In the OEHHA Schools Risk Screening Model, an age-dependent adjustment factor (ADAF) of 3 is applied to the cancer toxicity values for all the chemicals for children aged 2 to < 16 years old. However, since none of the PCOCs in this analysis is a mutagen, an ADAF was not applied.

A.4 Risk/Hazard Characterization

A.4.1 Residential Scenario

The estimated excess lifetime cancer risks and non-cancer hazards for chlordane (total), 4,4'-DDE, and Aroclor 1254 for hypothetical future on-site residents exposed to soil through direct contact were evaluated by directly comparing the Building G Area data with the DTSC-modified RSLs or the USEPA RSLs for residential soil. Since none of these chemicals is on the DTSC HHRA Note 3 chemical list (Cal/EPA 2014), USEPA RSLs (USEPA 2014) were used. USEPA RSLs are concentrations of chemicals in residential soil that the USEPA consider to be below thresholds of concern for risks to human health over a lifetime. These values correspond to an excess lifetime target cancer risk of one in 1 x 10^{-6} or a target HQ of 1 for noncancer health effects.

The excess lifetime cancer risks and non-cancer HQs for hypothetical future on-site residents exposed to chemicals in soil were calculated using the following equations:

$$Cancer\ Risk = \frac{Soil\ EPC}{Residential\ Soil\ Cancer\ RSL} * 10^{-6}$$

$$HQ = \frac{Soil\ EPC}{Residential\ Soil\ Non-Cancer\ RSL}$$

A.4.2 School Scenario

Using the pathway-specific parameters, EPCs, and toxicity values discussed above, equations used to calculate the cancer risks and non-cancer HQs for school receptors exposed to chemicals in soil are presented in this section, which are consistent with the OEHHA Schools Risk Screening Model.

Ingestion of Outdoor Soil or Indoor Dust

The estimated excess lifetime cancer risks and non-cancer HQs for outdoor soil or indoor dust ingestion were calculated using the following equations:

$$Cancer\ Risk = EPC * IF_{ing} * CSF_{oral} * CF$$

$$HQ = EPC * IF_{ing} / RfD_{oral} * CF$$

Where:

EPC	=	Exposure point concentration, outdoor soil or indoor dust (µg/kg)
IF_{ng}	=	Intake factor for outdoor soil or indoor dust ingestion (kg of soil/kg body weight/day)
CSF_{oral}	=	Oral cancer slope factor (mg/kg body weight/day)$^{-1}$
RfD_{oral}	=	Oral reference dose (mg/kg body weight/day)
CF	=	Conversion Factor (µg/mg)

Dermal Contact with Outdoor Soil or Indoor Dust

The estimated excess lifetime cancer risks and non-cancer HQs for dermal contact with outdoor soil or indoor dust were calculated using the following equations:

$$Cancer\ Risk = EPC * IF_{derm} * CSF_{oral} * ABS * CF$$

$$HQ = EPC * IF_{derm} * ABS / RfD_{oral} * CF$$

Where:

EPC	=	Exposure point concentration, outdoor soil or indoor dust (µg/kg)
IF_{derm}	=	Intake factor for dermal contact with outdoor soil or indoor dust (kg of soil/kg body weight/day)
CSF_{oral}	=	Oral cancer slope factor (mg/kg body weight/day)$^{-1}$
RfD_{oral}	=	Oral reference dose (mg/kg body weight/day)
ABS	=	Soil dermal absorption factor (unitless)
CF	=	Conversion Factor (µg/mg)

Soil dermal absorption factors (ABS) are presented in Table A.2.

Inhalation of Outdoor Soil or Indoor Dust Particulates

The estimated excess lifetime cancer risks and non-cancer HQs for inhalation of outdoor soil or indoor dust particulates were calculated using the following equations:

$$Cancer\ Risk = EPC * IF_{part.inh} * \ (IUR/BR_{assumed} * BW_{assumed}) \ /\text{PEF}$$

$$HQ = EPC * IF_{part.inh} / \ (RfC_{inh} * BR_{assumed}/BW_{assumed})/\text{PEF}$$

Where:

EPC	=	Exposure point concentration, outdoor soil or indoor dust (µg/kg)
$IF_{part.inh}$	=	Intake factor for inhalation of outdoor soil or indoor dust particulates (cubic meter [m^3] of air/kg of body weight/day)
IUR	=	Inhalation unit risk $(\mu g/m^3)^{-1}$
RfC_{inh}	=	Inhalation reference concentration ($\mu g/m^3$)
$BR_{assumed}$	=	Breathing rate assumed with IUR (20 m^3/day)
$BW_{assumed}$	=	Body weight assumed with IUR (70 kg)
PEF	=	Particulate emission factor (m^3/kg of soil)

It is assumed that school receptors may be exposed to airborne particulates on a daily basis under the current conditions in the Building G Area. Consistent with Cal/EPA recommendations (Cal/EPA 2010), a PEF of 5.6 x 10^8 m^3/kg was used to estimate airborne concentrations of a chemical from corresponding outdoor soil or indoor dust concentrations for school receptors. This PEF reflects an airborne concentration of particulates of approximately 1.8 $\mu g/m^3$.

For middle school and high school students, excess lifetime cancer risks and non-cancer HQs were calculated for each exposure pathway and each age year separately. Cancer risks from each age year were summed to represent the excess lifetime cancer risk for the whole exposure duration; that is 11 to < 14 years old for middle school students, 14 to < 18 years old for high school students, and 11 to < 18 years old for middle/high school students. The maximum HQ among different age years was selected to represent the HQ for the whole exposure duration; that is 11 years old for middle school students, 14 years old for high school students, and 11 years old for middle/high school students.

A.4.3 Lead

In this HHRA, to evaluate the potential adverse health effects resulting from exposure to lead in soil, especially the effects on blood lead concentrations, soil lead data were conservatively compared to the DTSC-modified RSL of 80 mg/kg for lead in residential soil for both residential and school scenarios.

References

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Tables

Table A-1. Exposure Assumptions for School Scenario[a]
Malibu High School
30215 Morning View Drive
Malibu, California

Exposure Factor	Units	Symbol	Teacher /Staff	Student (Age 11)	Student (Age 12)	Student (Age 13)	Student (Age 14)	Student (Age 15)	Student (Age 16)	Student (Age 17)
Population-Specific Exposure Assumptions										
Exposure Time, Outdoor	hr/day	ET_O	1.8	2.0	1.8	1.8	1.8	1.8	1.8	1.8
Exposure Time, Indoor	hr/day	ET_I	8.0	7.4	7.5	7.5	7.5	7.5	7.5	7.5
Fraction of Time Outdoor at School During Waking Hours	unitless	F_O	0.11	0.13	0.11	0.11	0.11	0.11	0.11	0.11
Fraction of Time Indoor at School During Waking Hours	unitless	F_I	0.50	0.46	0.47	0.47	0.47	0.47	0.47	0.47
Exposure Frequency	days/year	EF	250	250	250	250	250	250	250	250
Exposure Duration	years	ED	25	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Body Weight	kg_{BW}	BW	72	43	48	53	57	60	63	64
Averaging Time for Carcinogens	days	AT_c	25,550	25,550	25,550	25,550	25,550	25,550	25,550	25,550
Averaging Time for Noncarcinogens	days	AT_{nc}	9,125	365	365	365	365	365	365	365
Soil/Dust Ingestion										
Soil/Dust Ingestion Rate	mg_{soil}/day	$IR_{S/D}$	100	100	100	100	100	100	100	100
Conversion Factor	kg_{soil}/mg_{soil}	CF	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06
Intake Factor for Outdoor Soil Ingestion, cancer	kg_{soil}/kg_{BW}/day	$IF_{soil.ing\_c}$	3.7E-08	2.8E-09	2.2E-09	2.0E-09	1.9E-09	1.8E-09	1.7E-09	1.7E-09
Intake Factor for Outdoor Soil Ingestion, noncancer	kg_{soil}/kg_{BW}/day	$IF_{soil.ing\_nc}$	1.0E-07	2.0E-07	1.6E-07	1.4E-07	1.3E-07	1.2E-07	1.2E-07	1.2E-07
Intake Factor for Indoor Dust Ingestion, cancer	kg_{soil}/kg_{BW}/day	$IF_{dust.ing\_c}$	1.7E-07	1.0E-08	9.6E-09	8.6E-09	8.0E-09	7.6E-09	7.3E-09	7.1E-09
Intake Factor for Indoor Dust Ingestion, noncancer	kg_{soil}/kg_{BW}/day	$IF_{dust.ing\_nc}$	4.8E-07	7.3E-07	6.7E-07	6.0E-07	5.6E-07	5.3E-07	5.1E-07	5.0E-07
Soil/Dust Dermal Contact										
Skin Surface Area for Soil Contact	cm^2/day	SA	17,150	12,650	13,700	14,750	15,800	16,350	16,800	17,150
Fraction of Skin Surface Area, Head	unitless	F_{head}	0.076	0.098	0.087	0.10	0.093	0.086	0.080	0.076
Adherence Factor, Head	mg_{soil}/cm^2	AF_{head}	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Fraction of Skin Surface Area, Hands	unitless	F_{hand}	0.051	0.054	0.054	0.051	0.053	0.055	0.057	0.051
Adherence Factor, Hands	mg_{soil}/cm^2	AF_{hand}	0.092	0.092	0.092	0.092	0.092	0.092	0.092	0.092
Fraction of Skin Surface Area, Arms	unitless	F_{arm}	0.18	0.13	0.14	0.12	0.12	0.13	0.13	0.18
Adherence Factor, Arms	mg_{soil}/cm^2	AF	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023
Fraction of Skin Surface Area, Legs	unitless	F_{leg}	0.31	0.30	0.31	0.32	0.33	0.33	0.34	0.31
Adherence Factor, Legs	mg_{soil}/cm^2	AF_{leg}	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Fraction of Skin Surface Area, Trunk	unitless	F_{trunk}	0.32	0.35	0.35	0.33	0.33	0.33	0.33	0.32
Adherence Factor, Trunk	mg_{soil}/cm^2	AF_{trunk}	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
Fraction of Skin Surface Area, Feet	unitless	F_{feet}	0.073	0.072	0.070	0.080	0.077	0.073	0.069	0.073
Adherence Factor, Feet	mg_{soil}/cm^2	AF_{feet}	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.065
Conversion Factor	kg_{soil}/mg_{soil}	CF	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06	1.0E-06

Table A-1. Exposure Assumptions for School Scenario[a]
Malibu High School
30215 Morning View Drive
Malibu, California

Exposure Factor	Units	Symbol	Teacher /Staff	Student (Age 11)	Student (Age 12)	Student (Age 13)	Student (Age 14)	Student (Age 15)	Student (Age 16)	Student (Age 17)
Intake Factor for Outdoor Soil Dermal Contact, cancer	kg_{soil}/kg_{BW}/day	$IF_{soil.derm\_c}$	1.7E-07	9.7E-09	8.3E-09	8.1E-09	8.1E-09	7.9E-09	7.8E-09	7.8E-09
Intake Factor for Outdoor Soil Dermal Contact, noncancer	kg_{soil}/kg_{BW}/day	$IF_{soil.derm\_nc}$	4.9E-07	6.8E-07	5.8E-07	5.7E-07	5.6E-07	5.5E-07	5.4E-07	5.4E-07
Intake Factor for Indoor Dust Dermal Contact, cancer	kg_{soil}/kg_{BW}/day	$IF_{dust.derm\_c}$	7.9E-07	3.6E-08	3.6E-08	3.5E-08	3.5E-08	3.4E-08	3.3E-08	3.3E-08
Intake Factor for Indoor Dust Dermal Contact, noncancer	kg_{soil}/kg_{BW}/day	$IF_{dust.derm\_nc}$	2.2E-06	2.5E-06	2.5E-06	2.4E-06	2.4E-06	2.4E-06	2.3E-06	2.3E-06
Inhalation of Soil/Dust Particulates										
Breathing Rate, Outdoor	m^3/kg_{BW}/hr	BR_O	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
Breathing Rate, Indoor	m^3/kg_{BW}-hr	BR_I	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
Particulate Emission Factor	m^3/kg_{soil}	PEF	5.6E+08	5.6E+08	5.6E+08	5.6E+08	5.6E+08	5.6E+08	5.6E+08	5.6E+08
Intake Factor for Outdoor Soil Particulate Inhalation, cancer	m^3/kg_{BW}/day	$IF_{soil.part.inh\_c}$	1.9E-02	8.8E-04	7.7E-04	7.7E-04	7.7E-04	7.7E-04	7.7E-04	7.7E-04
Intake Factor for Outdoor Soil Particulate Inhalation, noncancer	m^3/kg_{BW}/day	$IF_{soil.part.inh\_nc}$	5.4E-02	6.2E-02	5.4E-02	5.4E-02	5.4E-02	5.4E-02	5.4E-02	5.4E-02
Intake Factor for Indoor Dust Particulate Inhalation, cancer	m^3/kg_{BW}/day	$IF_{dust.part.inh\_c}$	3.5E-02	1.3E-03	1.3E-03	1.3E-03	1.3E-03	1.3E-03	1.3E-03	1.3E-03
Intake Factor for Indoor Dust Particulate Inhalation, noncancer	m^3/kg_{BW}/day	$IF_{dust.part.inh\_nc}$	9.9E-02	9.1E-02	9.2E-02	9.2E-02	9.2E-02	9.2E-02	9.2E-02	9.2E-02

Notes:

cm^2/day = square centimeter per day
hr/day = hour per day
kg_{BW} = kilogram of body weight
kg_{soil}/kg_{BW}/day = kilogram of soil per kilogram of body weight per day
kg_{soil}/mg_{soil} = kilogram of soil per milligram of soil
mg_{soil}/cm^2 = milligram of soil per square centimeter
mg_{soil}/day = milligram of soil per day
m^3/kg_{BW}/day = cubic meter per kilogram of body weight per day
m^3/kg_{BW}/hr = cubic meter per kilogram of body weight per hour
m^3/kg_{soil} = cubic meter per kilogram of soil

a. The exposure parameters for teachers/staff and students recommended by OEHHA (Cal/EPA 2010) in the Schools Risk Screening Model were used in this HHRA.

Source:

California Environmental Protection Agency (Cal/EPA). 2010. Schools Risk Screening Model. March.

Table A-2. Toxicity Values
Malibu High School
30215 Morning View Drive
Malibu, California

Chemical Group	Chemical	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$		Inhalation Unit Risk $(\mu g/m^3)^{-1}$		Oral RfD (mg/kg-day)		Inhalation RfC $(\mu g/m^3)$		Soil Dermal Absorption Factor ABS_{soil}	
Organochlorine Pesticide	Chlordane (total)	0.35	IRIS	0.00010	IRIS	0.00050	IRIS	0.70	IRIS	0.05	Cal/EPA 2010
Organochlorine Pesticide	4,4'-DDE	0.34	IRIS	0.000097	Cal/EPA 2014	0.00050	IRIS, b	1.8	c	0.05	Cal/EPA 2010
PCB	Aroclor 1254	2.0	IRIS, a	0.00057	IRIS, a	0.000020	IRIS	0.070	c	0.14	Cal/EPA 2010

Notes:
mg/kg-day = milligram per kilogram per day
$\mu g/m^3$ = microgram per cubic meter
ABS_{soil} = Soil Dermal Absorption Factor
Cal/EPA = California Environmental Protection Agency
DDE = Dichlorodiphenyldichloroethylene
DDT = Dichlorodiphenyltrichloroethane
IRIS = Integrated Risk Information System (USEPA 2014)
OEHHA = Office of Environmental Health Hazard Assessment
PCB = Polychlorinated Biphenyl
RfD = Reference Dose
RfC = Reference Concentration
USEPA = United States Environmental Protection Agency
a. According to USEPA (2014), Aroclor 1254 was assigned the high risk toxicity values from IRIS.
b. DDT was used as a surrogate for DDE.
c. Route to route extrapolation.

Sources:
California Environmental Protection Agency (Cal/EPA). 2010. Schools Risk Screening Model. March.
California Environmental Protection Agency (Cal/EPA). 2014. OEHHA Toxicity Criteria Database. Online database maintained by OEHHA. Accessed September 30, 2014.
United States Environmental Protection Agency (USEPA). 2014. Integrated Risk Information System (IRIS). Online database Maintained by the USEPA. Accessed September 2014.

Attachment A:

OEHHA Schools Risk Screening Model Input File

Input			
Chemical name	**Chlordane**		
CAS #	57749		
Concentration of	**Chlordane**		
In on-site soil	8.8E-2	mg/kg	
In shallow ground water	0.0E+0	mg/l	
In soil vapor	0.00E+0	$\mu g/m^3$	
In on-site PM_{10}	0.0E+0	mg/kg	
In vapors from off-site	0.0E+0	$ug/L_{air\ (=mg/m^3)}$	
In PM_{10} from off-site	0.0E+0	$ug/L_{air\ (=mg/m^3)}$	
In drinking water supply	0.0E+0	mg/l	
Chronic Toxicity of	**Chlordane**		
Ingestion RfD	5.0E-4	5.0E-4 mg/kg/day	
Inhalation RfC (mg/m^3)	7.0E-4	2.0E-4 mg/kg/day	
User-supplied oral RfD	5.0E-4	mg/kg/day	
User-supplied inhalation RfD	2.0E-4	mg/kg/day	
Cancer Potency of	**Chlordane**		
By ingestion	3.5E-1	3.5E-1 $(mg/kg/day)^{-1}$	
Inhalation URF $(\mu g/m^3)^{-1}$	1.0E-4	3.5E-1 $(mg/kg/day)^{-1}$	
User-supplied oral CPF	3.5E-1	$(mg/kg/day)^{-1}$	
User-supplied inhalation URF	1.0E-4	$(\mu g/m^3)^{-1}$	
School year length	250	days	

Output		
Age-specific Risk and Hazard		
Age	**Cancer Risk**	**Hazard Quotient**
0-1	3.1E-10	1.2E-4
1-2	6.8E-9	2.7E-3
2-3	5.6E-9	2.2E-3
3-4	4.6E-9	1.8E-3
4-5	4.0E-9	1.6E-3
5-6	3.2E-9	1.3E-3
6-7	2.8E-9	1.1E-3
7-8	1.3E-9	5.4E-4
8-9	1.2E-9	4.8E-4
9-10	1.1E-9	4.3E-4
10-11	9.5E-10	3.8E-4
11-12	8.5E-10	3.4E-4
12-13	7.8E-10	3.1E-4
13-14	7.1E-10	2.9E-4
14-15	6.7E-10	2.7E-4
15-16	6.4E-10	2.6E-4
16-17	6.2E-10	2.5E-4
17-18	6.1E-10	2.4E-4
Moms	6.1E-10	2.4E-4
Staff	1.4E-8	2.3E-4

Input			
Chemical name	**DDE**		
CAS #	72559		
Concentration of	**DDE**		
In on-site soil	2.8E-2	mg/kg	
In shallow ground water	0.0E+0	mg/l	
In soil vapor	0.00E+0	$\mu g/m^3$	
In on-site PM_{10}	0.0E+0	mg/kg	
In vapors from off-site	0.0E+0	$ug/L_{air\ (=mg/m^3)}$	
In PM_{10} from off-site	0.0E+0	$ug/L_{air\ (=mg/m^3)}$	
In drinking water supply	0.0E+0	mg/l	
Chronic Toxicity of	**DDE**		
Ingestion RfD	5.0E-4	5.0E-4 mg/kg/day	
Inhalation RfC (mg/m^3)	1.8E-3	5.1E-4 mg/kg/day	
User-supplied oral RfD	5.0E-4	mg/kg/day	
User-supplied inhalation RfD	5.1E-4	mg/kg/day	
Cancer Potency of	**DDE**		
By ingestion	3.4E-1	3.4E-1 $(mg/kg/day)^{-1}$	
Inhalation URF $(\mu g/m^3)^{-1}$	9.7E-5	3.4E-1 $(mg/kg/day)^{-1}$	
User-supplied oral CPF	3.4E-1	$(mg/kg/day)^{-1}$	
User-supplied inhalation URF	9.7E-5	$(\mu g/m^3)^{-1}$	
School year length	250	days	

Output		
Age-specific Risk and Hazard		
Age	**Cancer Risk**	**Hazard Quotient**
0-1	9.6E-11	4.0E-5
1-2	2.1E-9	8.7E-4
2-3	1.8E-9	7.2E-4
3-4	1.4E-9	5.9E-4
4-5	1.3E-9	5.2E-4
5-6	9.9E-10	4.1E-4
6-7	8.8E-10	3.6E-4
7-8	4.2E-10	1.7E-4
8-9	3.8E-10	1.6E-4
9-10	3.3E-10	1.4E-4
10-11	3.0E-10	1.2E-4
11-12	2.6E-10	1.1E-4
12-13	2.4E-10	1.0E-4
13-14	2.2E-10	9.2E-5
14-15	2.1E-10	8.6E-5
15-16	2.0E-10	8.2E-5
16-17	1.9E-10	7.9E-5
17-18	1.9E-10	7.8E-5
Moms	1.9E-10	7.8E-5
Staff	4.5E-9	7.4E-5

Input			
Chemical name	**Aroclor 1254**		
CAS #	1336363		
Concentration of	**Aroclor 1254**		
In on-site soil	3.37E-1	mg/kg	
In shallow ground water	0.0E+0	mg/l	
In soil vapor	0.00E+0	$\mu g/m^3$	
In on-site PM_{10}	0.0E+0	mg/kg	
In vapors from off-site	0.0E+0	$ug/L_{air\ (=mg/m^3)}$	
In PM_{10} from off-site	0.0E+0	$ug/L_{air\ (=mg/m^3)}$	
In drinking water supply	0.0E+0	mg/l	
Chronic Toxicity of	**Aroclor 1254**		
Ingestion RfD	2.0E-5	2.0E-5	mg/kg/day
Inhalation RfC (mg/m^3)	7.0E-5	2.0E-5	mg/kg/day
User-supplied oral RfD	2.0E-5	mg/kg/day	
User-supplied inhalation RfD	2.0E-5	mg/kg/day	
Cancer Potency of	**Aroclor 1254**		
By ingestion	2.0E+0	2.0E+0	$(mg/kg/day)^{-1}$
Inhalation URF $(\mu g/m^3)^{-1}$	5.7E-4	2.0E+0	$(mg/kg/day)^{-1}$
User-supplied oral CPF	2.0E+0	$(mg/kg/day)^{-1}$	
User-supplied inhalation URF	5.7E-4	$(\mu g/m^3)^{-1}$	
School year length	250	days	

Output		
Age-specific Risk and Hazard		
	Cancer	**Hazard**
Age	**Risk**	**Quotient**
0-1	1.9E-8	3.3E-2
1-2	1.6E-7	2.8E-1
2-3	1.3E-7	2.3E-1
3-4	1.1E-7	1.9E-1
4-5	9.6E-8	1.7E-1
5-6	7.5E-8	1.3E-1
6-7	6.8E-8	1.2E-1
7-8	3.5E-8	6.2E-2
8-9	3.2E-8	5.6E-2
9-10	2.9E-8	5.0E-2
10-11	2.6E-8	4.5E-2
11-12	2.3E-8	4.0E-2
12-13	2.2E-8	3.8E-2
13-14	2.0E-8	3.5E-2
14-15	1.9E-8	3.4E-2
15-16	1.9E-8	3.3E-2
16-17	1.8E-8	3.2E-2
17-18	1.8E-8	3.1E-2
Moms	1.8E-8	3.1E-2
Staff	4.2E-7	2.9E-2

Input			
Chemical name	**Aroclor 1254**	(excavated)	
CAS #	1336363		
Concentration of	**Aroclor 1254**		
In on-site soil	2.31E-1	mg/kg	
In shallow ground water	0.0E+0	mg/l	
In soil vapor	0.00E+0	$\mu g/m^3$	
In on-site PM_{10}	0.0E+0	mg/kg	
In vapors from off-site	0.0E+0	$ug/L_{air\ (=mg/m^3)}$	
In PM_{10} from off-site	0.0E+0	$ug/L_{air\ (=mg/m^3)}$	
In drinking water supply	0.0E+0	mg/l	
Chronic Toxicity of	**Aroclor 1254**		
Ingestion RfD	2.0E-5	2.0E-5 mg/kg/day	
Inhalation RfC (mg/m^3)	7.0E-5	2.0E-5 mg/kg/day	
User-supplied oral RfD	2.0E-5	mg/kg/day	
User-supplied inhalation RfD	2.0E-5	mg/kg/day	
Cancer Potency of	**Aroclor 1254**		
By ingestion	2.0E+0	2.0E+0 $(mg/kg/day)^{-1}$	
Inhalation URF $(\mu g/m^3)^{-1}$	5.7E-4	2.0E+0 $(mg/kg/day)^{-1}$	
User-supplied oral CPF	2.0E+0	$(mg/kg/day)^{-1}$	
User-supplied inhalation URF	5.7E-4	$(\mu g/m^3)^{-1}$	
School year length	250	days	

Output		
Age-specific Risk and Hazard		
Age	**Cancer Risk**	**Hazard Quotient**
0-1	1.3E-8	2.3E-2
1-2	1.1E-7	1.9E-1
2-3	9.0E-8	1.6E-1
3-4	7.4E-8	1.3E-1
4-5	6.6E-8	1.2E-1
5-6	5.2E-8	9.0E-2
6-7	4.6E-8	8.1E-2
7-8	2.4E-8	4.2E-2
8-9	2.2E-8	3.8E-2
9-10	2.0E-8	3.5E-2
10-11	1.8E-8	3.1E-2
11-12	1.6E-8	2.8E-2
12-13	1.5E-8	2.6E-2
13-14	1.4E-8	2.4E-2
14-15	1.3E-8	2.3E-2
15-16	1.3E-8	2.2E-2
16-17	1.2E-8	2.2E-2
17-18	1.2E-8	2.1E-2
Moms	1.2E-8	2.1E-2
Staff	2.9E-7	2.0E-2

Attachment B:

LeadSpread 8 Input/Output File

LEAD RISK ASSESSMENT SPREADSHEET 8

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	80.0
Respirable Dust (ug/m^3)	1.5

OUTPUT						
Percentile Estimate of Blood Pb (ug/dl)						PRG-90
	50th	90th	95th	98th	99th	(ug/g)
BLOOD Pb, CHILD	0.6	1.0	1.2	1.5	1.7	77
BLOOD Pb, PICA CHILD	1.1	2.1	2.4	3.0	3.4	39

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	0.00	1%		0.00	0%
Soil Ingestion	7.0E-3	0.56	99%	1.4E-2	1.13	100%
Inhalation	2.0E-6	0.00	0%		0.00	0%

Attachment C:
ProUCL Output Files

UCL Statistics for Data Sets with Non-Detects									
User Selected Options									
Date/Time of Computation	10/2/2014 11:41:13 AM								
From File	UCL_Inputs - Soil.xls								
Full Precision	OFF								
Confidence Coefficient	95%								
Number of Bootstrap Operations	10000								
Unit	mg/kg								

Result (4,4'-dde_2 ft)

General Statistics			
Total Number of Observations	14	Number of Distinct Observations	11
Number of Detects	9	Number of Non-Detects	5
Number of Distinct Detects	9	Number of Distinct Non-Detects	2
Minimum Detect	0.006	Minimum Non-Detect	0.0049
Maximum Detect	0.059	Maximum Non-Detect	0.005
Variance Detects	3.8094E-4	Percent Non-Detects	35.71%
Mean Detects	0.0278	SD Detects	0.0195
Median Detects	0.023	CV Detects	0.703
Skewness Detects	0.5	Kurtosis Detects	-1.255
Mean of Logged Detects	-3.859	SD of Logged Detects	0.843

Normal GOF Test on Detects Only		
Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.203	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	Detected Data appear Normal at 5% Significance Level
Detected Data appear Normal at 5% Significance Level		

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	0.0196	Standard Error of Mean	0.00521
SD	0.0184	95% KM (BCA) UCL	0.0283
95% KM (t) UCL	0.0288	95% KM (Percentile Bootstrap) UCL	0.0281
95% KM (z) UCL	0.0282	95% KM Bootstrap t UCL	0.0311
90% KM Chebyshev UCL	0.0352	95% KM Chebyshev UCL	0.0423
97.5% KM Chebyshev UCL	0.0521	99% KM Chebyshev UCL	0.0715

Gamma GOF Tests on Detected Observations Only		
A-D Test Statistic	0.333	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.73	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.175	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.283	Detected data appear Gamma Distributed at 5% Significance Level
Detected data appear Gamma Distributed at 5% Significance Level		

Gamma Statistics on Detected Data Only			
k hat (MLE)	1.965	k star (bias corrected MLE)	1.384
Theta hat (MLE)	0.0141	Theta star (bias corrected MLE)	0.0201

nu hat (MLE)	35.37	nu star (bias corrected)	24.91
MLE Mean (bias corrected)	0.0278	MLE Sd (bias corrected)	0.0236
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	1.138	nu hat (KM)	31.86
Approximate Chi Square Value (31.86, α)	19.96	Adjusted Chi Square Value (31.86, β)	18.72
95% Gamma Approximate KM-UCL (use when n>=50)	0.0313	95% Gamma Adjusted KM-UCL (use when n<50)	0.0334
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.006	Mean	0.0214
Maximum	0.059	Median	0.0105
SD	0.0177	CV	0.825
k hat (MLE)	1.92	k star (bias corrected MLE)	1.556
Theta hat (MLE)	0.0112	Theta star (bias corrected MLE)	0.0138
nu hat (MLE)	53.76	nu star (bias corrected)	43.57
MLE Mean (bias corrected)	0.0214	MLE Sd (bias corrected)	0.0172
		Adjusted Level of Significance (β)	0.0312
Approximate Chi Square Value (43.57, α)	29.43	Adjusted Chi Square Value (43.57, β)	27.9
95% Gamma Approximate UCL (use when n>=50)	0.0317	95% Gamma Adjusted UCL (use when n<50)	0.0335
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.295	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.0188	Mean in Log Scale	-4.618
SD in Original Scale	0.0197	SD in Log Scale	1.274
95% t UCL (assumes normality of ROS data)	0.0282	95% Percentile Bootstrap UCL	0.0275
95% BCA Bootstrap UCL	0.0285	95% Bootstrap t UCL	0.0309
95% H-UCL (Log ROS)	0.0706		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	-4.38	95% H-UCL (KM -Log)	0.0398
KM SD (logged)	0.946	95% Critical H Value (KM-Log)	2.704
KM Standard Error of Mean (logged)	0.268		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0187	Mean in Log Scale	-4.626
SD in Original Scale	0.0198	SD in Log Scale	1.256
95% t UCL (Assumes normality)	0.0281	95% H-Stat UCL	0.0666
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.0288	95% KM (Percentile Bootstrap) UCL	0.0281
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Result (aroclor-1254_2 ft)			
General Statistics			
Total Number of Observations	36	Number of Distinct Observations	17
Number of Detects	15	Number of Non-Detects	21
Number of Distinct Detects	15	Number of Distinct Non-Detects	3
Minimum Detect	0.064	Minimum Non-Detect	0.049
Maximum Detect	1.5	Maximum Non-Detect	0.14
Variance Detects	0.168	Percent Non-Detects	58.33%
Mean Detects	0.5	SD Detects	0.41
Median Detects	0.41	CV Detects	0.82
Skewness Detects	1.16	Kurtosis Detects	1.13
Mean of Logged Detects	-1.061	SD of Logged Detects	0.96
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.168	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.229	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	0.237	Standard Error of Mean	0.0584
SD	0.339	95% KM (BCA) UCL	0.337
95% KM (t) UCL	0.336	95% KM (Percentile Bootstrap) UCL	0.334
95% KM (z) UCL	0.333	95% KM Bootstrap t UCL	0.373
90% KM Chebyshev UCL	0.412	95% KM Chebyshev UCL	0.492
97.5% KM Chebyshev UCL	0.602	99% KM Chebyshev UCL	0.818
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.167	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.754	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.107	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.225	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.506	k star (bias corrected MLE)	1.249
Theta hat (MLE)	0.332	Theta star (bias corrected MLE)	0.4

nu hat (MLE)	45.19	nu star (bias corrected)	37.48
MLE Mean (bias corrected)	0.5	MLE Sd (bias corrected)	0.447
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.49	nu hat (KM)	35.26
Approximate Chi Square Value (35.26, α)	22.68	Adjusted Chi Square Value (35.26, β)	22.22
95% Gamma Approximate KM-UCL (use when n>=50)	0.368	95% Gamma Adjusted KM-UCL (use when n<50)	0.376
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.214
Maximum	1.5	Median	0.01
SD	0.357	CV	1.666
k hat (MLE)	0.413	k star (bias corrected MLE)	0.397
Theta hat (MLE)	0.519	Theta star (bias corrected MLE)	0.54
nu hat (MLE)	29.71	nu star (bias corrected)	28.57
MLE Mean (bias corrected)	0.214	MLE Sd (bias corrected)	0.34
		Adjusted Level of Significance (β)	0.0428
Approximate Chi Square Value (28.57, α)	17.37	Adjusted Chi Square Value (28.57, β)	16.97
95% Gamma Approximate UCL (use when n>=50)	0.352	95% Gamma Adjusted UCL (use when n<50)	0.36
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.111	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.229	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.226	Mean in Log Scale	-2.685
SD in Original Scale	0.35	SD in Log Scale	1.676
95% t UCL (assumes normality of ROS data)	0.324	95% Percentile Bootstrap UCL	0.327
95% BCA Bootstrap UCL	0.349	95% Bootstrap t UCL	0.364
95% H-UCL (Log ROS)	0.698		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	-2.199	95% H-UCL (KM -Log)	0.343
KM SD (logged)	1.134	95% Critical H Value (KM-Log)	2.539
KM Standard Error of Mean (logged)	0.196		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.224	Mean in Log Scale	-2.57
SD in Original Scale	0.351	SD in Log Scale	1.439
95% t UCL (Assumes normality)	0.323	95% H-Stat UCL	0.439
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.336	95% KM (Percentile Bootstrap) UCL	0.334
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Result (aroclor-1254_2 ft_excavated)			
General Statistics			
Total Number of Observations	36	Number of Distinct Observations	15
Number of Detects	13	Number of Non-Detects	23
Number of Distinct Detects	13	Number of Distinct Non-Detects	3
Minimum Detect	0.064	Minimum Non-Detect	0.049
Maximum Detect	0.8	Maximum Non-Detect	0.14
Variance Detects	0.0661	Percent Non-Detects	63.89%
Mean Detects	0.377	SD Detects	0.257
Median Detects	0.34	CV Detects	0.682
Skewness Detects	0.398	Kurtosis Detects	-1.253
Mean of Logged Detects	-1.263	SD of Logged Detects	0.861
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.919	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.129	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.246	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
Mean	0.167	Standard Error of Mean	0.0375
SD	0.216	95% KM (BCA) UCL	0.231
95% KM (t) UCL	0.231	95% KM (Percentile Bootstrap) UCL	0.229
95% KM (z) UCL	0.229	95% KM Bootstrap t UCL	0.246
90% KM Chebyshev UCL	0.28	95% KM Chebyshev UCL	0.331
97.5% KM Chebyshev UCL	0.402	99% KM Chebyshev UCL	0.541
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.3	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.127	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.24	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.897	k star (bias corrected MLE)	1.51
Theta hat (MLE)	0.199	Theta star (bias corrected MLE)	0.249

nu hat (MLE)	49.31	nu star (bias corrected)	39.27
MLE Mean (bias corrected)	0.377	MLE Sd (bias corrected)	0.306
Gamma Kaplan-Meier (KM) Statistics			
k hat (KM)	0.6	nu hat (KM)	43.17
Approximate Chi Square Value (43.17, α)	29.1	Adjusted Chi Square Value (43.17, β)	28.58
95% Gamma Approximate KM-UCL (use when n>=50)	0.248	95% Gamma Adjusted KM-UCL (use when n<50)	0.253
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detected data is small such as < 0.1			
For such situations, GROS method tends to yield inflated values of UCLs and BTVs			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	0.143
Maximum	0.8	Median	0.01
SD	0.233	CV	1.634
k hat (MLE)	0.453	k star (bias corrected MLE)	0.433
Theta hat (MLE)	0.316	Theta star (bias corrected MLE)	0.33
nu hat (MLE)	32.58	nu star (bias corrected)	31.2
MLE Mean (bias corrected)	0.143	MLE Sd (bias corrected)	0.217
		Adjusted Level of Significance (β)	0.0428
Approximate Chi Square Value (31.20, α)	19.44	Adjusted Chi Square Value (31.20, β)	19.02
95% Gamma Approximate UCL (use when n>=50)	0.229	95% Gamma Adjusted UCL (use when n<50)	0.234
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.246	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.155	Mean in Log Scale	-2.931
SD in Original Scale	0.227	SD in Log Scale	1.553
95% t UCL (assumes normality of ROS data)	0.219	95% Percentile Bootstrap UCL	0.22
95% BCA Bootstrap UCL	0.231	95% Bootstrap t UCL	0.237
95% H-UCL (Log ROS)	0.4		
UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed			
KM Mean (logged)	-2.381	95% H-UCL (KM -Log)	0.22
KM SD (logged)	0.977	95% Critical H Value (KM-Log)	2.357
KM Standard Error of Mean (logged)	0.17		
DL/2 Statistics			
DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.153	Mean in Log Scale	-2.789
SD in Original Scale	0.227	SD in Log Scale	1.28
95% t UCL (Assumes normality)	0.217	95% H-Stat UCL	0.251
DL/2 is not a recommended method, provided for comparisons and historical reasons			

Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.231	95% KM (Percentile Bootstrap) UCL	0.229
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Result (lead_2 ft)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	2	Mean	12.3
Maximum	42	Median	10.35
SD	10.63	Std. Error of Mean	2.842
Coefficient of Variation	0.865	Skewness	1.746
Normal GOF Test			
Shapiro Wilk Test Statistic	0.823	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.237	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	17.33	95% Adjusted-CLT UCL (Chen-1995)	18.39
		95% Modified-t UCL (Johnson-1978)	17.55
Gamma GOF Test			
A-D Test Statistic	0.339	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.16	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.232	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.641	k star (bias corrected MLE)	1.337
Theta hat (MLE)	7.495	Theta star (bias corrected MLE)	9.199
nu hat (MLE)	45.95	nu star (bias corrected)	37.44
MLE Mean (bias corrected)	12.3	MLE Sd (bias corrected)	10.64
		Approximate Chi Square Value (0.05)	24.43
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	23.04
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	18.85	95% Adjusted Gamma UCL (use when n<50)	19.99

Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.237	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	0.693	Mean of logged Data	2.175
Maximum of Logged Data	3.738	SD of logged Data	0.874
Assuming Lognormal Distribution			
95% H-UCL	24.19	90% Chebyshev (MVUE) UCL	21.81
95% Chebyshev (MVUE) UCL	26.04	97.5% Chebyshev (MVUE) UCL	31.92
99% Chebyshev (MVUE) UCL	43.47		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	16.97	95% Jackknife UCL	17.33
95% Standard Bootstrap UCL	16.78	95% Bootstrap-t UCL	19.67
95% Hall's Bootstrap UCL	26.72	95% Percentile Bootstrap UCL	17.09
95% BCA Bootstrap UCL	18.46		
90% Chebyshev(Mean, Sd) UCL	20.83	95% Chebyshev(Mean, Sd) UCL	24.69
97.5% Chebyshev(Mean, Sd) UCL	30.05	99% Chebyshev(Mean, Sd) UCL	40.58
Suggested UCL to Use			
95% Student's-t UCL	17.33		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.

For additional insight the user may want to consult a statistician.

Appendix B

Revised Health and Safety Plan

Juan Cabrillo Elementary School and Malibu Middle/High School Malibu, California

Revised Health and Safety Plan

Prepared for:
Santa Monica-Malibu United School District
Santa Monica, California

Prepared by:
ENVIRON International Corporation
Irvine, California

Date:
December 2014

Project Number:
0433980M

ENVIRON

Table 1A: Emergency Response Telephone Roster

		Office
PERSONNEL		
ENVIRON Corporation		
Principal In Charge: Carol Serlin		949.798.3660
Project Manager: Safaa Dergham		949.798.3610
Designated Site Supervisor: Amy Caron		213.943.6323
Health & Safety Coordinator: Fan Xu		213.943.6343
Corporate H&S Director: Mark Watka		312.288.3875
Contractors		
Company: BC2	Contact: Sam Walker	714.744.2990
Company: Spectrum	Contact: Brett Baker	818.886.4500
Company: Jones Environmental	Contact: Karen Prame	714.449.9937
Company: Innovative Construction Solutions	Contact: John Farmer	714 893.6366
Company: Sawaya Engineering	Contact: Selim Sawaya	626.715.2320
Client/Security:		
Site Contact: Terry Kamibayashi		
EMERGENCY RESPONSE AGENCIES		
Hospital Kaiser Permanente (called 5/12/14)		805.374.7600
Emergency Fire		310.457.2578
Emergency Police		805.375.5630
County Health Department		310.419.5362
Ambulance Service		911
Other:		
OTHER EMERGENCY ASSISTANCE		
CHEMTREC		800.424.9300
National Response Center (oil and chemical spills)		800.424.8802
Poison Control Center		800.222.1222
Federal Emergency Management Agency		202.646.2500
OFF-SITE AGENCIES – NON EMERGENCY PHONE NUMBERS		
Police		805.375.5630
Medical Center		805.374.7600
Hospital		805.374.7600
Fire		310.457.2578
Ambulance Service		911
Federal Agency		
State Agency		
Regional and Local Agencies		
Other		
Other		

Table 1B: Emergency Services Instructions

For Emergency Medical Incidents, Emergency Fire Response, or Hazardous Materials Incidents

Emergency Telephone Numbers:

- Hospital: Kaiser Permanente – 805.374.7600
- Police: City of Thousand Oaks Police – 805.375.5630
- Fire Department: Los Angeles Fire Dept. Station #71 – 310.457.2578
- Site Security/Client: Santa Monica-Malibu Unified School District – 310.450.8338

1. Remember to speak SLOWLY and CLEARLY. Do NOT hang up first: let the dispatcher conclude the call.
2. Provide the following information:
    a. **Location: Juan Cabrillo Elementary School and Malibu Middle/High School**
       30237 and 30215 Morning View Drive
       Malibu, California
    b. **Your name and phone number**
3. Describe nature of Incident:
    a. **Emergency Medical Incident**
    b. **How many victims**
    c. **Type of incident - physical injury, etc.**
    d. **Assessment of victims' condition if known (whether victim is conscious/unconscious, breathing/not breathing, pulse/no pulse, nature of injuries, first aid measures used, etc.)**
    e. **Where incident occurred**
    f. **Fire:**
    g. **Location of Fire**
    h. **Hazardous Materials Incident:**
    i. **This is a hazardous materials incident requiring dispatch of HAZMAT unit**
    j. **Type of incident (fire, explosion, spill, etc.)**
    k. **Type of material (specific chemicals or general description)**
    l. **Whether there is also a Medical Emergency**
4. Give your location at the Site

Note: Security, Site Supervisor or designee must meet the emergency personnel at the staging area to brief them on the situation.

Route Description and Map to Hospital

Hospital Information:

Hospital Name: Kaiser Permanente

Hospital Address: 365 East Hillside Drive

Hospital Phone Number: 805.374.7600

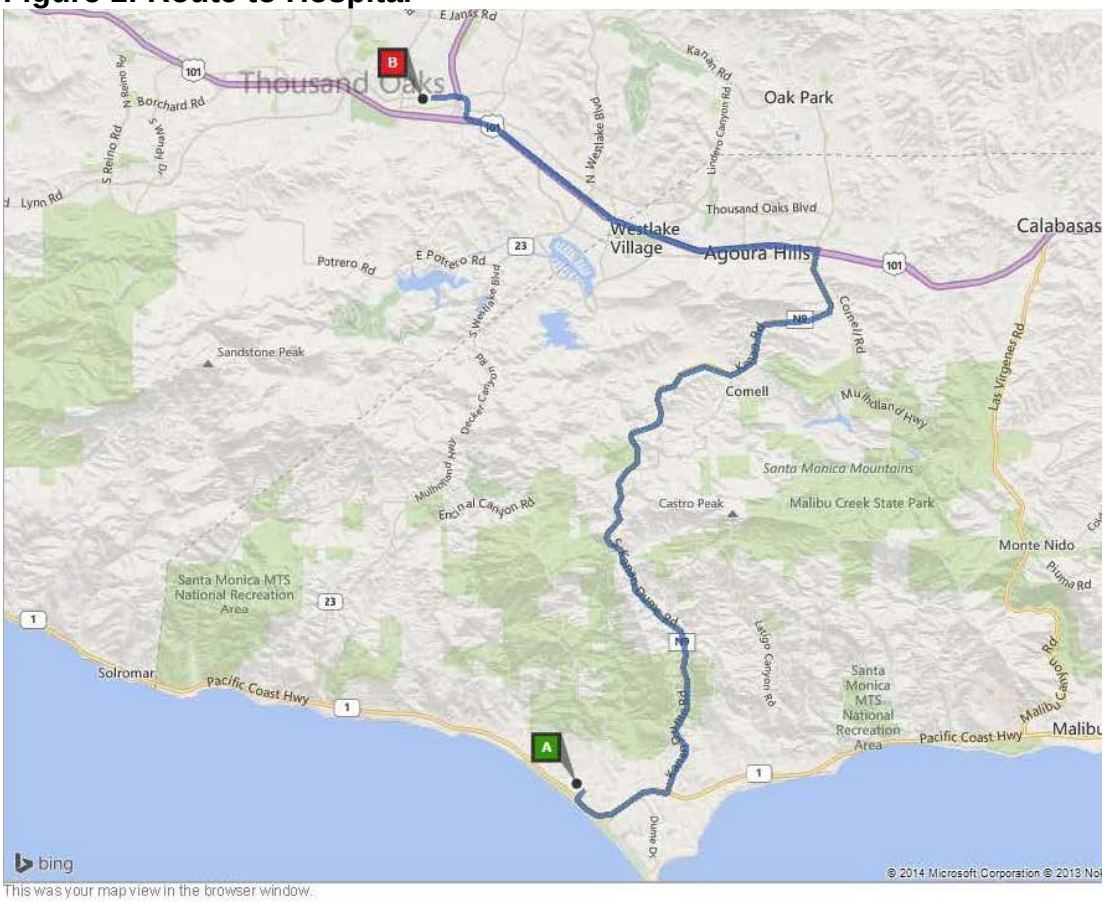
Directions to Area Hospital:

From: 30217 and 30215 Morning View Drive
Malibu California 90265

To: 365 East Hillcrest Drive
Thousand Oaks, California 91360

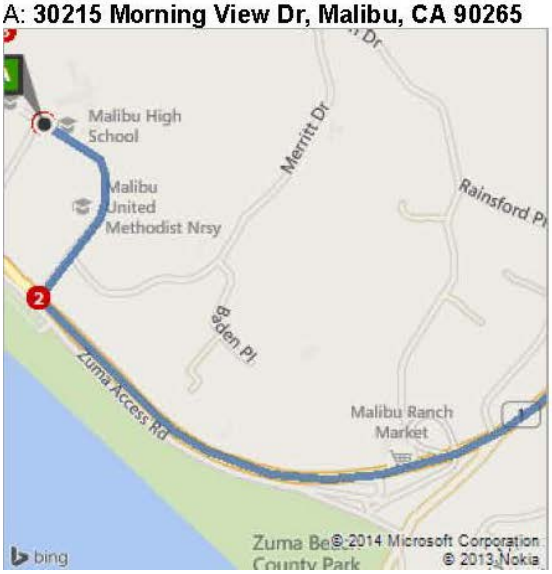
1.	**Head southeast on Morning View Drive toward Merritt Drive**	**0.3 miles**
2.	**Turn left onto CA-1S**	**1.7 miles**
3.	**Turn left onto Kanan Dume Road**	**6.2 miles**
4.	**Continue on Kanan Rood**	**2.0 miles**
5.	**Turn right to stay on Kanan Road**	**4.1 miles**
6.	**Turn right to stay on Kanan Road**	**0.2 miles**
7.	**Turn right to merge onto US101 North**	**6.1 miles**
8.	**Take the Rancho Road exit**	**0.2 miles**
9.	**Slight right onto South Rancho Road**	**0.3 miles**
10.	**Take the 3rd left onto Hillcrest Drive** **Destination will be on the right**	**0.7 miles**

Figure 1: Route to Hospital

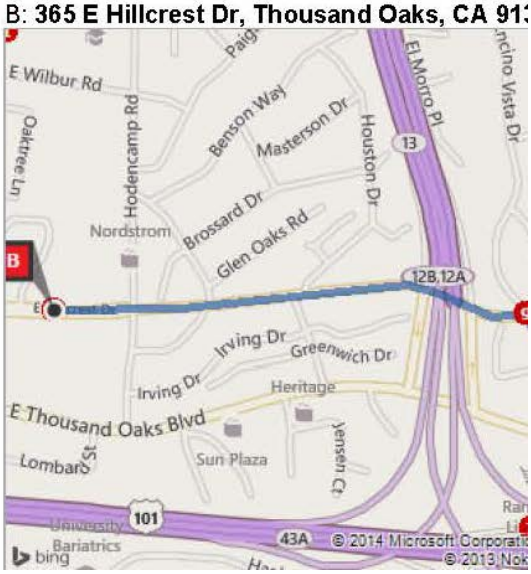


This was your map view in the browser window.

A: **30215 Morning View Dr, Malibu, CA 90265**



B: **365 E Hillcrest Dr, Thousand Oaks, CA 913**



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Acronyms and Abbreviations

AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
BBP	Bloodborne Pathogen
C	Ceiling Limit
CPR	cardiopulmonary resuscitation
dBA	Decibels on the “A” weighted scale
EMR	Experience Modification Rate
ENVIRON	ENVIRON International Corporation
ERP	Emergency Response Plan
GFCI	Ground fault circuit interrupter
H	High
HA	Hazard Assessment
HASP	Health and Safety Plan
HSIR	Health and Safety Incident Report
HSSC	Health and Safety Site Coordinator
IDLH	Immediately Dangerous to Life and Health
LOTO	Lockout/Tagout
L	Low
M	Moderate
MSDS	Material Safety Data Sheet
mg/m^3	milligrams per cubic meter
NA	Not Anticipated
NE	Not Established
NIOSH	National Institute for Occupational Safety and Health
PC	Program Coordinator
PELs	Permissible Exposure Limits
PM	Project Manager
PPE	Personnel Protective Equipment
PPM	Parts Per Million
SC	Site Coordinator
SPI	Standard Practice Instruction
SSC	Subsurface Clearance
STEL	Short Term Exposure Limits
T & C	Terms and Conditions
TWA	Time Weighted Average

Health & Safety Plan Review and Approval:

By signing below, it is acknowledge that this HASP identifies the activities that are anticipated to be performed in the field. In addition, this HASP identifies the personal protective and monitoring equipment that may be necessary to be on site and be available for use. It is also understood that the provisions of this HASP will be updated if there is a change of a task and/or the addition of tasks and will be approved by the individuals listed below or their designee.

Carol Serlin Principal-in-Charge	Signature	December 17, 2014 Date
Safaa Dergham Project Manager	Signature	December 17, 2014 Date
Fan Xu Health & Safety Coordinator	Signature	December 17, 2014 Date
Amy Caron Designated Site Supervisor	Signature	December 17, 2014 Date
Timothy Knapp Designated HASP Preparer	Signature	December 17, 2014 Date
Fan Xu Designated HASP Reviewer	Signature	December 17, 2014 Date

This form MUST be signed prior to starting the on-site work. In addition, a copy of this form should be returned to the office Health and Safety Coordinator prior to leaving for the field. After completion of the project, the original signed HASP must be retained in the project file

Author's Initials: TK Typist's Initials: gw

File Name: P:\S\SMMUSD\0433980M RAW\Appendices\Appendix B - hasp\HEALTH AND SAFETY PLAN.docx

1 Introduction

This HASP was prepared to inform all ENVIRON International Corporation (ENVIRON) personnel of known or reasonably anticipated potential hazards and safety concerns at this Site. All personnel participating in field activities must be trained in the general and specific hazards unique to the job they are performing and, if applicable, meet recommended medical examination and/or training requirements. All ENVIRON employees shall follow the guidelines, rules, and procedures contained in this site-specific HASP. ENVIRON personnel shall contact the Project Manager (PM) if unexpected conditions are encountered at the site, including but not limited to new processes; changes in operation, products, services; additional or changes in the chemicals of concern; and/or unsafe conditions are encountered which were not previously addressed in this HASP.

For purposes of this HASP, subcontractors refer to those retained directly or indirectly by ENVIRON, and contractors refer to all other entities working on site. Each contractor, subcontractor, and visitor shall be expected to review and understand the hazards, risks, and control methods (including emergency procedures) as outlined in this HASP, and sign off on the HASP. This can be accomplished either during the project planning stage or during the first safety briefing on site. However, contractors and subcontractors will be required to prepare their own HASP to address site safety and work hazards associated with their proposed site activities prior to mobilization to the site. In addition, each subcontractor will be required to provide ENVIRON with their site-specific HASP, and communicate the types of hazards and control methods associated with their activities to ENVIRON during the first safety briefing on site and as conditions change. Relevant Contractor information regarding the identification of hazards and appropriate control strategies for the hazards for their particular job tasks should also be presented and a site-specific HASP should be available for review by all parties. Each contractor or subcontractor must assume direct responsibility for its own employees' health and safety.

Copies of the HASPs will be kept on site for review and reference during all site activities. Upon completion of the project, the finalized and signed copy of the HASP will be placed in the project file.

When retaining and working with subcontractors, the following minimum requirements shall be met:

- A properly executed Contractor/Subcontractor Terms and Conditions (T&C) agreement with ENVIRON in place prior to commencing work on-site;
- Insurance policies and limits are acceptable to ENVIRON and all applicable Insurance Certificates are properly executed (i.e., ENVIRON being named as additionally insured under such policies, including Professional and Pollution Liability, if applicable. This will also include adding ENVIRON's CLIENT as being named as an insured party under the same policies);

- The roles and responsibilities of the subcontractor have been established, including the naming of the Health and Safety point of contact (these should be clearly indicated in the applicable subcontractor HASP);
- Submission of illness and injury logs indicating a favorable total incident rate (i.e., for the previous calendar year: the total incident rate is calculated by the total number of cases X 200,000 divided by the total hours worked by all employees of the subcontractor). This should be equal to or less than the industry average (i.e., for remediation services listed under the North American Industry Classification System (NAICS) 5629 the total incident rate must be equal or below 3.8); and
- A favorable Experience Modification Rate (EMR) (i.e., a rate equal to or less than 1.0) or an explanation of why your company does not qualify for an EMR from the Contractors insurance company.

1.1 Site Description

The site, which is comprised of Juan Cabrillo Elementary School (JCES) and Malibu Middle/High School (MHS), is located in the Zuma Beach Area, in the City of Malibu, on the southern flank of the western portion of the Santa Monica Mountains. JCES is located at 30237 Morning View Drive and MHS is located on 30215 Morning View Drive (Figure 2), 0.2 miles north of Pacific Coast Highway (PCH). The terrain generally consists of rolling hills with a maximum topographic relief of approximately 90 feet and elevations ranging from approximately 80 to 170 feet above mean sea level (amsl). The topography at the site and its vicinity slopes gently southwesterly to the Pacific Ocean. Land in the vicinity of the site consists of rural residential and recreational properties. Detailed descriptions of JCES and MHS are presented in the ensuing sections.

Juan Cabrillo Elementary School

JCES is comprised of approximately 6.4 acres, consisting of seven buildings (Buildings A through G, and the Multi-Purpose Room/Cafeteria), and two trailers used for childcare (Figure 2). Most of JCES was built between the late 1950s and the early 1960s, except for the Multipurpose Room/Cafeteria and the childcare trailers, which were built in 1995 and 1992, respectively. The main playground located in the northern portion of JCES consists of asphalted areas, a grassy field, and two sandboxes. The drop-off area is located along Morning View Drive, south of the buildings. Staff parking is located on the west side of the school, west of the Building A (Office) and the Multi-Purpose Room/Cafeteria. Most areas around the buildings are bordered with an approximate 8- to 10- foot wide concrete walkway and a concrete and/or vinyl siding overhang. Buildings A, D, and F are bordered by a planter to the south, north, and west, respectively. Buildings B and C, and D are separated by planter/garden areas that are used by students and staff for outdoors education such as gardening, farming, and recreation.

Malibu Middle/High School

MHS is comprised of approximately 80 acres and is currently improved with multiple permanent and temporary structures and various recreational facilities, including a pool and several sports fields (Figure 2). MHS consists of many buildings (Buildings A through K, and New Gymnasium). Construction of most of the buildings occurred in the 1960s, except for Building H

and the New Gymnasium, which were built in 2002. Two large metal barn-like structures that are used for facility storage and vehicle maintenance, including a bus washing station ("Bus Barn") are located in the northwestern portion of MHS. Similarly to JCES, most buildings at MHS are bordered by an approximately 8- to 10- foot wide concrete walkway and a concrete and/or vinyl siding overhang. An outdoor concrete amphitheater is located north of Building I and east of Building G.

The swimming pool and athletic fields are located on the north and northeastern half of MHS. The area east of the athletic fields is mostly undeveloped. The District owns and leases three areas to other parties: 1) a green house and garden area located in the northwestern portion of the MHS, which is referred to as Cornucopia, 2) The Boys and Girls Club located adjacent and northeast of the swimming pool, and 3) a portion of the Equestrian Center, located southeast of the MHS buildings (Figure 2).

1.2 Site History

The site was undeveloped until the late 1950s and portions appear to have been used for activities related to dry land farming. JCES is the smaller of the two schools and is located east of MHS. Construction of JCES was initiated in late 1950s and the school was completed in its current configuration in 1992. Construction of MHS was initiated in the early 1960s and the school was completed in its current configuration in 2002. Since construction, the site has been used for educational purposes.

1.3 Historical Documents

- A review of documents provided to ENVIRON by the District including facility prepared plans and procedures and material safety data sheets (MSDSs) for products (e.g. maintenance chemicals, pesticides, rodenticides, herbicides) used at the site. In addition, ENVIRON reviewed the following other documents:
  - SMMUSD ES Reconstruction Program, Report of Additional Site Assessment Activities, by Cape Environmental Management, dated February 18 1993.
  - Workplan to Assess Malibu Park High Site closure Permit No 9285B, by Cape Environmental Management, August 2 1993.
  - Additional Data Regarding Water Depth in the Vicinity of Malibu Park School, Malibu, California, by Ocean Blue Engineers, Inc., August 4, 1993.
  - Subsurface Investigation by Drilling Four Borings and Soil Sampling, and Possible Installation, Development and Sampling of Four Groundwater Monitoring Wells at Malibu Park School, Malibu, by Ocean Blue Engineers, Inc. California, dated April 4, 1994.
  - Background Information and Specifications for Subsurface Investigation by Drilling Four Borings and Soil Sampling, and Possible Installation, Development and Sampling of Four Groundwater Monitoring Wells at Malibu Park School, Malibu, California, by Ocean Blue Engineers, Inc., dated July 27, 1994.
  - Interim Report of Groundwater Monitoring Well Installation and Site Assessment Report at 30215 Morning View Drive, Malibu, California, by Vector Three Environmental, Inc., dated December 7, 1995.

- Summary Report of Previous Site Investigations and Closure Requests for Malibu Park School Located at 30215 Morning View Drive, Malibu, California, Ocean Blue Engineers, Inc., dated August 21, 1996.
- Destruction of Four Groundwater Monitoring Wells at Malibu Park School Located at 30215 Morning View Drive, Malibu, California, by Ocean Blue Engineers, Inc., dated November 5, 1996.
- Consultation Regarding Floor Slab Moisture, Existing Building E, Malibu High School, 30215 Morning View Drive, Malibu, California, by Law/Crandall, Inc. dated 1994.
- Facilities Area Survey, Malibu High School, and Juan Cabrillo Elementary School, by Malibu High School dated March 1, 1999.
- Award of Bid #3.05 Energy Efficiency Lighting Retrofit Project – Phase III – Malibu High School, by Santa Monica Malibu Schools, dated October 28, 2005.
- Building sewers to Septic System, Malibu High School and Juan Cabrillo Elementary School, by D. Lewis Company, dated January 28, 2009.
- Scope of Work, Seepage Pit Backfill, by Topanga Underground, dated July 30, 2009.
- Final Percolation Test Data - Seepage Pits, Revised Seepage Pit Depths, by Topanga Underground, August 25, 2009.
- Draft Phase I Environmental Site Assessment, Malibu Middle and High School Campus, 30215 Morning View Drive, Malibu, California, prepared by LFR, dated September 17, 2009.
- Preliminary Environmental Assessment Report, Malibu Middle and High School Campus Improvement Project, 30215 Morning View Drive, Malibu California, prepared by ARCADIS, dated June 14, 2010.
- Removal Action Work Plan, Malibu Middle and High School Campus Improvement Project, 30215 Morning View Drive, Malibu, California, prepared by ARCADIS, dated August 5, 2010.
- Santa Monica – Malibu Unified School District, Malibu Middle and High School Campus Improvement Project, Environmental Impact Report, prepared by Atkins, formerly PBS&J, July 2011.
- Removal Action Completion Report, Malibu Middle and High School Campus Improvement Project, 30215 Morning View Drive, Malibu, California, prepared by ARCADIS, dated June 12, 2012.
- 4th Quarter 2013 Monitoring Report for Malibu High School, Malibu Middle School, and Juan Cabrillo Elementary School," by Ashirt Engineering Inc., dated January 14, 2014.

To date, subsurface investigations have been conducted only at MHS. Subsurface investigations have not been conducted at the JCES. Subsurface investigation information was obtained from available files received from regulatory agencies and files received from the District.

1.3.1 Subsurface Investigations

Previous subsurface investigations conducted at MHS consisted of:

- Removal of the two former 10,000 gallon USTs located at the Bus Barn; these investigations were conducted by Ocean Blue Engineers, Cape Environmental Management, and Vector Three Environmental between 1992 and 1996;
- Evaluation and backfilling of septic system leach pits at JCES and MHS conducted by Topanga Underground in 2009; and
- Soil investigations and subsequent soil removal in areas proposed for redevelopment at MHS; these investigations were conducted by Arcadis in 2009 and 2010. Soil removal was conducted in 2011.

These investigations are summarized below:

1.3.1.1 Former Underground Storage Tank (UST) Removal Activities

In a letter dated May 15, 1986, Dames and Moore reported the results of integrity testing conducted on the former diesel USTs, which indicated a “slight leak somewhere within the system and arrangements are being made to have the systems checked and repaired.” On August 27, 1987, the Los Angeles County Department of Public Work (LACDPW) issued a letter regarding the USTs’ integrity test failure and requested a written report to document the lateral and vertical extent of the potential impact of the leaking USTs. The USTs and associated piping were removed in August 1992 under the oversight of the LACDPW. Soil confirmation samples were collected two feet beneath the former USTs and associated dispensers and were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) by United Stated Environmental Protection Agency (USEPA) Method 8020 and for total petroleum hydrocarbon-diesel (TPH-d) by USEPA Method 8015 Modified (M). Analytical results indicated that toluene, ethylbenzene, xylenes, and/or TPH-d were detected in soil in sample SST2AW at maximum concentrations of 10,000 micrograms per kilogram (µg/kg), 15,000 µg/kg, 130,000 µg/kg, and 5,800 µg/kg, respectively.

Five stockpile soil samples were collected from stockpiled excavated soils and were analyzed for BTEX by USEPA Method 8020 and for TPH-d by USEPA Method 8015 Modified (M). Stockpile soil sampling results indicated that diesel was detected at maximum concentration of 1,200 milligrams per kilogram (mg/kg). Toluene was detected in a sample at a concentration of 6.2 µg/kg and xylenes were detected in two soil samples at concentrations of 880 µg/kg in SSSP1E and 430 µg/kg in SSSP1SE.

The removed USTs were certified as non-hazardous and were transported to D.W. Russel Co. for recycling or destruction.

In October 1992, eight borings (B1 through B8) were drilled in the vicinity of the former USTs to characterize the extent of impacted soil. Soil borings B3 and B8 were advanced to a depth of approximately 40 feet and 35 feet bgs, respectively. Soil Borings B1, B2, and B4 through B7 were advanced to a depth of approximately 20 feet bgs, and soil samples were collected at variable depths. Soil samples were analyzed for BTEX by USEPA Method 8020 and for TPH-d

by USEPA Method 8015M. Soil sampling results indicated that BTEX and TPH-d were detected at maximum concentrations of 360 µg/kg, 17,000 µg/kg, 32,000 µg/kg, 310,000 µg/kg, and 2,200 µg/kg, respectively.

In January 1993, an additional subsurface investigation was conducted to better define the extent of impacted soil. Three additional soil borings (B9 through B11) were advanced to depths of approximately 30- and 40-feet bgs. Soil samples were collected from borings B9 starting from approximately 25 feet bgs and then at 5 foot intervals to the total depth of the boring and from boring B11 starting from approximately 15 feet bgs and then at 5 foot intervals to the total depth of the borings. Boring B10 was slant-drilled underneath the dispensers and the building and sampled at depths of approximately 12-, 21-, and 30-feet bgs and two soil samples (W. dispenser #1 and E. dispenser #2) were collected directly underneath the dispensers at depths of approximately 3- and 4-feet bgs, respectively. Soil samples were analyzed for BTEX by USEPA Method 8020 and TPH-d by USEPA Method 8015 M. BTEX and TPH-d were detected in soil samples from B9 through B11 at maximum concentrations of 500 µg/kg, 690 µg/kg, 320 µg/kg, 2,900 µg/kg, and 14 µg/kg, respectively.

Soil samples collected below the dispensers indicated that soil was impacted with TPH-d at a maximum concentration of 290 µg/kg. BTEX were not detected above their respective laboratory reporting limits.

During advancement of the borings, perched groundwater was encountered in boring B11 at approximately 40 feet bgs and a grab groundwater sample was collected and analyzed for BTEX by USEPA Methods 8020. The grab groundwater sample results indicated that BTEX was detected at maximum concentrations of 1,500 micrograms per liter (µg/l), 19,000 µg/l, 2,300 µg/l, and 15,000 µg/l, respectively.

In early 1993, oversight of the USTs removal was transferred from the LACDPW to the LARWQCB. The LARWQCB requested evaluation of groundwater conditions through installation of four monitoring wells. In 1995, monitoring wells MW1 through MW3 were installed to a depth of approximately 50 feet bgs and monitoring well MW4 was installed to a depth of approximately 42 feet bgs. During well installation, soil samples were collected at 5-foot intervals from each boring. BTEX and TPH-d were not detected above their respective laboratory reporting limits in soil samples obtained from borings MW-1 through MW-3. Soil samples obtained from monitoring well MW-4 exhibited BTEX at maximum concentrations of 444 µg/kg, 63 µg/kg, 212 µg/kg, and 193 µg/kg at approximate depths ranging from 32 to 35 feet bgs.

Based on ENVIRON's review of the available soil analytical data concentrations of toluene, benzene, ethylbenzene, and xylenes in certain soil samples exceeded the current applicable USEPA residential regional screening levels (RSLs) for each of the compounds.

Initial groundwater sampling results, post well development, indicated that BTEX and TPH-d were detected only in MW-3 and MW-4 at maximum concentrations of 42.9 µg/l 16.3 µg/l, 6.9 µg/l, 41.5 µg/l, 1.2 µg/l, respectively. BTEX and TPH-d were not detected above their respective laboratory reporting limits in MW-1 and MW-2.

In 1996, three quarters of groundwater sampling were conducted in January, April, and July. Concentrations of BTEX and TPH-d were not detected above their respective laboratory reporting limits in MW-1 and MW-2. Concentrations of BTEX in monitoring well MW-4 decreased to below their respective reporting limits by July 1996. In monitoring well MW-3, the July 1996 sampling results indicated that TPH-d, toluene, and xylenes were not detected above their laboratory reporting limit. Benzene was detected at a concentration of 33.4 μg/l, exceeding its MCL of 1 μg/l and ethylbenzene was detected at a concentration of 34.7 μg/l, below its MCL of 700 μg/l.

Based on the groundwater monitoring results, Ocean Blue Engineers concluded that concentrations of BTEX had generally been declining, and therefore requested closure from the LARWQCB on August 21, 1996. On September 11, 1996, the LARWQCB provided closure for the former USTs. Monitoring wells MW-1 through MW-4 were abandoned on November 6, 1996.

1.3.1.2 Evaluation and backfilling of septic systems leach pits

In 2009, a District contractor, Topanga Underground, installed 11 monitoring wells (MW-1 through MW-11) at the site to evaluate the separation between the groundwater table and the base of each leach pit associated with the various on-site septic systems. The City of Malibu requires a separation of 10 feet between the bottom of each leach pit and the groundwater table. The locations of the monitoring wells and septic tanks are illustrated on Figure 3. Depth to water measurements collected following installation of the monitoring wells indicated that the distance between the groundwater table and the bottom of each pit associated with Septic Systems 1, 3, 4, 7, 9, and 11 was less than 10 feet and therefore the base of the leach pits needed to be adjusted. For each pit requiring adjustment, a concrete and sand slurry mixture was placed in the lower portion of the pit, raising the bottom of the pit to obtain the required 10-foot separation between the bottom of the pit and the underlying groundwater table. In accordance with the LARWQCB WDR permit for the septic systems, groundwater monitoring wells are gauged and sampled quarterly to monitor the separation between base of the leach pits and the water table and to monitor for coliform bacteria.

1.3.1.3 Shallow Soil Sampling by Arcadis

In October 2009, LFR/Arcadis, on behalf of the District, conducted a Phase I ESA in preparation for the redevelopment of certain portions of MHS. The Phase I ESA identified five RECs: REC 1, the potential for lead-based paint (LBP) and termiticides due to the age of the buildings; REC 2, the former 10,000 gallon former diesel USTs; REC-3, septic tanks; REC-4, bus washing station in the bus barn; and REC5, transformers.

Arcadis reviewed these RECS in light of the planned redevelopment, which at that time, consisted of the 20 areas. Arcadis then prepared a Preliminary Environmental Assessment (PEA) Work Plan to evaluate the 3 RECs that were located within the boundaries of the 20 areas proposed for redevelopment and improvements. The other two RECs were not included in the PEA because they were located outside the proposed improvement areas. The 3 RECs addressed in Arcadis' PEA include:

- **REC-1:** Current and former structures constructed prior to the ban of LBP and organochlorinated pesticides in the late 1970s/early 1980s;

- **REC-2:** Residual volatile hydrocarbons in the vicinity of the former USTs; and
- **REC-3:** The potential for hazardous materials from the chemistry laboratories, woodshop, art studio, and/or the photography darkroom being released to the septic systems.

Arcadis conducted the PEA in November 2009 and February 2010. The PEA included the collection and analysis of soil and soil vapor samples Results were compared to residential California Human Health Screening Levels (RCHHSLs)[1]. Results of Arcadis' investigation of the RECs are summarized below:

REC-1: Shallow[2] soil samples were collected from depths of approximately 0.5- and 2.5-feet bgs at 18 locations (SS-Structure-1 through SS-Structure-18) and were analyzed for lead, pesticides and PCBs using USEPA Methods 6010B, 8081A, and 8082, respectively. Below is a summary of the compounds detected:

- Lead concentrations ranged from 2.74 mg/kg in SS-STRUCTURE-10-0.5 to 57.4 mg/kg in soil sample SS-STRUCTURE-7-0.5 located east of Building E. Lead concentrations were not reported above the RCHHSL for lead of 80 mg/kg.
- Of the pesticides, technical chlordane, alpha chlordane and gamma chlordane were detected in soil at maximum concentrations of 1,910 µg/kg, 683 µg/kg and 305 µg/kg in soil sample SS-STRUCTURE-7-0.5, located east of Building E, 4,4-DDT was detected at a maximum concentration of 361 µg/kg. at SS-Structure-13-0.5, located north of Building A. Technical chlordane exceeded the RCHHSL of 430 µg/kg at SS-STRUCTURE-7 at 0.5 feet (1,910 µg/kg) and 2.5 feet (601 µg/kg), and alpha chlordane exceeded the same RCHHSL at 0.5 feet (683 µg/kg).
- Aroclor-1254 was the only detected PCB, with a maximum concentration of 1,040 µg/kg in soil sample SS-STRUCTURE-12-0.5, located north of Buildings B/C (Administration Building). PCBs (Aroclor-1254) exceeded the RCHHSL of 89 µg/kg at 11 of 18, or 61 % of sampled locations.

Subsequent to the initial sampling, 16 step-out soil samples (SS-SO-2 through SS-SO-17) were collected from depths of approximately 0.5- and/or 2.5-feet bgs from various areas to further delineate PCB-impacted soils and 3 soil step-out samples (SS-SO-18 through SS-SO-20) were collected to delineate pesticide-impacted soils surrounding sample location SS-Structure-7. In summary:

- Aroclor-1254 was reported in soil samples collected from approximately 0.5 feet bgs at locations SS-SO-2 through SS-SO-6, SS-SO-9, SS-SO-13, and SS-SO-14 and ranged in concentrations from 50.4 µg/kg to 1,420 µg/kg, exceeding the RCHHSL of 89 µg/kg at five locations. Aroclor 1254 also was detected in soil samples collected from approximately 2.5 feet bgs at locations SS-SO-2 (98.8 µg/kg) and SS-SO-5 (119 µg/kg) that exceeded the

[1] In 2010 when Arcadis compared detected concentrations of PCBs, pesticides, and metals to screening thresholds, it used residential CHHSLs. According to the current DTSC PEA Guidance Manual (page 39), "CHHSLs are no longer generally recommended for use in a human health risk evaluation, because they are not routinely reviewed and revised as new scientific information becomes available."

[2] Shallow samples are less than or equal to two feet.

RCHHSL of 89 µg/kg. All other reported detections of Aroclor 1254 in soil samples collected from approximately 2.5 feet bgs were below the RCHHSL.

- Pesticide soil step-out samples were collected from a depth of approximately 0.5-feet bgs. Pesticides were not detected above laboratory reporting limits in soil samples SS-SO-18 or SS-SO-19. Alpha chlordane, gamma chlordane and technical chlordane were detected in soil sample SS-SO-20 at concentrations of 21.2 µg/kg, 15.3 µg/kg, and 155 µg/kg, respectively below their RCHHSLs of 430 µg/kg, 500 µg/kg, and 430 µg/kg.

REC- 2: Three vapor probes (VW-5 through VW-7) were advanced in the vicinity of the neutralization tank, and three vapor probes (SV-8 through SV-10) were advanced north of the Bus Barn area. Soil vapor samples were collected at 5 and 10 feet bgs. Soil vapor samples were analyzed for volatile organic compounds (VOCs) by USEPA Method 8260B. Soil vapor sampling results indicated that VOCs were not detected above their respective laboratory reporting limits in VW-5 through VW-7, in the general vicinity of the neutralization tank.

Benzene was detected at 10 feet bgs at a concentration of 0.16 µg/l in SV-9 Toluene was not detected at 5 feet bgs, and was detected in all 3 soil vapor samples at 10 feet bgs at a maximum concentration of 1.2 µg/l. No step-out sampling was conducted.

REC-3: Soil and soil vapor sampling were conducted in REC-3 as further described below:

1.3.2 Shallow Soil Sampling

Shallow soil samples were collected from nine locations (SS-Perc-1 through SS-Perc-9) at depths ranging from 10- to 30-feet bgs to evaluate the seepage pits associated with the septic systems. Four background soil samples (SB-1 through BS-4) were also were collected from approximately 2.5 feet bgs from undeveloped areas around the site. All samples were analyzed for metals and pH by USEPA Methods 6010 and 9045C, respectively. Maximum concentrations of detected metals were compared to the maximum concentrations of metals in background samples and to the RCHHSLs. pH ranged from 7.0 to 8.7 pH units in the percolation zone samples and ranged from 7.6 to 7.7 pH units in the background sample locations. Metals that were detected at concentrations greater than their respective CHHSLs are discussed below:

- Arsenic concentrations ranged from 1.12 mg/kg to 13.7 mg/kg in the soil samples collected from the percolation zones and from 3.59 mg/kg to 10.6 mg/kg in the soil samples collected from undeveloped areas for the background metals comparison. Detected arsenic concentrations collected from the percolation zones and the background samples exceeded arsenic's RCHHSL of 0.07 mg/kg.
- Cadmium concentrations ranged from not detected above the laboratory reporting limit to 6.17 mg/kg in the percolation zone samples and ranged from 1.05 mg/kg to 4.77 mg/kg in the background sample locations. Select cadmium concentrations collected from the percolation zones and the background samples exceeded cadmium's RCHHSLs of 1.7 mg/kg.

- Lead concentrations ranged from 0.59 mg/kg to 304 mg/kg in the percolation zone sample locations and ranged from 1.23 mg/kg to 4.1 mg/kg in the background sample locations. Detected lead concentrations collected from the percolation zones and the background samples were below the RCHHSLs of 80 mg/kg, except for one location, SS-Perc-9 (near the neutralization tank), are at a depth of approximately 10 feet bgs at a concentration of 304 mg/kg.

While the concentrations of certain metals were above their respective CHHSLs, these same metals occur naturally in soils throughout California, At this site, arsenic and cadmium concentrations were found to be consistent with background concentrations.

Lead was detected in sample SS-Perc-9 (near the neutralization tank are) at a depth of approximately 10 feet bgs at a concentration of 304 mg/kg, exceeding the maximum background for lead of 4.1 mg/kg and the RCHHSL of 80 mg/kg. Step-out (and up) sampling was conducted and consisted of one soil boring (SS-SO-1), with soil samples collected from depths of approximately 0.5- and 2.5-feet bgs, adjacent to SS-Perc-9. These soil samples were analyzed for lead by USEPA Method 6010B. Lead was detected at 5.03 mg/kg at 0.5-foot bgs and 2.26 mg/kg at 2.5 feet bgs, below the RCHHSL of 80 mg/kg.

1.3.3 Soil Vapor Sampling

Four soil vapor probes were advanced in the vicinity of the leach pits associated with Septic Tank 1 (SV-1 through SV-4). Soil vapor samples were collected at depths of approximately 5 and 10 feet bgs. Soil vapor samples were analyzed for VOCs. Analytical results indicate that toluene was detected in SV-2 in the 10-foot sample at a concentration of 4.3 μg/L and benzene was detected at a concentration of 0.1 μg/L at 5 feet in SV-1, slightly exceeding its RCHHSL of 0.036 μg/L. VOCs were not detected in any of the samples collected from SV-3 and SV-4.

Arcadis prepared a Human Health Screening Risk Evaluation (HHSRE***).*** Based on the results of the HHSRE, Arcadis recommended excavating soils containing Aroclor 1254 and technical chlordane at concentrations greater than the applicable RCHHSLs of 430 μg/kg and 89 μg/kg, respectively. In August 2010, Arcadis prepared a Removal Action Workplan, which was implemented between July and August of 2011 to excavate, remove, and dispose of impacted soil from nine impacted areas (Areas 1 through 9); Area 9, illustrated on Figure 3, was identified as pesticide-impacted soil and the remaining eight areas (Areas 1-8) illustrated on Figure 3 were identified as PCB-impacted soil. In total, approximately 1,179 cubic yards (yds^3) of pesticide and PCB-impacted soil was excavated, subsequently characterized as non-hazardous, and disposed of at the Chiquita Canyon Landfill in Castaic, California.

Based on the results of the historical review conducted for the site and results of previous subsurface investigations, ENVIRON has identified the following chemicals of potential concern (COPCs) and developed the scope of work described in Section 1.5.

Pesticides, herbicides, metals, total petroleum hydrocarbons (TPH), SVOCs, VOCs, lead, and PCBs are considered COPCs in certain areas of the site. COPCs and associated media are listed below:

- Shallow soils (surface to 2 feet bgs): Pesticides (organophosphates and organochlorine), herbicides, metals, PCBs, and TPH;
- Deeper soils (> than 2 feet bgs): SVOCs, metals and TPH; and
- Soil vapor (equal to or > 5 feet bgs): VOCs.

1.4 Scope and Applicability

ENVIRON has been retained to conduct and/or manage investigation activities at the Site. This HASP addresses activities currently being planned at the Site. Addendums will be added to this HASP to address activities at the site as they develop in the future.

ENVIRON views the implementation of a site-specific HASP as a critical management tool necessary to the safety, health, and well-being of Site personnel and the community. Site operations will be performed in such a manner as to minimize the possibility of serious injury or accidents to site personnel, fire, explosion, or any unplanned or sudden release of contaminants into the environment that could adversely affect local receptors. This HASP is intended to be in compliance with all applicable state, federal and local regulations and is consistent with ENVIRON's commitment to the health and safety of its personnel, contractors on the site, and the surrounding community.

The HASP identifies potential hazards associated with the activities being conducted during field activities at the Site, establishes the minimum procedural and equipment requirements to protect on-site personnel from potential hazards, and requires that on-site activities are conducted in a manner consistent with both accepted professional practice and applicable regulations. It also describes measures to minimize accidents and injuries that may occur during normal daily activities or during adverse conditions.

The HASP is based upon the currently available information regarding the Site. Operating conditions could potentially change as the work progresses, requiring some modification of the HASP. Any permanent modifications to the HASP, including changes necessary to correct any potential health and safety issues at the Site will be made only with permission by those individuals listed in Section 1 of this HASP. Approved changes will be added to the HASP as Addendums.

Applicability of this HASP extends to all personnel and visitors to the Site. However, ENVIRON's subcontractors are ultimately responsible for the health and safety of their personnel and representatives, and are required to furnish their own HASP. All personnel and visitors entering on-site active fieldwork areas are responsible for reading and complying with the HASP, and must sign an agreement to comply with the requirements of the HASP.

1.5 Specific Work Activities

The principal features of the field activities currently underway or planned for the immediate future include the following work activities or tasks:

- Task 1 – Utility Clearance
- Task 2 – Soil Sampling

- Task 3 – Soil Vapor Sampling
- Task 4 – Monitoring Well Sampling
- Task 5 – Surveying
- Task 6 – Investigation Derived Waste
- Task 7 – Focused Excavation in the Building G Area
- Task 8 – Removal and Disposal of the Excavated Soil
- Task 9- Post-Excavation Incremental Soil Sampling of Excavated Areas

Each of these Tasks is further described as follows:

Task 1 – Utility Clearance

Prior to initiating fieldwork, ENVIRON will perform a site visit to mark proposed soil, soil gas, and grab groundwater boring locations. Underground Services Alert (USA) will be notified prior to any drilling activities to mark utilities to the site boundaries. ENVIRON will request that the Santa Monica-Malibu United School District (District) provide utility maps, if such are available. In addition, ENVIRON will retain a private utility locating subcontractor to clear each sampling location of subsurface structures and/or utilities using geophysical methods and delineate zones for drilling.

Soil, Soil Gas, and Grab Groundwater Sampling

Prior to soil boring advancement temporary fencing or other barriers will be placed and warning signs will be posted around the work zone designated by ENVIRON personnel and its subcontractors to restrict staff, students, and the public from obtaining access to work zone and drilling areas.

Task 2 – Soil Sampling (Completed)

ENVIRON will advance borings throughout the site for collection of soil samples as depicted on Figure 4. Borings for soil sample collection will be advanced in accordance with the scope of work and rationale listed in Table 2. Boring depths range from 0.5 feet below ground surface (bgs) to 55 feet bgs. Borings 2 feet or shallower likely will be advanced with a hand auger. Soil samples will be collected using a slide hammer. Borings greater than 2 feet will be hand augered to 5 feet bgs to clear for underground utilities, after which a geoprobe, and/or hollow steam auger drilling techniques will be used to reach the total depth of the boring.

Drilling and collection of soil samples will be conducted in accordance with the field sampling protocols included in Appendix H. Soil samples will be selectively analyzed by a California-State certified fixed laboratory for semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270C; pesticides by USEPA Methods 8141 and 8081; herbicides by USEPA Method 8151; polychlorinated biphenyls (PCBs) by USEPA Method 8082A; total petroleum hydrocarbons (TPH) by USEPA Modified Method 8015B; and/or metals including lead by USEPA Method 6010B/7471A. Non-disposable equipment will be decontaminated prior to each successive use and re-use.

Task 3 – Soil Vapor Sampling and Grab Groundwater Sampling (Completed)

Soil Vapor Sampling

ENVIRON will advance borings throughout the site for collection of soil vapor samples as depicted on Figure 4. Borings for soil vapor sample collection will be advanced in accordance with the scope of work and rationale listed in Table 2. Soil vapor probes will be installed at variable depths ranging from 5 feet bgs to 55 feet bgs as listed in Table 2. Borings will be hand augered to 5 feet bgs after which a geoprobe, and/or hollow steam auger drilling techniques will be used to complete the boring to its proposed depth. Soil gas probe construction and soil gas sampling will be conducted in accordance with the California Environmental Protection Agency, Department of Toxic Substances Control, Los Angeles Regional Water Quality Control Board, and San Francisco Regional Water Quality Control Board *Advisory – Active Soil Vapor Investigations* (Advisory), dated April 2012. Soil vapor samples will be analyzed for VOCs by USEPA Method 8260 Modified by a California State certified mobile laboratory.

Grab Groundwater Sampling

ENVIRON will advance two of the proposed soil gas borings to first encountered groundwater, anticipated between 55 and 60 feet bgs (see Figure 4). Drilling and collection of grab groundwater samples will be conducted in accordance with the field sampling protocols included in Appendix H. Grab ground water samples will be analyzed for VOCs by USEPA Method 8260B and TPH by USEPA Method 8015M.

Task 4 – Monitoring Well Sampling (Completed)

Eleven monitoring wells are located at the Site. ENVIRON will measure the depth to groundwater in each of the 11 wells according to the groundwater level monitoring protocol included in Appendix H. Select monitoring wells (MW-3, -4, -5, -6, -7, -10, and -11) will then be purged and sampled according to ENVIRON's "Low-Flow Groundwater Sampling Protocol" included in Appendix H. Groundwater samples will be analyzed for VOCs by USEPA Method 8260B, SVOCs by USEPA Method 8270C, Title 22 Metals (field filtered) by USEPA 6010B/7471A, and TPH by USEPA Method 8015M.

Task 5 – Surveying (Completed)

The locations of all monitoring wells, soil borings, soil vapor probes, and grab groundwater samples will be surveyed by a licensed surveyor and tied in to the local coordinate system. Vertical elevations will reference mean sea level to the nearest 0.01 foot. Horizontal position will be referenced to the State Plane Coordinate System to the nearest 1 foot.

Task 6 – Investigation Derived Waste (Completed)

Decontamination rinseate, disposable sampling equipment, and Personal Protective Equipment will be collected and contained in a Department of Transportation (DOT)-approved 55-gallon drums.

Drilling residuals such as unused portions of soil samples and drill cuttings will be stored in DOT-approved drums. Analytical results reported from the sampling event will be used to characterize the soil residuals prior to off-site disposal.

All drums will be labeled, sealed, and stored on-site at the Bus Barn, away from occupied buildings and playgrounds, pending appropriate off-site disposal in accordance with state and federal regulations.

Task 7 – Focused Excavation in the Building G Area

An area measuring 45 feet long by 7 feet wide by 1.5 feet deep was identified for excavation in the Building G Area. The Building G Area, within the MHS footprint, is comprised of the planters located immediately east of Building G and north of Building I. The area is composed of planters varying in width from 2 feet (east of Building G) to approximately 5 feet (north of Building I) as depicted. The Building G Area and the footprint of the excavation area are depicted on Figures 5 and 6, respectively.

Impacted soil will be removed with a mini-excavator. As soil is excavated, it will be transferred into a bobcat bucket. The bobcat will then transport the soil from the excavation area, north and around of Building G, and will load it directly onto roll-off bins temporarily stored at the westernmost perimeter fencing. Areas traversed by the bobcat carrying the excavated soil will be lined with Visqueen plastic sheeting overlain with plywood. These areas include the concrete walkway east of Building G and directly adjacent to the proposed excavation area, the concrete area north of Building G, and the asphalt and a portion of the parking lot where the roll off bins will be stored. Dust generation will be controlled through wetting the soil and air monitoring will be conducted at locations depicted on Figure 7 to confirm particulate concentrations are acceptable. A portion of the hillside north of Building G, the lower half of the wall in proximity to the westernmost perimeter, and the grass and picnic areas, in proximity to the roll off bins and excavation area will be covered with Visqueen plastic sheeting during excavation activities to reduce the potential deposition of dust and soil particulates during soil loading procedures. Excavation will not be conducted during times of high wind conditions (e.g., wind speed in excess of 25 miles per hour). Visqueen plastic lining and plywood will be taken down and removed from the Building G Area and site immediately after completion of excavation activities.

Task 8 – Removal and Disposal of the Excavated Soil

Existing soil data will be used to profile the excavated soil before it is transported off-site for disposal. Based on the analytical results gathered during previous investigations, the soil excavated from the Building G Area will be handled as non-hazardous waste, and will be transported to a Class III landfill to be recycled for alternate daily cover. Currently, the removal action contractor plans to transport the excavated soil to the Waste Connections - Chiquita Canyon Landfill for disposal.

During soil transport activities, trucks will enter the site from Morning View Drive as depicted on Figure 8. The trucks will then make a right on a gated alley way that separates MHS from JCES, and then turn right onto the parking lot north of Building K through a chain linked fence and stop at the western most perimeter fenced area where the roll-off bins will be stored and where they will be loaded onto the trucks. Transportation will be coordinated in such a manner that at any given time, on-site trucks will be in communication with the removal action contractor. In addition, trucks will be required to maintain slow speeds (i.e. less than 5 miles per hour) for safety and dust control purposes.

Prior to exiting the loading/fenced area, the trucks will be swept to remove any extra soil or dust to minimize transport of potentially impacted soil. Prior to off-site transport, the trucks will be inspected to ensure that the roll-off bins are securely covered and cleaned of excess soil, properly placarded, and that the truck manifest has been completed and signed by the generator and the transporter. Once loaded, the trucks will be leave the loading fenced area and exit the site through the same alley they used to come to the site, back to Morning View Drive, to Pacific Coast Highway.

Task 9- Post-Excavation Incremental Soil Sampling of Excavated Areas

Post-excavation soil sampling will be conducted using the DTSC-approved incremental sampling methodology that previously was used in implementation of the PEA Work Plan. Two Decision Units (DU) have been identified for the post-excavation soil samples: 1) DU-1 is comprised of the bottom wall and 2) DU-2 is comprised of the sidewalls (northern, eastern, and part of the southern wall where soil is exposed) of the excavation. Each DU will be divided into 30 grids for a total of 60 grids. Following the same procedures used during implementation of the PEA Work Plan, three incremental soil sampling locations will be randomly selected within each grid in a given DU for a total of 180 borings (90 samples in DU-1 and 90 samples in DU-2). At each location, one soil sample will be collected from the surface to 0.5 feet below the surface. Soil samples will be analyzed for PCBs, specifically Aroclor 1254, using USEPA Method 8082 on an expedited turn-around time for incremental sample analysis (4 working days). Upon completion of the incremental sampling, the area will be backfilled with clean soil and restored to its original condition.

Table 2. Proposed Scope of Work
Juan Cabrillo Elementary School and Malibu Middle/High School
30237 and 30215 Morning View Drive
Malibu, California

Area/Building				Media	Number of Borings[a]	Number of Samples	Depth (feet bgs)	Sampling Type	Analysis	Proposed Scope of Work	Objective
Juan Cabrillo Elementary School (JCES)	AOI-1	Buildings constructed prior to 1981	Building A (teacher's lounge, office)	Soil	43	86	0.5 and 2	Discrete	PCBs, Pesticides, Herbicides, and Lead	Collect soil samples adjacent to buildings constructed prior to 1981 in accessible exposed areas (typically grassy, planter, or sandy areas); At buildings where concrete walkways abut the side of the building, soil samples will be collected from soil as close as feasible to the edge of the concrete; Soil samples will be collected from elevated planters, adjacent to buildings; Proposed soil boring locations are evenly spaced around the buildings at intervals ranging from 20 to 25 feet and/or in areas closest to and/or across from windows where PCB-containing caulk may potentially be present.	• Evaluate the potential presence of PCBs, lead, and termiticides in exposed soil adjacent to and in close proximity to buildings constructed prior to 1981. • Evaluate the potential presence of pesticides and herbicides due to potential application of such at the site. • Perform a human health screening risk evaluation.
			Building B								
			Building C								
			Building D								
			Building E								
			Building F								
	AOI-2	Septic Systems	Septic System 7 (3 pits @ 31, 30, 32 feet bgs)	Soil and Soil Vapor	2 Soil Vapor 2 Soil	6 Soil Vapor 8 Soil	SV: 5, 15, 30 Soil: 5, 15, 25, 35	Discrete	SV: VOCs Soil: SVOCs, TPH, and Metals, Groundwater: VOCs, SVOCs, TPH, and Metals	Collect soil and soil vapor samples adjacent to leach pits associated with Septic Tanks 7, 8, and 9 and collect groundwater samples from existing monitoring wells MW-3 and MW-4 associated with Septic Tanks 8 and 9. In each boring: • Soil samples will be collected at 10-foot intervals starting at 5 feet bgs to below the base of the leach pit; • Soil vapor samples will be collected at three locations: at 5 feet bgs, near the middle of the leach pit, and near the bottom of the leach pit; Collect groundwater samples from monitoring wells MW-3 and 4.	• Evaluate potential impact to soil from septic systems and leach pits. • Determine groundwater quality in proximity to septic system 9. • Perform a human health screening risk evaluation.
			Septic System 8 (Leach Field)	Soil, Soil Vapor, and Groundwater	2 Soil Vapor 2 Soil 1 groundwater (MW-3)	2 Soil Vapor 4 Soil; 1 Groundwater	SV: 5 Soil: 5, 10				
			Septic System 9 (1 pit @ 36 feet bgs)		1 Soil Vapor 1 Soil 1 groundwater (MW-4)	3 Soil Vapor 5 Soil; 1 Groundwater	SV: 5, 20, 36 Soil: 5, 15, 25, 35, 40				
	AOI-3	Electrical Transformer	Electrical Transformer west of Building A	Soil	2	4	0.5, 2	Discrete	PCBs	Collect soil sample adjacent to transformer concrete pad	• Evaluate the potential for PCBs in soil due to potential impact from former/older transformer. • Perform a human health screening risk evaluation.
	AOI-4	Grassy and Sandy Playgrounds	Playground - grassy area	Soil	4	8	0.5, 2	Discrete	Pesticides, Herbicides, and Metals	Collect soil samples from open playground areas (grassy and sandy) where pesticides and herbicides could have been applied. Soil sample locations are randomly selected across the playing fields.	• Evaluate the potential presence of pesticides and herbicides due to potential application of such at the site. • Perform a human health screening risk evaluation.
			Drop-off - grassy area		2	4	0.5, 2				
			Area near patio/lunch		1	2	0.5, 2				
			Playground -sandy area		5	5	1				
Malibu Middle/High School (MHS)	AOI-5	Buildings constructed prior to1981	Building E	Soil	34	68	0.5, 2	Discrete	PCBs, Pesticides, Herbicides, and Lead	Collect soil samples adjacent to buildings constructed prior to 1981 in accessible exposed areas (typically grassy, planter, or sandy areas); At buildings where concrete walkways abut the side of the building, soil samples will be collected from soil as close as feasible to the edge of the concrete Soil samples will be collected from elevated planters, adjacent to buildings; Proposed soil boring locations are evenly spaced around the buildings at intervals ranging from 20 to 25 feet and/or in areas closest to and/or across from windows where PCB-containing caulk may potentially be present.	• Evaluate potential presence of PCBs, pesticides, lead, and termiticides in exposed soil by collecting soil samples. adjacent to and in proximity to buildings constructed prior to 1981 buildings that have not been previously sampled;. • Evaluate the potential presence of pesticides and herbicides due to potential application of such at the site. • Perform a human health screening risk evaluation.
			Building D								
			Building A								
			Buildings B/C								
			Building G/G2								
			Building I								
	AOI-6	Areas Previously Excavated by Arcadis	Various Buildings	Soil	19	38	0.5, 2, and for previously excavated areas just below the base of previous excavation	Discrete	PCBs, pesticides, and herbicides	Collect soil samples adjacent to soil confirmation samples collected from the sidewalls or bottom of previously excavated areas. Additionally, soil samples will be collected from the open areas where previous soil sampling was conducted	• Confirm the adequacy of the lateral and vertical extent of the excavations performed by Arcadis. • Assess and confirm previous soil sampling results conducted by Arcadis. • Perform a human health screening risk evaluation.

Table 2. Proposed Scope of Work
Juan Cabrillo Elementary School and Malibu Middle/High School
30237 and 30215 Morning View Drive
Malibu, California

Area/Building				Media	Number of Borings[a]	Number of Samples	Depth (feet bgs)	Sampling Type	Analysis	Proposed Scope of Work	Objective
Malibu Middle/High School (MHS)	AOI-7	Open areas around and in between older buildings within AOI-5	Building G/G2	Soil	27	54	0.5, 2	Discrete	Pesticides, Herbicides, and Metals	Soil samples will be collected from open areas between buildings where pesticides and herbicides could have been applied. Soil samples are randomly selected	• Evaluate potential presence of pesticides and herbicides due to potential application of such at the site. • Perform a human health screening evaluation.
			Building H								
			Open areas around and in between buildings								
	AOI-8	Neutralization Tank	Chemistry lab waste neutralization area	Soil and Soil Vapor	1 Soil Vapor 1 Soil	2 Soil Vapor 3 Soil	SV: 5, 10 Soil: 2, 5, 10	Discrete	SV: VOCs Soil: SVOCs, metals, TPH, and pH	Soil and soil vapor samples will be collected adjacent to neutralization tank to 5 feet beneath the base of the tank;	• Evaluate potential impact to soil from neutralization tank waste. • Perform a human health screening risk evaluation.
	AOI-9	Former USTs at Bus Barn	Former USTs at Bus Barn, Bus Washing Station	Soil, Soil Vapor, and Groundwater	6 Soil Vapor 4 Soil 2 Grab Groundwater samples	18 Soil Vapor 20 Soil 2 Grab Groundwater samples	Soil Vapor: 5, 20, and 35 Soil: 10, 20, 30, 40, 50 Grab Groundwater: first encountered groundwater anticipated at approximately 58 feet bgs	Discrete	SV: VOCs Soil: TPH Groundwater: VOCs and TPH	Soil and soil vapor samples will be collected adjacent to and downgradient of the former USTs. Soil samples will be collected at 10 foot intervals, starting just above the former base of the USTs (10 feet bgs) and ending at 50 feet bgs where historical soil sampling results indicated low levels of BTEX; Grab groundwater samples will be collected adjacent to the former USTs where maximum BTEX concentrations were reported in soil and hydraulically downgradient to the former USTs	• Evaluate potential impact to soil, soil vapor, and groundwater due to a release from the former diesel USTs, located at the Bus Barn area. • Perform a human health screening risk evaluation.
	AOI-10	Diesel-impacted soil stockpile	Bus Barn/Former USTs	Soil	1	1	0.5	Discrete	TPH	A soil sample will be collected from the general area where TPH-impacted soil was stockpiled on plastic after UST removal activities and prior to off-site disposal.	• Evaluate potential impact to surface soils from the previous stockpile.
	AOI-11	Grounds Shop	Grounds Shop in Bus Barn Area	Soil	1	2	0.5, 2	Discrete	TPH, pH, SVOCs, Pesticides, and Herbicides	A soil sample will be collected from inside the Maintenance Building where gasoline and herbicides are stored.	• Evaluate potential l impact to soil from Maintenance Building operations. • Perform a human health screening risk evaluation.
	AOI-12	Septic Systems	Septic System 1-1 and 1-2 (4 pits @ 31,32,32,30 feet bgs)	Soil, Soil Vapor, and Groundwater	3 Soil Vapor 3 soil	9 Soil Vapor 12 soil	SV: 5, 20, 35 Soil: 5, 15, 25, 35	Discrete	SV: VOCs Soil: SVOCs, TPH, Metals Groundwater: VOCs, SVOCs, TPH, and Metals	Collect soil and soil vapor samples adjacent to leach pits associated with Septic Tanks 1, 3, 4, 5, 6, and 11. In each boring: Soil samples will be collected at 10-foot intervals starting at 5 feet bgs to below or adjacent to the base of the leach pit; Soil vapor samples will be collected at three locations: at 5 feet bgs, near the middle of the leach pit, and near the bottom of the leach pit. Collect groundwater samples from existing wells MW-3 though MW-7, MW-10, and MW-11.	• Evaluate potential impact to soil from septic systems and leach pits. • Determine groundwater quality in proximity to septic systems1, 3, and 5. • Perform a human health screening risk evaluation.
			Septic System 3-1 and 3-2 (6 pits @ 35, 35, 36, 38, 38, 39 feet bgs)		3 Soil Vapor 3 soil	9 Soil Vapor 15 soil	SV: 5, 20, 40 Soil: 5, 15, 25, 35, 40				
			Septic System 4 (3 pits @ 37 feet bgs)		2 Soil Vapor 2 soil	6 Soil Vapor 10 soil	SV: 5, 20, 40 Soil: 5, 15, 25, 35, 40				
			Septic system 5 (1 pit @ 51 feet bgs)		1 Soil Vapor 1 soil	3 Soil Vapor 6 soil	SV: 5, 20, 50 Soil: 5, 15, 25, 35, 45, 55				
			Septic system 6 -1 and 6-2 (8 pits @ 51, 51, 53, 53, 53, 55, 55, 41 feet bgs)		4 Soil Vapor 4 soil	12 Soil Vapor 24 soil	SV: 5, 25, 55 Soil: 5, 15, 25, 35, 45, 55				
			Septic system 11 (1 pit @ 21 feet bgs)		1 Soil Vapor 1 soil	3 Soil Vapor 3 soil	SV: 5, 10, 20 Soil: 5, 15, 25				

Table 2. Proposed Scope of Work
Juan Cabrillo Elementary School and Malibu Middle/High School
30237 and 30215 Morning View Drive
Malibu, California

Area/Building				Media	Number of Borings[a]	Number of Samples	Depth (feet bgs)	Sampling Type	Analysis	Proposed Scope of Work	Objective
Malibu Middle/High School (MHS)	AOI-13	Retention Basin	Retention Basin located in the northern parking lot	Soil	1	1	Surface soil	Discrete	SVOCs, TPH, and Metals	Collect surface soil sample adjacent to the discharge pipe.	• Evaluate the potential that runoff from the parking lot has impacted the retention basin. • Perform a human health screening risk evaluation.
	AOI-14	Athletic fields	Football/Baseball/softball and soccer fields	Soil	300	9	0.5	Incremental	Pesticides, Herbicides, and Metals	Incremental soil sampling will be conducted on the athletic fields where mean COPC concentrations can be used to evaluate potential health risks. The athletic fields will be divided into three Decision Units (DUs) for sampling purposes: (1) the football field (40 increments); (2) the large baseball field (30 increments); and (3) the upper softball/soccer field areas (30 increments).	• Evaluate the potential presence of pesticides, herbicides, and metals in exposed soil. • Perform a human health screening risk evaluation.
	AOI-15	Cornucopia	Cornucopia	Soil	4	8	0.5, 2	Discrete	Pesticides, Herbicides, and Metals	Collect two soil samples in the growing beds and two soil samples in random areas. Soil sample selection within the growing bed was based on the direct contact with the soil when gardening. Soil sampling is also proposed in areas where pesticides and herbicides could have historically been used.	• Evaluate the potential for pesticides, herbicides, and metals in exposed soil. • Perform a human health screening risk evaluation.
	AOI-16	Undeveloped Area - Building E	Open Undeveloped Area between Building E and football field	Soil	3	3	0.5	Discrete	Pesticides, Herbicides, and Metals	Soil samples will be collected in areas that students traverse where pesticides and herbicides could have historically been used. Soil sample locations will be randomly selected.	• Evaluate the potential presence for pesticides, herbicides, and metals in exposed soil. • Perform a human health screening risk evaluation.
	AOI-17	Electrical Transformers	Electrical Transformer north of "Boys and Girls Club"; Electrical Transformers (2) west of Food Service/Kitchen Building	Soil	6	12	0.5, 2	Discrete	PCBs	Collect soil samples adjacent to the concrete pad where the transformers are situated (two soil samples for each concrete pad area).	• Evaluate the potential of PCBs in soil due to potential impact from former/older transformer. • Perform a human health screening risk evaluation.
	AOI-18	Redevelopment Area	New parking lot and modified stairs visitor's parking	Soil	4	8	0.5 and 2	Composite	Pesticides, Herbicides, and Metals	Soil samples will be collected from an undeveloped area where pesticides and herbicides could have been applied. This undeveloped area is proposed for future redevelopment as a parking lot. Four soil samples will be collected from random locations at each proposed depths and composite into one sample per depth.	• Evaluate the potential for pesticides, herbicides, and metals in soil prior to ground disturbance for grading in areas not previously evaluated under another AOI.
			New Bleachers	Soil	2	4	0.5, 2	Composite	Pesticides, Herbicides, and Metals	Soil samples will be collected from an undeveloped area where pesticides and herbicides could have been applied. This undeveloped area is proposed for future redevelopment as new bleachers. Two soil samples will be collected from random locations at each proposed depth and composite into one sample per depth.	
			New Tennis Court	Soil	4	8	0.5 and 2	Composite	Pesticides, Herbicides, and Metals	Soil samples will be collected from an undeveloped area where pesticides and herbicides could have been applied. This undeveloped area is proposed for future redevelopment as a tennis court . Four soil samples will be collected from random locations at each proposed depths and composited into one sample per depth. Sampling methodology was based on the size of the area, its future use by students, and future proposed surface (concrete)	
			New Student Drop-off	Soil	2	4	0.5, 2	Composite	Pesticides, Herbicides, and Metals	Soil samples will be collected from an undeveloped area where pesticides and herbicides could have been applied. Two soil samples will be collected from random locations at each proposed depth and composite into one sample per depth.	

Table 2. Proposed Scope of Work
Juan Cabrillo Elementary School and Malibu Middle/High School
30237 and 30215 Morning View Drive
Malibu, California

Area/Building				Media	Number of Borings[a]	Number of Samples	Depth (feet bgs)	Sampling Type	Analysis	Proposed Scope of Work	Objective
Malibu Middle/High School (MHS)	AOI-18	Redevelopment Area	New I.T. Room	It is being evaluated as part of AOIs 6 and 7							
			New Ramp and Stairs	It is being evaluated as part of AOI 16							
			Middle School Quad	It is being evaluated as part of AOIs 6 and 7							
			High School Quad	It is being evaluated as part of AOIs 6 and 7							

Notes:
Polychlorinated Biphenyls (PCBs) will be analyzed using USEPA analytical method 8082A
Pesticides will be analyzed by USEPA analytical methods 8141 (organophosphates) and 8081 (organochlorine)
Herbicides will be analyzed by USEPA analytical method 8151
Semi-volatile organic compounds (SVOCs) will be analyzed by USEPA analytical method 8270C
Total petroleum hydrocarbons (TPH) will be analyzed by USEPA analytical method 8015 M
Volatile organic compounds (VOCs) will be analyzed by USEPA analytical method 8260B modified
Metals will be analyzed by USEPA analytical method 6010/7000
USEPA - United States Environmental Protection Agency (USEPA)
SV - Soil Vapor
bgs - below ground surface
BTEX - benzene, toluene, ethybenzene, and xylenes
UST - underground storage
[a] Soil, soil vapor, and grab groundwater sampling locations depicted on Figure 17 are approximate and may be adjusted in the field due to access constraints and/or locations of features of interest (e.g. windows, leach pits, etc.).

1.6 Applicable Standards

The methods and procedures prescribed in this HASP are intended to conform to established professional practices and applicable federal, state, and local occupational safety and health protection standards based on information that is currently available. Regulations serving as the technical compliance basis for this document may include but are not limited to the following:

- US Department of Labor, Occupational Safety and Health Standards for Construction (29 CFR 1926).
  - Hazardous Waste Operations and Emergency Response (29 CFR 1926.65)
  - *Hearing Protection* (29 CFR 1926.101 and 29 CFR 1926.52)
  - Eye and Face Protection (29 CFR 1926.102)
  - Respiratory Protection (29 CFR 1926.103)
  - Working Over or Near Water (29 CFR 1926.106)
  - Material Handling Equipment (29 CFR 1926.602)
- US Department of Labor, *OSHA Standards for General Industry* (29 CFR 1910).
  - Hazardous Waste Operations and Emergency Response (29 CFR 1910.120)
  - PPE General Requirements (29 CFR 1910.132)
  - Eye and Face Protection (29 CFR 1910.133)
  - Respiratory Protection (29 CFR 1910.134)
  - *Head Protection* (29 CFR 1910.135)
  - *Foot Protection* (29 CFR 1910.136)
  - *Hand Protection* (29 CFR 1910.138)
  - Medical Services and First Aid (29 CFR 1910.151)
  - Portable Fire Extinguishers (29 CFR 1910.157)
  - Hazard Communication Standard (29 CFR 1910.1200)
  - Control of Hazardous Energy (LOTO) (29 CFR 1910.147)
- US Department of Labor, Recording and Reporting Occupational Injuries and Illnesses, (29 CFR 1904).

The following technical documents may have been utilized as references in the preparation of this HASP. However, the citation of these technical documents does not imply compliance with all aspects of these documents. The purpose of these citations is to aid in the interpretation of conflicting issues that may arise during the performance of Site activities. The following technical documents may include but are not limited to:

- American National Standards Institute (ANSI), Emergency Eyewash and Shower Equipment, Z358.1 (1981).

- ANSI, Protective Footwear, Z41.1 (1983).
- ANSI, Practice for Occupational and Educational Eye and Face Protection, Z87.1 (1979).
- ANSI, Protective Headgear for Industrial Workers - Requirements, Z89.1 (1986).
- National Institute for Occupational Safety & Health (NIOSH)/OSHA/United States Coast Guard (USCG)/United States Environmental Protection Agency (USEPA), Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, (October, 1985).
- US Department of Health and Human Services (DHHS), NIOSH Sampling and Analytical Methods, DHHS (NIOSH) Publication 84-100.

2 Identification of Key Personnel

An efficient on-site operation requires that all key personnel be identified and that their roles and responsibilities be clearly defined. Below is a discussion of the management structure for this project.

2.1 Project Organization

ENVIRON serves as the Project Coordinator for the Site. ENVIRON is responsible for overseeing activities conducted by ENVIRON personnel and ENVIRON's subcontractors at the Site. ENVIRON also is responsible for oversight of compliance with this HASP in the field by ENVIRON personnel. ENVIRON subcontractors may plan, manage, and carry out activities at the Site, including environmental investigation and remediation tasks, and will provide their own health and safety officers and HASP. As part of ENVIRON's role as Site Coordinator, ENVIRON will ensure that all subcontractors and Site workers are aware of the ENVIRON HASP and its requirements.

2.2 ENVIRON Personnel

Assigned functions of key ENVIRON project team members and subcontractors are described in Tables 3 and 4, respectively, located at the end of this section. The applicable responsibilities for these individuals are as follows:

2.2.1 Principal in Charge/Project Manager

Responsibilities include overall coordination of site activities. The Principal in Charge (PIC) and the Project Manager (PM) have overall accountability and responsibility for the safety of operations and the health and safety of all personnel and for monitoring the work effort, schedule, costs, communication, and will ensure that the activities of all Site personnel comply with the approved work plans and will recommend or provide disciplinary action, as appropriate, if non-compliances occur.

These individuals will also provide the focal point for communications between the regulatory authorities; state and local community, on-site contractors, and project staff. This liaison activity will provide a clear line of communication between all parties to minimize the chance for misconceptions concerning any aspect of the project.

Any and all recommended revisions or changes in the HASP will be reviewed by the PIC, PM and Project Health and Safety Coordinator prior to final approval by the Corporate Health and Safety Director.

2.2.2 Corporate Health and Safety Director

The ENVIRON Corporate Health and Safety Director (CHSD) will oversee all issues related to health and safety and will have final approval authority for any revisions or changes.

2.2.3 Project Health and Safety Coordinator

The Project Health and Safety Coordinator (HSC), along with the Corporate Health and Safety Director are resources for the development of the site-specific hazard assessments and control

mechanisms. Any changes/modifications/additions that may need to occur to the HASP, the Project Health and Safety Coordinator and/or the Corporate Health and Safety Director will be consulted. The Corporate Health and Safety Director will make all final decisions regarding questions on the hazard assessment and/or the control mechanisms.

Any and all recommended revisions or changes in the HASP will be reviewed by the PIC, PM and Project Health and Safety Coordinator prior to final approval by the Corporate Health and Safety Director.

2.2.4 Designated Site Supervisor

The ENVIRON Designated Site Supervisor is responsible for overseeing day-to-day Site activities performed by ENVIRON and its subcontractors. The principal responsibility of the designated ENVIRON Site Supervisor will be to coordinate and document all on-site work necessary to fulfill approved work plans. The ENVIRON Site Supervisor and Project Health and Safety Coordinator and/or Officer may be the same individual.

The ENVIRON Site Supervisor reports to the PIC and Corporate Health and Safety Director. The Site Supervisor is responsible for ensuring compliance with all aspects of the HASP which include, but are not limited to, safe work practices, site access controls, work safety zones, proper personal protective equipment (PPE), review planned Site activities, implement safety procedures necessary to complete work safely, perform daily safety briefings, assist in on-site emergencies, and act as technical liaison to regulatory agency personnel. The Site Supervisor will report all Site-related injuries to the PIC/PM and the Project Health and Safety Coordinator and/or Corporate Health and Safety Director and to any other necessary authorities. The Site Supervisor will ensure that all Site personnel understand their respective emergency response duties. In the instance of any emergency or non-emergency incidents concerning Site personnel, the Site Supervisor will be contacted and will be responsible for communicating any information regarding Site safety conditions to rescue or emergency personnel. The Site Supervisor will ensure that all activities at the Site comply with the approved HASP.

Any person working on-site has the authority to **stop work** if any operation threatens the health and safety of on-site workers or the surrounding community. In the event that such a situation occurs, the Site Supervisor shall be notified immediately. ENVIRON's Site Supervisor will update the ENVIRON PIC/PM and on all project-related health and safety issues as they arise.

The Site Supervisor will be certified in first aid and cardiopulmonary resuscitation (CPR) by the American Red Cross, or equivalent. The Site Supervisor will also be HAZWOPER trained for site work in accordance with applicable regulations and participate in a medical surveillance program.

In the event of an emergency, the ENVIRON Site Supervisor will also function as the Site Emergency Response Coordinator and will implement and coordinate emergency response procedures described in this HASP.

2.2.5 Other Personnel

All other ENVIRON personnel will be certified in first aid and cardiopulmonary resuscitation (CPR) by the American Red Cross, or equivalent and will also be HAZWOPER trained for site work in accordance with applicable regulations and participate in a medical surveillance program.

ENVIRON's subcontractors, if needed, shall prepare their own company HASP which shall specifically govern the work performed by its employees. The contractor's HASP shall be in conformance with ENVIRON's HASP.

All Subcontractors will also provide a Health and Safety Site Coordinator (HSSC) who will assist ENVIRON's Site Supervisor. The subcontractor HSSC will ensure that their personnel have received appropriate health and safety training and are participating in a medical surveillance program.

Table 3: ENVIRON Personnel Contact Information

Personnel Telephone Roster		
Company/Title	**Personnel**	**Office**
ENVIRON Principal in Charge	Carol Serlin	949.798.3660
ENVIRON Project Manager	Safaa Dergham	949.798.3610
ENVIRON Corporate Health and Safety Director	Mark Watka	312.288.3875
ENVIRON Project Health and Safety Coordinator	Fan Xu	213.943.6343
ENVIRON Designated Site Supervisor	Amy Caron	213.943.6323
Client Contact	Terry Kamibayashi	310.450.8338

Table 4: Contractor/Subcontractor Contact Information

Contractor/Subcontractor Telephone Roster		
Company/Title	**Personnel**	**Office**
BC2/Project Manager	Sam Walker	714.744.2990
Spectrum/Owner	Brett Baker	818.886.4500
Jones Environmental/Owner	Dr. Steve Jones	714.449.9937
Sawaya Engineering/Owner	Selim Sawaya	626.715.2320
Innovative Construction Solution (ICS)/Senior Project Manager	John Farmer	714.893-6366

3 Hazard Evaluation

The Project Hazard Analysis below identifies the hazards anticipated to be encountered by the project team based on the tasks presented in Section 2.5.

Table 5: Project Hazard Analysis

Chemical Hazards Present: ☐ None	☐ Flammable/combustible ☐ Compressed gas ☐ Explosive ☐ Organic peroxide ☐ Oxidizer ☐ Water reactive ☐ Unstable reactive ☒ Dust/Fumes/Particulates	☐ Corrosive ☒ Toxic ☐ Highly Toxic ☒ Irritant ☐ Sensitizer ☒ Carcinogen ☐ Mutagen ☐ Other:
Physical Hazards Present: ☐ None	☒ Heat ☐ Cold ☒ Walking/working surfaces ☒ Visible Dust ☒ Traffic/Vehicles ☒ Noise ☐ Other:	☐ Ionizing radiation ☐ Non-ionizing radiation ☒ Electricity ☐ Severe Weather ☐ Poor lighting ☒ Overhead Hazards
Environmental/ Mechanical Hazards Present: ☐ None	☒ Heavy machinery/ Drill Rigs ☒ Trenching/excavation ☐ Docks-marine operations ☐ Docks-loading ☒ Drilling ☒ Forklifts ☐ Operations on Water ☐ Elevated heights (includes fall protection) ☒ Overhead/Underground utilities ☐ Confined spaces ☒ Power tools	☐ Cranes/Hoists/Rigging ☐ Ladders ☐ Scaffolding ☐ Manlifts ☐ Gas cylinders ☐ Roadway work ☐ Railroad work ☐ Energized equipment (LO/TO) ☐ Pressurized equipment (LO/TO) ☒ Drums and containers ☐ Others:
Biological Hazards Present: ☐ None	☐ Animal/human fluids or blood ☐ Animal/human tissue(s) ☐ Poisonous/irritating plants ☐ Other:	☐ Contaminated needles ☐ Live bacterial cultures ☒ Insects/rodents/snakes ☐ Other:
Ergonomics Hazards Present: ☐ None	☒ Repetitive motion ☒ Awkward position ☒ Heavy Lifting ☒ Frequent Lifting	☐ Limited movement ☐ Forceful exertions ☒ Vibration ☐ Other:
Personal Safety/Security: ☒ None	☐ Personal safety ☐ Security issue ☐ Project site in isolated area ☐ Employees working alone ☐ Wild/Feral Animals	☐ Employees working early/late ☐ Potentially dangerous wildlife ☐ Guard or stray dogs in area ☐ No/limited cell phone service ☐ Other:

3.1 Specific Chemicals of Concern

The chemicals listed in the table below includes the identification of chemical contaminants known and/or suspected of being present on-site, the affected media, known concentrations (if applicable), the Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV), and the

Action Level (i.e., 50% of the PEL/TLV). This information will be inserted into Table 6 below. In addition, Appendix A contains specific hazardous property information for commonly encountered chemicals although a Material Safety Data Sheet (MSDS) (or equivalent) will also be included in Appendix A.

Table 6: Chemicals of Concern

Chemical	Environmental Media[1]	Highest Measured Concentration	PEL/TLV[2]
Benzene	SO	500 µg/kg	1 ppm
Toluene	SO	17,000 µg/kg	10 ppm
Ethylbenzene	SO	32,000 µg/kg	5 ppm
Xylene	SO	310,000 µg/kg	100 ppm
Diesel	SO	5,800 mg/kg	Not Determined
Lead	SO	304 mg/kg	0.05 mg/m^3
Pesticides	SO	1,910 µg/kg	DDT – 1 mg/m^3
PCB	SO	2,350 µg/kg	0.5 mg/m^3
Benzene	GW	5,800 µg/L	1 ppm
Toluene	GW	19,000 µg/L	10 ppm
Ethylbenzene	GW	2,300 µg/L	5 ppm
Xylene	GW	15,000 µg/L	100 ppm
Diesel	GW	1.2 mg/L	Not Determined
Benzene	SG	0.16 µg/L	1 ppm
Toluene	SG	4.3 µg/L	10 ppm

Notes:

[1] Codes for environmental media: **SL**=Sludge; **GW**=Ground Water; **SW**=Surface Water; **LW**=Liquid Waste; **SO**=Soil; **A**=Air; **SG**=Soil Gas; **OTH**= Other (Specify)

[2] **PEL:** Permissible Exposure Limit/**TLV:** Threshold Limit Value, use appropriate PEL which would be country or state specific or if one is not available may be from a recognized source.

µg/kg: micrograms per kilograms

mg/kg: milligrams per kilograms

µg/L: micrograms per liter

mg/L: milligrams per liter

ppm: parts per million

mg/m^3: milligrams per cubic meter

%: Minimum percent allowed for personal entry into a space.

4 Hazard Controls

In order to conduct a Task in the safest possible manner, the hazard(s) associated with a Task need to be identified so that appropriate hazard control(s) can be implemented and used by personnel conducting these Task(s). This process is called a "Job Hazard Analysis (JHA) or "Job Safety Analysis" (JSA). To aid in the JHA/JSA process, the associated Task(s) (as outlined in Section 1.3) are correlated against the anticipated hazards. A "Relative Hazard/Risk Rating" is also provided in order to identify which hazards pose the greatest risk to personnel but more importantly, what hazard controls should be implemented.

Table 7: Control of Hazards Summary

Task Number(s)	Hazards	Relative Hazard /Risk Rating*	Hazard Controls Appendix and/or HASP Section
2,3,4,6,7,8,9	Chemical	NA☐ Low☒ Medium☐ High☐	B1
1,2,3,4,5,6,7,8,9	Physical	NA☐ Low☒ Medium☐ High☐	B2
1,2,3,7,8,9	Mechanical	NA☐ Low☒ Medium☐ High☐	B3
1,2,3,4,5,6,7,8,9	Traffic/Equipment	NA☐ Low☒ Medium☐ High☐	B4
2,3	Electrical Hazards/Safety	NA☐ Low☒ Medium☐ High☐	B5/B20
NA	Fire/Explosion	NA☒ Low☐ Medium☐ High☐	B6
2,3	Noise (acoustical)	NA☐ Low☒ Medium☒ High☐	B7
NA	Ventilation / Oxygen Deficiency	NA☒ Low☐ Medium☐ High☐	B8
1,2,3,4,5,6,7,8,9	Heat Stress	NA☐ Low☒ Medium☒ High☐	B9
NA	Cold Stress	NA☒ Low☐ Medium☐ High☐	B10
1,2,3,4,5.6,7,8,9	Insects, Spiders, Snakes	NA☐ Low☒ Medium☐ High☐	B11
NA	Poisonous Plants	NA☒ Low☐ Medium☐ High☐	B12
1,2,3,4,5,6,7,8,9	Personal Safety	NA☐ Low☒ Medium☐ High☐	B13
NA	Working Alone	NA☒ Low☐ Medium☐ High☐	B14
NA	Severe Weather	NA☒ Low☐ Medium☐ High☐	B15
2,3	Above and Underground Utilities	NA☐ Low☒ Medium☐ High☐	B16 & Sections 4.2-4.3
NA	Trenching/Excavation	NA☒ Low☐ Medium☐ High☐	B17
NA	Water Safety	NA☐ Low☒ Medium☐ High☐	B18
1,2,3,4,5,6,7,8,9	Material Handling / Ergonomics	NA☐ Low☒ Medium☐ High☐	B19
NA	Power Tools	NA☒ Low☐ Medium☐ High☐	B20
1,2,3,4,5,6,7,8,9	Vehicle Use	NA☐ Low☒ Medium☐ High☐	B21
NA	Seasonal Hunting	NA☒ Low☐ Medium☐ High☐	B22
NA	Demolition	NA☒ Low☐ Medium☐ High☐	B23
NA	Unexploded Ordinances	NA☒ Low☐ Medium☐ High☐	B24
NA	Closed/Abandoned Mine	NA☒ Low☐ Medium☐ High☐	B25
NA	Confined Space	NA☒ Low☐ Medium☐ High☐	Section 9
NA	Spills	NA☒ Low☐ Medium☐ High☐	Section 10

Relative Hazard/Risk Rating

When evaluating a Task against a specific hazard, the evaluator should:

1. **Determine how frequently you will be conducting the Task and generally be exposed to the Hazard while on-site;**
2. **Determine the duration (i.e., the amount of time) you will spent conducting the Task; and**
3. **Determine the Severity that the Task/Hazard may cause using Table 8. When assessing the severity, assume the hypothetical injury was a result of the task being conducted improperly and that PPE was not being worn:**
   - **Minimal Severity** would require first aid and/or the property/equipment damage is limited to minor wear and tear, scratches, dents (still functional);
   - **Moderate Severity** requires professional medical attention and/or the property/equipment damage necessitates repair but not replacement; and
   - **High Severity** requires immediate medical attention/life threatening and/or the property/equipment damage is significant and requires replacement.

NOTE: A single hazard maybe listed under several Tasks. In this case, use the highest Severity ranking of the tasks evaluated as the overall ranking.

Table 8: Relative Risk Rating Decision Table*

The Hazard…	Has No Severity	Has Minimal Severity	Has Moderate Severity	Has High Severity
Is Not Present (i.e., 0% of your on-site time does not expose you to this Hazard)	NA	NA	NA	NA
Is Rarely Present (i.e., <25% of your on-site time exposes you to this Hazard)	NA	LOW	LOW	MED
Is Sometimes Present (i.e., 25% - <50% of your time exposes you to this Hazard)	NA	LOW	MED	HIGH
Is Frequently to Constantly Present (i.e., 50% to 100% of your time exposes you to this Hazard)	NA	MED	HIGH	HIGH

4.1 General Site Safety

All activities will be conducted in a manner that minimizes hazards and employee exposures to such hazards. The following are some general safety rules that must be followed while on site:

- All personnel who perform on site operations with the potential for exposure to hazardous substances are required to meet personnel training requirements and medical surveillance criteria, which are described in this site health and safety plan.
- All hazardous substances and contaminated soils, liquids, and other residues shall be handled, transported, labeled, and disposed of in accordance with accepted material handling procedures.
- Personnel will wear personal protective equipment as required.

- All work on site, will be planned and supervised by the appropriate personnel to prevent injuries.
- All injuries and accidents will be reported.
- Supervisors will ensure that their employees observe and obey all safety rules and regulations required for the safe conduct of work.
- Alcoholic beverages and illegal drugs will not be allowed on-site. Possession of either will be grounds for disciplinary actions.
- No employee will be assigned to a task without first having been instructed on proper methods of carrying out the task.
- All posted safety signs will be obeyed.
- Space around on-site emergency and fire-fighting equipment will be kept clear.
- All trash and discarded materials will be staged in an orderly fashion and regularly removed from the Site.
- Approval to perform work operations alone must be preapproved by the Site PM/PIC and a communication plan must be established.
- Smoking, eating, drinking, and chewing gum or tobacco will not be permitted within the work zones and will follow applicable decontamination procedures prior to eating, drinking, and/or smoking.
- Personnel should keep track of weather conditions and wind direction to the extent they could affect potential exposure.
- Personnel should be alert to any abnormal behavior on the part of other workers that might indicate distress, disorientation, or other ill effects.
- Personnel should never ignore symptoms that could indicate potential exposure to chemical contaminants. These should be immediately reported to their supervisor or the Site Health and Safety Officer.
- Visible indicators of potentially immediate danger to life and health (IDLH) conditions include:
    1. Large containers and tanks that must be entered.
    2. Enclosed spaces such as buildings or trenches that must be entered.
    3. Potentially explosive or flammable situations (indicated by bulging drums, effervescence, gas generation, or instrument readings).
    4. Extremely hazardous materials (such as cyanide, phosgene, or radiation sources).
    5. Visible vapor clouds.
    6. Areas where biological indicators such as dead animals or vegetation are located.

4.2 Specific SSC Requirements

The hazards posed by the presence of underground and overhead services are significant. Where there is a requirement for ground penetrating activity, the work shall be thoroughly vetted

prior to commencing subsurface work. No intrusive work is to be conducted until the hazards associated with the possible presence of underground and overhead services have been properly identified, and safe locations for intrusion marked and agreed upon. This applies to any intrusive site work (i.e., any work which will involve the disturbance or penetration of the ground or manmade surface by mechanical or manual means, INCLUDING: trial pit excavations, borehole excavations (shell and auger, rotary, hydraulic, percussive), gas spiking, manual excavations, hand digging, intrusion into vertical, indoor, or below ground surfaces, and/or any other on-site activity where disturbance of the ground surface is required). If conducting intrusive activities, the following tasks must be completed **and documented** prior to initiating ground disturbance activities (each is summarized below):

4.2.1 Historical Site Information Review

Obtain the most recent as-built drawings and/or site plans (including underground storage tank (UST), product and vent lines), as available. Consider requesting any other site plot plans, surveys, photographs, and information that might be instructive from the client or other sources. Site information reviewed shall be specified in Table 9 SSC Actions (below).

4.2.2 Plot Plan

Develop a plot plan the accurately reflects all available information and site conditions as accurately as possible, including the number of facilities/pipelines or utilities, locations and alignments. The plot plan shall be updated as SSC activities commence to properly capture site-conditions or visual indicators. Intrusive activities shall not proceed without an updated plot plan or drawing.

4.2.3 Pre-Marking Ground Disturbance Locations

Whenever feasible, ground disturbance locations and/or areas shall be pre-marked using white stakes, white paint or white flags (or black in cases where snow is on the ground) prior to the public and/or private utility mark-outs. Pre-marking provides the line locators with visual boundaries as guidance in clearing locations and placing marks.

4.2.4 Line Location Services:

In areas where public and private resources are available, ENVIRON will contact both public and private utility locate services for any project that involves intrusive activities. In order to give line operators sufficient time to respond to a request to locate, a minimum of 72 business hours is required prior to the planned start of work. In the event that the driller/excavator retains these services, ENVIRON will conduct a follow-up to confirm utility locate information.

Meet directly with the private locator and provide them with location plans, if possible. If an on-site meeting with the private locator is not possible, you MUST contact the private locator so that they understand the scope of the proposed subsurface work and the extent of their activities.

4.2.5 Site Walkover-Visual Indicators

The Designated Person MUST conduct site walk-over and complete the SSC Field Checklist (Appendix C) for all projects that involve ground disturbance. The site walk-over and visual

inspection is most effective when completed during locating activities, but, at a minimum, must be completed PRIOR to ground disturbance. The main intent of the SSC Field Checklist is to identify above ground indicators which may identify the potential existence of subsurface issue. It will also be used to confirm that common utilities have been accounted for, located and verified. Any potential underground utilities should be marked on a site plot plan and the site walkover should be documented utilizing ENVIRON's Subsurface Clearance Field Checklist.

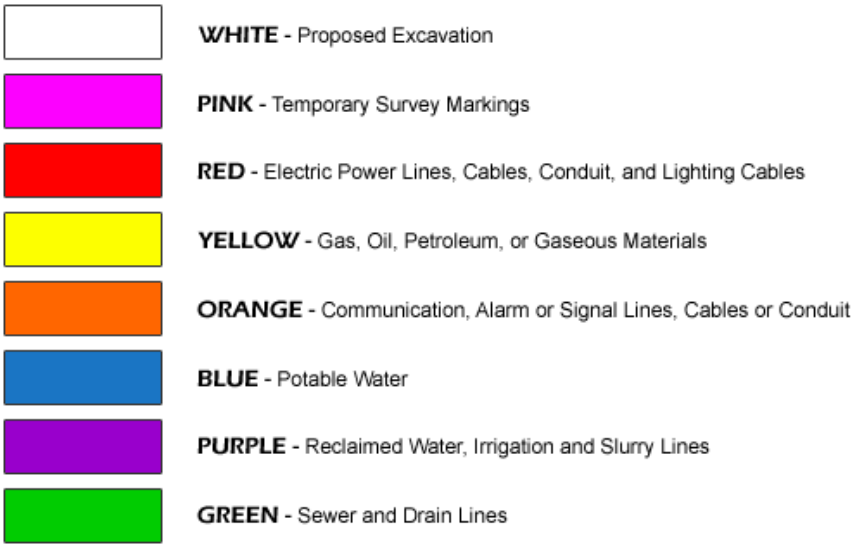
4.2.6 Utility Mark-out

All known pipelines and utilities, as noted on the plot plan, pipeline map or drawing, that pass within the search zone must be located, identified and marked to indicate location and alignment.

A qualified and competent line locator shall conduct line-locating practices utilizing available pipeline maps or plot plans for all areas within the search zone. Direct connection (clamping on) to all possible nearby underground services should be undertaken whenever possible to increase the success rate/reliability in locating. **The specific ground penetration location must be cleared to the edge of the critical zone** (5 feet or 1.5m area surrounding intrusive locations/areas in every direction) using a search and sweep method to verify maximum detection capabilities.

If anticipated services are not identified or located, drilling or ground disturbance will not occur until the service is visually identified.

Commonly used utility mark out colors and identifiers are listed below:



Upon completion of their work (whether you are on-site or not), the private locator MUST contact you to present their results. In addition to providing you with an overall summary of their work, **they must also inform you of any unique circumstance(s) which limited their ability in locating the potential presence of underground utilities (e.g., the existence of overhead electrical lines); if they encountered any abnormalities (e.g., concrete surfaces**

with reinforced rebar); and/or any other condition which may have diminished the validity of their results and efforts.

Where doubt exists over the location of a service, request a site visit from the appropriate utility provider or abandon locations in the immediate area and contact the PM and/or PIC.

4.2.7 Clearance of Ground Disturbance Locations & Critical Zones:

After anticipated utilities have been located and marked, use the available information along with regulatory requirements and project objectives to select final ground disturbance locations.

Each specific ground penetration location must be cleared to the edge of the critical zone (5 feet or 1.5m area surrounding intrusive locations/areas in every direction) using a search and sweep method to verify maximum detection capabilities. Ensure that all detected services and those featured on location plans are outside of the critical zone of EACH location where intrusive work will occur, using a sweep and search method.

The critical zone takes into account minimum tolerance distances from facility lines (which vary by location) and uncertainties introduced by on-site conditions, human factors, and equipment. **No intrusive activities shall take place within a critical zone with which utilities or visual indicators intersect**. When known utilities intersect ground disturbance critical zones, boring and/or excavation location criteria should be reevaluated by the Designated Person and PM, and if possible, moved to a pre-cleared alternate location.

In the event that work is required to be conducted in a critical zone containing a marked utility or visual indicator, approval MUST be obtained from the PIC, PM and H&S Director prior to ground penetrating activities.

4.2.8 Overhead Lines

Ensure that any ground penetrating activities are located a minimum of 28 feet (9m) horizontally from any overhead electric cable supported wooden poles, or 50 feet (15m) horizontally in the case of those supported on metal poles/towers. Where this cannot be achieved, contact relevant electricity provider for guidance as well as the PIC/PM and Director H&S.

4.3 SSC Summary

If the tasks presented in this HASP involve ground penetrating work, Table 9 and the specific procedures outlined in section 4 are applicable and must be followed. Table 9 summarizes the steps required to be completed, including justification of any exceptions. This table must be completed in its entirety prior to conducting subsurface work. If certain requirements are not applicable, describe reason for exemption.

The SSC Project Checklist (Table 9) is to be completed by the HASP preparer and used as a guideline for the activities that must be planned for SSC project work. Planned and proposed dates and activities should be included by the HASP preparer, and information updated as it become available. If field practices differentiate from plans proposed and documented on the SSC Project Planning Checklist (like walkover dates or historical documents reviewed), it is the Designated Person's responsibility to update the project-specific HASP and SSC Project

Planning Checklist to reflect these changes. Any deviations from these requirements must be documented and approved prior to the commencement of ground disturbance activities.

Table 9: SSC Project Planning Checklist

Subsurface Clearance (SSC) Pre-Project Planning Checklist
Document the steps that must be followed and justify any exceptions.
This checklist MUST be completed in its entirety.

SSC Requirements	Yes	No	NA	Comments
1. Prequalification of Contractor for capability of ground disturbance work performed (See Section 4)	☒	☐	☐	BC2 and ICS are on our approved MSA list.
2. "Designated Person" for SSC work assigned (must be on-site)	☒	☐	☐	Amy Caron of ENVIRON will accompany Spectrum Geophysics (Spectrum) during the SSC.
3. Historical Site Information Review	☒	☐	☐	Site visit, interviews, review of maps, aerials, agency files, prior subsurface investigation reports (Ocean Blue Engineers, Cape Environmental Management, Vector, Topanga Underground, and Arcadis)
4. Development of site-specific plot plan	☒	☐	☐	See Figures 4 through 7
5. Ground penetrating location marked prior to locate(s) and alternate locations chosen	☒	☐	☐	A site visit will be conducted by Amy Caron of ENVIRON to mark locations prior to drilling and excavation.
6. Service notifications provided to clear/locate **public** utilities	☒	☐	☐	USA will be called at a minimum of 48 hours prior to commencement of fieldwork.
7. **Private** locate contracted for on-site utilities	☒	☐	☐	Spectrum
8. Designated Person present during private locating	☒	☐	☐	Amy Caron of ENVIRON will accompany Spectrum during the SSC.
9. Underground utilities identified prior to commencement of intrusive activities as reasonably feasible	☒	☐	☐	Spectrum will visit each proposed drilling location prior to intrusive activities.
10. Site walkover conducted to assess utility locations, visual indicators and complete SSC Field Checklist	☒	☐	☐	Amy Caron of ENVIRON will accompany Spectrum during the SSC.

Table 9: SSC Project Planning Checklist

Subsurface Clearance (SSC) Pre-Project Planning Checklist
Document the steps that must be followed and justify any exceptions.
This checklist MUST be completed in its entirety.

SSC Requirements	Yes	No	NA	Comments
11. Ground penetration locations(s)/area(s) and Critical Zones (i.e., the 5ft or 1.5m distance surrounding intrusive activities in every direction) cleared	☒	☐	☐	Spectrum will visit each proposed drilling location prior to intrusive activities to mark zones for drilling.

5 Personnel Training Requirements

All personnel performing on-site operations with the potential for exposure to hazardous substances or health hazards will meet the personnel training requirements in accordance with applicable regulations. The training policies and procedures will ensure that personnel can recognize hazards, understand emergency response procedures, and have the knowledge necessary to enable them to perform their assigned jobs in a manner that ensures employee and public safety. Completion of appropriate health and safety training, as described below, and participation of medical surveillance will be required to gain access to on-site areas other than the Support Zone. Documentation of training includes initial 40-hour health and safety training, 8 hours of annual refresher training, 8 hours of supervisor training, supervised field experience, first aid training, and CPR certification.

5.1 Initial Training

A. Basic Health and Safety Training

A minimum of 24 hours of initial health and safety training off-site is required to obtain on-site access to areas other than the Support Zone. All personnel engaged in or supervising activities in the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ) will have a minimum of 40 hours of initial health and safety training off-site, meeting the in accordance with applicable regulations.

B. Supervised Field Experience

All personnel with 24 hours of initial health and safety training are also required to have a minimum of 1 day of field experience under the direct supervision of an experienced supervisor. Personnel with 40 hours of initial health and safety training are required to have a minimum of 3 days of field experience under the direct supervision of an experienced supervisor.

C. Supervisor Training

All on-site managers and supervisors directly responsible for, or who supervise personnel engaged in invasive site activities will have received the initial 40-hour health and safety training and at least eight additional hours of specialized off-site training consistent with in accordance with applicable regulations. This specialized training will include topics such as, but not limited to, regulatory compliance, management of on-site health and safety hazards and recognition of special personnel training needs.

D. Health and Safety Officer Training

Health and safety officers will be trained to a level required by their job function and responsibility. This will include training in implementation of HASPs and compliance with applicable health and safety requirements.

E. First Aid and CPR Training

ENVIRON personnel will maintain first aid and CPR training as certified by the American Heart Association (or equivalent) to render first aid and CPR.

5.2 Refresher Training

All personnel who have received 40 hours of initial health and safety training will receive 8 hours of refresher training annually, as specified in accordance with applicable regulations. Topics to be covered in this training program will include those specified in the initial 40-hour health and safety training and/or those specified in the supervisory training course, as well as a critique of incidents that could serve as training examples.

Project-specific refresher training will be provided when the project scope is changed and/or when the hazards change.

A. Site Safety Briefings

Site safety briefings will be conducted prior to the start of each workday or work shift to discuss health and safety issues, changes in work procedures, exposure incidents and other relevant information. Prior to each change in operations, the meetings will address PPE use and maintenance, physical safety hazards from machinery, protection from chemical hazards, decontamination procedures, protection from heat/cold stress and specific safety requirements associated with the new operations. During safety meetings, on-site personnel qualified to perform first aid and CPR will be identified. All changes in the HASP will be reviewed during the morning safety briefing. A record of the meeting will be written daily and signed by all participants and included in section 13.0 of this HASP.

B. Visitor's Briefing

Visitors and other observers (e.g. third party consultants) will not be permitted to enter areas other than the Support Zone unless documentation of training, as described above, is presented to the ENVIRON site supervisor. All visitors will be provided with applicable site specific information including but not limited to hazard recognition, personnel hygiene, and Site safety rules, use of PPE, and emergency response procedures. Visitors requesting on-site access to areas other than the Support Zone will be required to review and sign off on the HASP to ensure understanding and compliance with the provisions in the HASP. All personnel, contractors, and site visitors will receive information contained in this HASP and any site-specific hazard awareness prior to entry into the site, as applicable. The training will ensure that personnel can recognize hazards, understand emergency response procedures, and have the knowledge necessary to enable them to perform their assigned jobs in a manner that ensures employee and public safety. All personnel will be required to sign an attendance sheet (see section 13.0 in this HASP) verifying that they received and participated in a training briefing. Individuals refusing to sign the sheet will not be allowed to work on the Site.

Compliance with Hazard Communication Standard is required for work at this Site. Material Safety Data Sheets (MSDSs) are part of Appendix A. Personnel shall receive training for the identification of hazards associated with the materials in use and the safe use of these materials, as applicable. Any hazardous chemical products brought to the Site (other than standard fuels) for use during field activities must be reviewed by the Site Supervisor. Contractors are responsible for having their own hazard communication program. Contractors will supply MSDS to the Site Supervisor for all products to be used on-site.

In addition, any employee who is or is expected to be directly involved with intrusive sampling of contaminated environmental media or other sampling activities that could reasonably lead to

chemical exposure is subject to appropriate training and standards, including but not limited to 40-hour HAZWOPER (and 8-hour refresher training), respiratory protection, first aid, and CPR training. This would include any employee that visits exclusion zones of hazardous waste sites or remediation sites.

5.3 Hazard Communication

The following procedures related to hazard communication are applicable to this site. All employees will be briefed on this program.

5.3.1 Container Labeling

All containers received on site will be inspected to ensure the following: (1) All containers will be clearly labeled as to the contents; (2) the appropriate hazard warnings will be noted; and (3) the name and address of the manufacturer will be listed.

All drums or bins to be shipped off the site will have a label affixed with the following information: (1) the identity of the waste generator, (2) the boring, well, or excavation identification and sample depth, (3) the waste matrix (e.g. soil, water, product), and (4) the date of waste generation.

5.3.2 Employee Training & Information

Prior to starting work, each employee will attend a health and safety orientation and will receive information and training on the following:

1. An overview of the requirements contained in the Hazard Communication Standard;
2. Hazardous chemicals present in their workplace operations;
3. Location and availability of a written hazard communication program;
4. How to read labels and review MSDSs to obtain appropriate hazard information;
5. Locations of MSDS files and the hazardous chemical inventory;
6. Physical and health effects of the hazardous chemicals;
7. Methods and observation techniques used to determine the presence or release of hazardous chemicals;
8. How to lessen or prevent exposure to these hazardous chemicals through usage of control/work practices and personal protective equipment; and
9. Emergency procedures to follow if they are exposed to these chemicals.

ENVIRON employee(s) will inform its subcontractor(s) the hazardous chemicals brought on-site by ENVIRON; and likewise, subcontractors shall inform ENVIRON employees the same.

5.4 Disciplinary Actions

In the event that personnel do not follow the H&S safety rules and/or are conducting operations that are hazardous to themselves or their fellow workers, disciplinary actions will be implemented in accordance with ENVIRON's policies.

5.5 Incident Reporting

Each contractor is responsible for maintaining injury and illness records in accordance with applicable regulations and supplying ENVIRON with applicable records in a timely fashion upon request. With respect to incidents, the following types of EHS incidents are to be reported:

- All employee injuries and illnesses that include first aid, doctor/hospital visits which may or may not involve restricted work and/or lost time;
- Environmental incidents and exposures, such as spills or other unplanned releases to the environment or nonconformance to operating procedures;
- All evacuations (false or real);
- Any Property damage;
- Near miss incidents which could have resulted in an injury, an accident, environmental impact or significant loss of facilities; and
- Public/third party liability - Incidents that involve injury, illness or property damage due to the actions of any non-ENVIRON employee arising out of, or in connection with the Firm's contracted scope of work, operations, products, or premises.

As a rule of thumb, all of the incidents types outlined above MUST be communicated by the ENVIRON Site Supervisor to either the PIC/PM and the Corporate Health and Safety Director and/or Project Health and Safety Coordinator immediately following the incident, either in person or via phone, e-mail, or text messaging. The contacted person will then ensure that the other core project members are informed either in person or via phone, e-mail, or text messaging, regardless of time of day. As soon as possible after the incident but no later than 72 hours after the event, the first page of the Incident Investigation Report form will be completed by the Site Supervisor or his/her designee and sent the core project members (i.e., the PIC/PM, Corporate Health and Safety Director, Project Health and Safety Coordinator), for preliminary root cause analysis. The root cause analysis will not be deemed complete until input from all individuals involved in the incident, applicable witnesses, and input from the core team has been obtained. Similarly, the implementation of any corrective/preventive actions will NOT be implemented until input from the Corporate Health and Safety Director (and others as necessary) has been obtained.

6 Medical Surveillance and Recordkeeping

The goals of the medical surveillance program are to monitor the health of potentially exposed personnel through the use of medical examinations and diagnostic laboratory testing, to provide medical care for occupational injury or illness, to keep accurate records for future reference and to ensure the selection of personnel physically able to safely perform the work assigned. The medical surveillance program supports and monitors the effectiveness of the primary health and safety goal of controlling worker exposure to hazardous substances. Medical examinations will be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine.

In general, all employees who may be exposed to hazardous substances above the permissible limits; who wear a respirator; or who are injured, become ill, or develop signs or symptoms due to possible overexposure to hazardous substances from hazardous waste operations must be medically monitored. ENVIRON's requirement is for all employees to be subject to Medical Surveillance Program as well as any employee who may wear a respirator, regardless of the during of use.

Each employee enrolled in the Medical Surveillance Program will be subject to periodic medical exams, the frequency of which will vary depending on the extent and duration of exposure, the type of chemicals involved, and the individual employee's medical profile. These personnel will receive a medical examination at least once per calendar year.

Documentation of current participation in a medical surveillance program and fitness for duty, including ability to wear respiratory protective equipment, will be necessary for all personnel who work on-site in areas other than the Support Zone. However, all specific medical information and examination results obtained in the course of administration of the medical surveillance program will be maintained by the examining physician as confidential.

6.1 Baseline Medical Examinations

The baseline medical examination serves two major purposes: (1) it determines the individual's fitness for duty, including the ability to work while wearing a respirator; and (2) it provides baseline data for comparison with future medical data. The baseline medical examination will include, at a minimum, the following:

1. Complete occupational and medical history;
2. Physical examination;
3. Blood count and chemistry profile;
4. Urinalysis with microscopic review;
5. Chest x-ray;
6. Pulmonary function tests;
7. Resting electrocardiogram (EKG); and
8. Cardiac stress test (at physician's discretion).

Certification of fitness for duty and ability to wear personal protective equipment must be provided to gain access to on-site areas other than the Support Zone. However, all specific medical information obtained in the course of administration of the medical surveillance program will be maintained as confidential.

6.2 Periodic Medical Examinations

Each individual enrolled in the medical surveillance program will be subject to periodic medical surveillance examinations. In general, personnel involved in field activities with a frequency of greater than 30 days per year will receive medical examinations at least annually. Periodic medical examinations should include the parameters included in the baseline examination, with the exception of the chest x-ray and EKG, which are repeated after the baseline examination at the physician's discretion and with agreement of the individual.

6.3 Special Medical Examinations

Special medical examinations or consultations will be arranged for personnel exposed in an emergency situation to hazardous substances at concentrations above the PELs without adequate protection. This will be done as soon as possible after the overexposure has been determined by the Site Supervisor, in consultation with the Corporate Health and Safety Director.

Special medical examinations shall also be arranged upon notification by the individual that he/she has developed signs or symptoms indicating a possible overexposure to hazardous substances, or if the examining physician determines that a more frequent medical examination is necessary.

6.4 Special Circumstances

Any individual who is on a medication that may interfere with the ability to perform his/her job function, or who may require special medical attention, must notify the Site Supervisor of these circumstances prior to commencing work at the Site.

6.5 Health and Safety Records

Health and safety records for on-site ENVIRON personnel including but not limited to training, medical clearances, fit testing, and any monitoring will be kept on file by the Corporate Health and Safety Director and on-site by the Site Supervisor, as applicable. Sub-contractor and contractor health and safety records shall be maintained by the applicable sub-contractor and/or contractor and provided to the Site Supervisor. ENVIRON Personnel Training and Medical Records are maintained at ENVIRON, 333 West Wacker Drive, Chicago, Illinois. RECORDS WILL BE MAINTAINED ON-SITE AS NECESSARY.

7 Personal Protective Equipment

This section of the Site Health and Safety Plan is a reference of selection for different levels of PPE. The protective equipment will be selected based on the contaminant type(s), concentration(s) in air (if any), standing liquid (if any), or other applicable matrix, and the known route(s) of entry into the human body. In situations where the type of materials, their concentrations, or exposure potentials are unknown, a decision based on professional judgment regarding the assignment of personal protective equipment will be made by the HSC.

7.1 Selection of PPE

The selected PPE should be able to resist degradation, penetration, and permeation by the contaminants present at the Site. In selecting the appropriate protective material, the following should be considered: chemical resistance; tear and puncture resistance; flexibility; thermal stress; cleanability; and durability.

PPE will be selected, used, and maintained in accordance with applicable regulations.

Levels of PPE

The four levels of PPE are Levels A, B, C, and D, with Level A providing the highest available level of respiratory, skin, and eye protection. A summary of the basic PPE ensemble for Levels A, B, C, and D is provided below. PPE selection for operations at the Site will be tailored to address specific task conditions.

Level A

Level A PPE provides the maximum degree of respiratory, skin, and eye protection. A Level A PPE ensemble should include:

1. Full-face piece self-contained breathing apparatus (SCBA) or full-face piece supplied air respirator with escape SCBA;
2. Fully encapsulating, chemical-resistant suit, safety boots and inner gloves; and
3. Hard hat (if overhead or bump hazards exist).

Level B

Level B PPE provides the maximum level of respiratory protection. Since chemical-resistant clothing is not considered gas, vapor, or particulate tight, Level B PPE does not provide the maximum skin protection. However, a good quality, hooded, chemical-resistant one-piece garment with taped wrists and ankles provides a reasonable degree of protection against splashes of liquids and lower concentrations of chemicals in ambient air. It is the minimum level recommended for confined space entries and initial Site entries until the hazards have been further identified. Level B PPE should be used when **any** one of the following criteria is met:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection but less skin protection -- this includes atmospheres with IDLH concentrations of specific substances that do not represent a severe skin hazard or atmospheres that do not meet the criteria for use of air-purifying respirators;

2. Atmosphere contains less than 19.5% oxygen; or
3. Presence of incompletely identified vapors or gases is indicated by air monitoring instruments but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin.

Level C

Level C PPE provides the same level of skin protection as Level B PPE, but a lower level of respiratory protection. Air-purifying respirators can be used only if the substance has adequate warning properties; the individual passes a qualitative fit-test for the mask; an appropriate cartridge/canister is used and its service limit concentration is not exceeded; and Site operations are not likely to generate unknown compounds or excessive concentrations of already identified substances. Level C PPE can be used when all of the following conditions are met:

1. Oxygen concentrations are not less than 19.5%;
2. Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin;
3. Types of air contaminants have been identified, concentrations measured, and a cartridge or canister is available that can remove the contaminant;
4. Atmospheric contaminant concentrations do not exceed IDLH levels; and
5. Job functions do not require self-contained breathing apparatus (SCBAs).

Modified Level D

Modified Level D PPE provides minimal skin protection (i.e., hand/glove protection along with standard work clothes with optional coveralls) and no respiratory protection. Modified Level D PPE can be used when the following conditions are met:

1. Atmosphere contains no known hazard;
2. Oxygen concentrations are not less than 19.5%; and
3. Work functions include minimal contact with contaminated soil, water, and groundwater and precludes splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Level D

Level D PPE provides no skin protection other than standard work clothes and no respiratory protection. Work functions are limited non-hazardous environments and preclude contact with media that may be potentially contaminated at hazardous levels for any type of chemical.

7.2 Respirator Fit Test

A respirator fit test will be conducted on all Site personnel who will perform work operations in areas other than the Support Zone. Prior to the initiation of any fit testing, personnel must be certified as medically able to wear a respirator. The respirator fit test is conducted to ensure proper face piece-to-face seal. A secure fit is important with positive-pressure equipment, and is

essential to the safe functioning of negative-pressure equipment, such as most air-purifying respirators. Personnel will receive instruction on proper wear and maintenance of the respirator.

Qualitative fit tests will be conducted annually in accordance with the ANSI Practices for Respiratory Protection, Z88.2-1989. In addition, a negative and positive fit check will be performed each time an employee dons the air-purifying respirator (APR). Documentation of annual respirator fit tests will be kept in the Support Zone.

7.2.1 Negative and Positive Fit Check

The negative and positive pressure fit check will be performed each time an employee dons the APR. The negative pressure fit check involves closing off the inlet openings to the APR cartridges by covering with the palms of the hands. If an inward leakage of air is detected, the APR should be checked for material defects and refitted or replaced with another APR.

The positive pressure fit check is performed by placing the palm of hand over the exhalation valve and gently exhaling for 10 seconds to create positive pressure inside the facepiece. If an outward air leak is detected, the APR should be readjusted. If after readjustment leakage still occurs, another APR should be used.

7.3 PPE Inspection Checklist and Maintenance

PPE inspections will be conducted upon receipt of PPE from the factory or distributor; when it is issued to workers; after use or training; and prior to maintenance. Periodic inspections of stored equipment will be conducted routinely, whenever a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise. At a minimum, PPE inspection should include the following:

A. Clothing

- Before use:
- Determine that the clothing material is correct for the specified task.
- Visually inspect for:
  - Imperfect seams
  - On-uniform coatings
  - Tears
  - Malfunctioning Closures
- Hold up to light and check for pinholes
- Flex product:
  - Observe for cracks
  - Observe for other signs of shelf deterioration
- If the product has been used previously, inspect inside and out for signs of chemical breakthrough or deterioration, such as:

- Discoloration
- Swelling
- Stiffness

- During the work task, periodically inspect for:
  - Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind that chemical permeation can occur without any visible effects.
  - Closure failure
  - Tears
  - Punctures
  - Seam discontinuities

B. Gloves

Before use, pressurize glove to check for pinholes. Either blow into glove, then roll gauntlet towards fingers or inflate glove and hold under water. In either case, no air should escape.

C. Respirators

SCBA/supplied air/air-purifying:

1. Inspect SCBA/supplied air/air-purifying respirators before and after each use, at least monthly when in storage and during cleaning. Air-purifying respirators should be inspected before each use to be sure they have been adequately cleaned.
2. Check all connections for tightness, inspect air lines prior to each use for cracks, kinks, cuts, frays, and weak areas.
3. Check for proper setting and operation of regulators and valves (according to manufacturer's recommendations) and check operation of alarms.
4. Check material conditions for:
   - Signs of pliability
   - Signs of deterioration
   - Signs of distortion
5. Check face shields and lenses for:
   - Cracks
   - Crazing
   - Fogginess
6. Examine cartridges or canisters to ensure that:
   - They are the proper type for the intended use,
   - The expiration date has not passed, and
   - They have not been opened or used previously.

7.4 Task Specific PPE

This section of the Project Health and Safety Plan is used for the selection of the appropriate PPE. The protective equipment will be selected based on the contaminant type(s), concentration(s) in air (if any), standing liquid (if any), or other applicable matrix (e.g., soil, sludge, sediment, etc.) and the known route(s) of entry into the human body. Table 10 presents the general level of protection to be used for each task that is anticipated to be conducted on this Project.

Table 11 identifies the specific PPE items that are required or recommended to be used on this project. This includes identifying the specific type of hand and body protection (as applicable) for the chemicals that may be encounter while conducting the tasks outlined in this HASP.

Table 10: Task Specific PPE

Task Description as depicted in Section 2.5	Level of Protection				
	A	B	C	Mod D	D
Task 1: Utility Clearance	☐	☐	☐	☒	☐
Task 2: Drilling /Soil Sampling	☐	☐	☐	☒	☐
Task 3: Soil Gas and Grab Groundwater Sampling	☐	☐	☐	☒	☐
Task 4: Well Gauging	☐	☐	☐	☒	☐
Task 5: Surveying	☐	☐	☐	☒	☐
Task 6: Investigation Derived Waste	☐	☐	☐	☒	☐
Task 7: Focused Excavation in the Building G Area	☐	☐	☐	☒	☐
Trask 8: Removal and Disposal of the Excavated Soil	☐	☐	☐	☒	☐
Task 9: Post-Excavation Incremental Soil Sampling of Excavated Areas	☐	☐	☐	☒	☐

Key:

Level D: Long sleeve shirt*; long pants*; hard hat; eye protection; hearing protection; and safety shoes.

Level D Modified: Level D protection plus protective coveralls, as required; and appropriate hand protection.

Level C: Level D (Modified) protection plus negative pressure respiratory protection with appropriate cartridges; chemical protective coveralls in lieu of general coveralls; use of inner and outer sets of hand protection.

Level B: Level C protection plus Pressure-demand supplied air respirator with escape bottle in lieu of negative pressure respirator; chemical resistant coveralls with hood; chemical resistant boots.

Level A: Level B protection plus fully encapsulating (gas tight) chemically resistant suit. *Clothing made of natural fibers shall be worn when a shock or arc flash hazard exists.

Table 11: Personal Protective Equipment and Supplies

Equipment	Req	Rec	NA	Equipment	Req	Rec	NA
Steel-toe Boots	☒	☐	☐	SCBA	☐	☐	☒
Outer Disposable Boots	☐	☐	☒	Full-face Airline Resp.	☐	☐	☒
Long Sleeve Shirt and Pants	☒	☐	☐	Full Face Negative Pressure Resp.	☐	☐	☒
Flame Retardant Coveralls	☐	☐	☒	Half Face Negative Pressure Resp	☐	☐	☒
Tyvek Suit	☐	☐	☒	Powered Air Purifying Resp	☐	☐	☒
Poly-coated Tyvek/Saranex Suit	☐	☐	☒	First Aid Kit	☒	☐	☐
Fully Encapsulated Chemical Suit	☐	☐	☒	Fire Extinguisher	☐	☒	☐
Hearing Protection	☒	☐	☐	Mobile Phones	☒	☐	☐
Leather Gloves	☐	☒	☐	Walkie Talkies	☐	☐	☒
Outer Chemical Gloves (Type): Nitrile	☒	☐	☐	Water or Other Fluid Replenishment	☒	☒	☐
Inner Chemical Gloves (Type):	☐	☐	☒	Eye Wash	☐	☐	☒
Hard Hat	☒	☐	☐	Sunscreen	☐	☒	☐
Safety Glasses with Side Shields	☒	☐	☐	Insect Repellent	☐	☒	☐
Vented (Splash proof) Goggles	☐	☐	☒	Other: High Visibility Vest	☒	☐	☐

Key:
Req = Required;
Rec = Recommended;
NA = Not Applicable

8 Air Monitoring/Sampling Procedures

Air samples may be collected during the project to identify and quantify airborne contaminants in order to delineate areas where PPE may be needed; determine the level of PPE necessary; document on-site employees' exposures; assess the potential health effects of exposure; determine the need to implement engineering controls or evacuate the work zone or Site; and determine the need for specific medical monitoring. Some commonly used devices include the following:

Combustible Gas Indicator (CGI) – Examples include O_2 / LEL meter. A CGI measures the concentration of a combustible gas or vapor. Its accuracy is, in part, dependent upon on the difference between the calibration and sampling temperatures; oxygen-deficient atmospheres also affect accuracy; filament can be damaged by silicones, halides, and tetraethyl lead; and the sensitivity is a function of the difference in the chemical and physical properties between the calibration gas and the unknown.

Flame Ionization Detector (FID) – Examples include Organic Vapor Analyzers (OVA). Depending on mode, it may detect many organic gases and vapors. A FID will not detect inorganic gases and vapors; has reduced reliability in high humidity conditions; and should not be used when temperatures are below 40F (4.4C).

Ultraviolet (UV) Photo Ionization Detector (PID) – Examples include HNU. Detects a number of organic and some inorganic gases and vapors. A PID does not detect methane; does not detect a compound if the probe used has a lower energy than the compound's ionization potential; does not readily ionize fully chlorinated materials; high humidity affect readings; low humidity affects operation; response is sensitive to dust or moisture on the lamp; and responses will fluctuate when gases are mixed.

Infrared Spectrophotometer (IR) – Examples include Miran. Measures concentrations of many gases and vapors in the air but designed to quantify one- or two- component mixtures. Not approved for use in hazardous conditions; must make repeated passes to achieve reliable results; and somewhat bulky/heavy.

Direct-Read Colorimetric Tubes – Examples include Drager. The compound reacts with the indicator chemical in the tube, producing a stain whose length is proportional to the compounds' concentration. Results are affected by temperature, pressure, and humidity; many similar compounds interfere with results.

Personal Air Monitoring – Quantitative air sampling for nuisance dust, metals, organic and inorganic compounds. Samples are collected using personal air sampling pumps and the appropriate sampling media. All personnel samples will be collected in the employees breathing zone over the duration of the work shift. The specific methods to be utilized for the collection of personal air samples will require the involvement of a Certified Industrial Hygienist (CIH) if this type of sampling will be conducted.

8.1 Using Monitoring Devices

Conducting an applicable task may necessitate using one or more monitoring devices as listed in Table 12, particularly if gases, vapors, explosion hazards, and/or oxygen deficient atmosphere can occur or are expected. If a monitoring device will be utilized, the corresponding device letter should be placed in the column labeled "Monitoring Instrument Required" in Table 12. In addition, you MUST record the following information in the field log book if you are going to use a monitoring device:

1. Instrument name and serial number
2. Date of calibration
3. Frequency/duration of monitoring
4. The monitoring results
5. And the actions taken based on the results, even if "no actions are required to be taken"

Table 12: Monitoring Devices Available

A	PID (10.6 eV)	H	Summa Canister
	PID (11.7 eV)	I	Heat Stress Monitor
C	FID	J	Air Sampling:
D	OVA	K	Air Sampling:
E	CGI/LEL	L	Radiation Detector
F	Colorimetric Indicator Tubes	M	Gas Multimeter
G	Dust Monitoring	N	Other Device:

With respect to Table 13, also insert the task and the applicable Action Level in the appropriate box using 50% of the most restrictive (lowest) PEL or TLV as the Trigger. For example, if the most restrictive PEL for a particular VOC is 50 ppm, use 25 ppm as the "Trigger" value.

Table 13: Required Monitoring

Required Monitoring	**Constituent**	**Task(s)**	**Trigger (action level)**	**Monitoring instrument required**
If monitoring is necessary to identify that a risk is at or above tolerable limits and/or is used in controlling a risk on site, document the task and the maximum allowable exposure or trigger, and the monitoring instrument required to be used.	Oxygen			
	Carbon Monoxide			
	H_2S			
	C_2S			
	CH_4			
	VOCs: Total	2, 3, 4, 6	0.5 ppm	A
	Semi-VOCs:			
	Metals			
	Dusts	7,8		G
	Others:			
	Others:			

8.2 Action Level Guidance

In general, this HASP must address site-specific chemicals as noted in Tables 12 and 13. However, there are chemicals commonly encountered in the workplace that may not be a chemical targeted for sampling but nonetheless will have adverse health effects. These chemicals are listed in Table 14 below.

Table 14. Action Levels for Commonly Encountered Compounds

Compound	Action Level
VOC (as Benzene)	0.5 ppm MAXIMUM
CH_4	0.5% MAXIMUM or 5000 ppm
CO_2	0.25% OR 2500 ppm MAXIMUM
CO	25 ppm MAXIMUM
H_2S	5 ppm MAXIMUM
O_2	19% MINIMUM – 23.5% MAXIMUM

8.2.1 Volatile Organic Compound

An action level for each chemical or group of chemicals should be based on 50% of the most restrictive (lowest) PEL or TLV. If a sustained (i.e., 1-minute sampling period) total volatile organic compound (VOC) reading within the breathing zone as determined by a photo ionization detector (PID) is above the action level, site personnel shall attempt to mitigate the situation through the use of engineering controls (i.e., move upwind, increase air circulation) as indicated in Table 15. If the action level still cannot be met, personnel shall leave the area and contact the PM and HSC for further instructions.

Table 15: Volatile Organic Compound

Instrument	Calibration Gas Standard	Frequency/ Duration of Air Monitoring	Action Level[(1)] Above Background (Breathing Zone)	Action
Photo ionization detector (PID) calibrated daily	100 ppm isobutylene	Every 5-10 minutes, take a 1-minute reading.	> 5 ppm above background level	Introduce engineering controls (i.e., blower fans) (Level D) Evaluate controls (see below)
After Introduction of Engineering Controls				
PID calibrated daily	100 ppm isobutylene	Every 5-10 minutes, take a 1-minute reading.	< 5 ppm	Continue work (Level D modified)
			5-5 ppm above background level	Don respirator (Level C); Contact HSC to evaluate

Table 15: Volatile Organic Compound				
Instrument	**Calibration Gas Standard**	**Frequency/ Duration of Air Monitoring**	**Action Level(1) Above Background (Breathing Zone)**	**Action**
			> 5 ppm above background level	Discontinue work (Level C)
Note: Action Levels for "Known contaminants" should be based upon each contaminant's Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV).				

8.2.2 Combustible Gas Indicator (CGI)/Oxygen Meter

Table 16: Combustible Gas Indicator (CGI)/Oxygen Meter	
Meter Response	**Action/Respiratory Protection**
CGI response <10% LEL	Continue normal operations with regular, periodic monitoring
CGI response > 10% LEL	Discontinue operations; evacuate personnel and prohibit entry; allow to vent until readings are <10%.
Oxygen level <19.5% or >23.5%	Retreat from work area; consult with PM and HSC about upgrading to Level B respiratory protection, adding mechanical ventilation, or possible changes in work practices.

8.2.3 Odors

If strong odors are encountered or if personnel develop headaches, dizziness, or other potential exposure symptoms, the personnel shall leave the work area to a well-ventilated area and contact the PM and HSC for further instructions.

8.2.4 Dusts

The permissible exposure levels for total and respirable dusts are 10 and 5 mg/m ^{3}, respectively. In general, at these concentrations you will not be able to read the face of a wristwatch (with your arm extended) when the total dust concentration reaches 15 mg/m ^{3}. Particles of dust in the respirable size range cannot be seen without the aid of a microscope but in aggregate, may be perceived as a haze. More importantly and with few exceptions, when dust is noticeable in the air, more respirable particles will exist than larger particles.

Typically, controlling dusty investigative activities through the use of a water sprayer will control potential exposures. However, in the event that dusty conditions exist that are not related to investigative/remedial activities (dry, uncovered soils with high winds), personnel shall leave the area and contact the PM and HSC for further instructions.

Nonetheless, to determine the likelihood of exposure from dusts, a theoretical "Total Dust" concentration in mg/m ^{3} can be calculated to estimate the total dust concentration in which the concentration of the contaminant in the soil could equal and/or exceed its' established exposure limit (EL). This equation is as follows:

Total Dust (mg/m ^{3}) = (10^6 mg/kg) (**EL** mg/m ^{3}) / (Conc. of contaminant in soil mg /kg) (**SF**)

Where:

EL = Exposure Limit of the contaminant of concern (e.g., its' PEL or TLV in mg/m ^{3}); and

SF = Safety Factor, a number between one and ten. Used to account for the degree of confidence in the characterization data (a ten would represent a poor degree of confidence, for example, only one soil sample was collected / analyzed to characterize the site).

The **SF** is based upon the following assumptions: 1) the concentration of the contaminant in the airborne dust is the same as its' concentration in the sample matrix; 2) the soil data depicts a representative "worst-case" scenario; 3) the monitoring instrument used, accurately measures the ambient concentration of particulate matter in the air; and 4) a single contaminant of concern is present.

As an example, assume that Lead (with an EL of 0.05 mg/m ^{3}) is the contaminant of concern and a soil concentration of 25,000 mg/kg has been identified. Depending on the SF used, the theoretical total dust concentration will range between 2 to 0.2 mg/m^3. This means that when the in-situ particulate monitoring device is registering a concentration within 2 to 0.2 mg/m ^{3} range, there is a high probability that this dust contains enough lead to equal and/or exceed the EL. Hence, the level of PPE used would be increased until engineering controls are determined to be effective as documented by personal monitoring.

9 Confined Space Entry

ENVIRON's health and safety policy prohibits unauthorized entry into confined spaces. In the event that entry into a confined space is required, prior to entering a confined space, ENVIRON employees (or its subcontractor's employees) will need additional training. Without Confined Space training, entry into confined spaces is prohibited. In addition, entry authorization will only be given after ENVIRON management has reviewed the nature of the confined space, the hazards present, and the measures needed to ensure safety. Under these circumstances, ENVIRON will work with the host facility/client to determine training requirements, sampling requirements, written program requirements, and equipment needed to safely enter the confined space.

It is not anticipated that confined space entry will be required for this project and/or the tasks listed in this HASP. If confined space entry is required, this HASP will be modified accordingly and all applicable regulations will be adhered to.

10 Spill Response

If warranted, before any spill clean-up work is initiated at the site, applicable local, state, and/or Federal Emergency Response Authorities will be identified and contacted by either the Client Contact and/or a designated ENVIRON employee.

10.1 Reporting and Initial Personnel Safety

Upon discovery of a hazardous substance spill, personnel are to:

- Immediately summon help by notifying the Project Manager and the Client Contact;
- Take action to ensure the safety of nearby personnel;
- Proceed to a safe location;
- If anyone is seriously injured, immediately contact emergency medical services; and
- Keep unauthorized personnel out of the area.

10.2 Initial Spill Reaction

Factors that limit the employee's response at the site of a spill are:

- Level of training;
- Personal safety;
- Available personal protective equipment (PPE); and
- Knowledge of the substance.

Employees should limit their actions to shutting off equipment or pumps and closing valves if possible, feasible and safe to do so.

10.3 Spill Response Evaluation

The identity and hazards of the spilled material should be determined before decisions regarding spill containment and control are made. The Client contact and Project Manager should evaluate the hazards regarding the spill and decide whether project employees or external response organizations should conduct the cleanup.

The Project Manager must contact the Principal in Charge and Corporate Health and Safety Director to discuss the spill incident for further input on deciding how the cleanup can be conducted, including:

- Levels of PPE and safety procedures;
- Safety and work zones;
- All steps of the response activities;
- Most effective procedures or methods for cleanup;
- Means of containment;

- Leak of spill control; and
- Decontamination procedures (including Emergency decontamination).

11 Decontamination

11.1 Sampling and Construction Equipment Decontamination

Decontamination involves the orderly controlled removal of contaminants. All undedicated sampling equipment and sampling meters (if applicable) will be cleaned prior to and between each use. All on-site equipment will be decontaminated and allowed to air dry before leaving the site. Decontamination may be accomplished using an approved cleaner, water, and steam. Subcontractors will be responsible for decontamination of their own equipment used during field operations, as well as disposal of the decontamination fluids. Decontamination fluids and soil cuttings will be collected and temporarily stored in sealed and labeled 55-gallon drums, staged at a safe location which is mutually acceptable to ENVIRON and the host facility, pending offsite disposal. The decontamination methods will be as follows:

- Wash non-disposable equipment with potable water, using a brush if necessary;
- Wash equipment with Alconox, or a phosphate-free detergent, and potable water solution, using a brush if necessary;
- Rinse with potable water;
- Rinse with distilled or deionized water; and
- Allow equipment to air dry.

11.2 Personnel Decontamination

All site personnel should minimize contact with contaminants. At a minimum, the gross removal of contaminants from PPE shall occur in a designated area. All disposable PPE will be disposed of in approved 55-gallon drums (including respirator cartridges). Non-disposal PPE must be decontaminated, particularly safety boots. Any PPE that cannot be decontaminated should be disposed of along with the waste generated from field operations. The drums will be sealed and labeled appropriately, stored at a single secure location on the site, and be disposed of appropriately off-site. Personnel should wash their hands and face prior to departing from the site and prior to eating, drinking, smoking, and/or applying cosmetics. The decontamination methods will be as follows:

Modified Level D Personnel Decontamination

Where activities are performed in Modified Level D PPE personnel will perform decontamination using the following guidelines:

- Place tools, instruments, samples and trash at an appropriate location. The equipment drop area should be clean and dry and at a minimum, plastic bags should be available for trash. Waste PPE will not be placed in the same containers as general trash.
- Inspect equipment, samples, and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples, and tools prior to removal from the decontamination areas.

- Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.
- Remove outer work gloves and place in an appropriate container specified for waste PPE.
- Remove outer Tyvek coveralls if used and place them in an appropriate container specified for waste PPE.
- Remove inner protective gloves and place them in an appropriate container specified for waste PPE.
- Remove inner protective gloves and place them in an appropriate container specified for waste PPE.
- Wash hands using soap and water (separate from other decontamination cleaners/solutions).

Level C Personnel Decontamination

Personnel involved in activities that require the use of Level C PPE will observe the following decontamination guidelines:

- Place tools, instruments, samples and trash at an appropriate location. There areas should be clean and dry, and at a minimum contain plastic bags for trash. Waste PPE will not be placed in the same containers as general trash.
- Inspection equipment samples and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples, and tools prior removal from the decontamination areas. Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.
- Untape wrists and ankles.
- Remove outer work gloves and place them in an appropriate container specified for waste PPE.
- Remove outer Tyvek coveralls and place them in an appropriate container specified for waste PPE.
- Wipe off and remove respirator mask (also goggles if worn).
- Remove inner protective gloves and place them in an appropriate container specified for waste PPE.
- Wash hands using soap and water (separate from other decontamination cleaners/solutions).

During emergencies, the need to quickly respond to an accident or injury must be weighed against the risk to the injured party from chemical exposure. It may be that the time lost decontaminating an individual may cause greater harm to the individual than from the potential

for chemical exposure, particularly if the injury is life-threatening. In these instances, a non-injured person needs to inform responding emergency personnel of the potential for chemical contamination on the victim, specifically mentioning the type and expected concentrations.

11.3 Investigation-Derived Material Disposal

Investigation-derived materials will also be handled appropriately and will be temporarily stored in sealed and labeled 55-gallon drums, staged at a safe location which is mutually acceptable to ENVIRON and the host facility, pending offsite disposal. The storage methods will be as follows:

1. Drill cuttings/well water: Drilling residuals not used for sample analysis will be stored in 55-gallon drums, labeled, sealed, and stored on-site in the Bus Barn pending appropriate off-site disposal.
2. Decontamination solutions: Decontamination rinseate will be collected and contained in 55-gallon drums, labeled, sealed, and stored on-site in the Bus Barn pending appropriate off-site disposal.

12 Emergency Response Plan

The Emergency Response Plan (ERP) describes contingencies and emergency response procedures. The ERP defines the responsibilities of key personnel in planning, prevention, and response to emergency situations, and identifies agency contacts and medical care procedures. The ERP addresses measures to prevent and respond to emergency situations, such as fire or explosion; spill or release of hazardous material; personnel injury or illness; or other adverse events. General Emergency guidelines are as follows:

12.1 Stop Work Authority

All ENVIRON employees have the authority and obligation to stop any task or operation where concerns and/or questions regarding the control of HSE risk exist, are not clearly established, or are not understood. Management is responsible for creating a culture where Stop Work Authority is exercised freely and without fear of retribution or intimidation.

When an unsafe condition is identified, a Stop Work intervention will be initiated and treated as a “near miss”. As such, an incident report will be completed in accordance with Standard Practice Instruction 19 entitled “Incident Reporting” so that the unsafe condition can be documented, reviewed, and corrective actions and preventative measures be implemented as applicable.

These actions will be coordinated by the Site Supervisor, with support from the PM or PIC and the HSC, and all affected personnel will be notified of the Stop Work issue. No work will resume until all Stop Work issues and concerns have been adequately addressed. Most issues can be resolved in a timely manner at the job site, but occasionally additional investigation and corrective actions may be required. Work may resume when it is safe to do so.

12.2 Personnel Involved in Emergency Response

Key personnel involved in Site emergency response include the PM, Site Supervisor, the ENVIRON PIC and contractor PMs. Clear lines of authority have been established for implementing emergency response procedures and for ensuring safety compliance. All emergencies and personal injuries will be immediately reported to Site Supervisor. The Site Supervisor will immediately report the incident to the PIC/PM and Corporate Health and Safety Director.

12.3 Emergency Response Telephone Roster

The Emergency Response Telephone Roster consists of persons and organizations both on- and off-site who would be involved in the ERP. This roster, provided as Table 1A, will be kept in ENVIRON site vehicle, a list of on-site personnel who are trained in first aid and CPR will also be kept in the file. All Site personnel will be familiar with the Emergency Response Telephone Roster and will understand the proper chain of command. A listing of on- and off-site emergency contacts and key personnel and their alternates will be posted in the Site office.

12.4 Emergency Communications

The external communication system between on-site and off-site emergency response personnel is necessary to report and coordinate emergency response. Personnel cell phone will

be the primary means of external communication, and will be used to notify off-site emergency response agencies and to request assistance.

12.5 Emergency Medical Care and Treatment

Every injury and exposure will be reported according to the procedures outlined in section 6.7 of this HASP, regardless of whether the incident appears to be serious or not, or whether any adverse health effects or symptoms are apparent after the exposure. Universal precautions to BBP shall be observed while administering first aid.

12.6 Life-Threatening Emergency Response

Incidents are possible that would result in emergencies beyond the on-site emergency response capabilities. Such incidents might include:

- Life-threatening injuries or injuries/exposures requiring medical treatment; and
- Fires progressing beyond incipient stage.

12.7 Evacuation Routes and Procedures

During site operations and in the event of an evacuation, a safe location (Rally point) will be identified. As part of the Site orientation, all on-site personnel will be informed of the evacuation plan and Rally points. For purposes of a safe and efficient means of vehicular egress, all vehicles will be backed into their designated parking location.

If evacuation is necessary, personnel will determine wind direction. Whenever possible, evacuation should be in the direction perpendicular to the wind direction without passing through the plume or smoke cloud and/or spilled material, if applicable. Personnel will report to their designated Rally point. In the event that a workers' evacuation to their primary rally point is hindered by emergency conditions, workers shall evacuate to the secondary Rally Point. If the on-site PM is not involved in emergency response activities, he/she will assist in accounting for all Site personnel; otherwise, their designated back-up will account for all personnel and will report this information to the Site Supervisor.

12.8 Training

All Site personnel will review the information in this HASP on the emergency response procedures, and the location and use of on-site emergency equipment, and will have received emergency response training. During the Site orientation and/or Site safety briefings, Site personnel will be trained in emergency response procedures, on-site communication systems, and evacuation routes, as stated in this HASP. Visitors will be briefed on hazard recognition, safe work practices, and basic emergency procedures by the Site Supervisor.

12.9 First Aid Procedures

If an employee is injured, general first aid will be administered. If safety concerns or hazardous conditions are still present (e.g., incipient fire, falling debris), the individual shall be moved to avoid further injury or risk. In the event that an employee is injured in a contaminated area, general first aid will be administered and then the employee will be moved to the support zone for decontamination (if applicable), additional first aid, and preparation for transportation, giving

due consideration to which risk will be greater; the spread of contamination or the health/safety of the individual.

First aid kits will be maintained on site at each project location. The type of first aid kit to be maintained will be for minor emergencies, such as cuts and skin abrasions. Where applicable, first aid supplies will be stored in a water proof container. The Site Supervisor or designated person will ensure that adequate first aid supplies (listed below) are maintained.

Minimum List of First Aid Supplies

(1) First Aid Guide*	(6) Burn treatment applications
(1) Absorbent Compress >4”x8”	(4) 3”x3” Sterile gauze pads
(16) 1”x3” Adhesive bandages	(2) Pair medical exam gloves
(1) Adhesive tape 2.5 yard roll	(1) Triangular bandage >40”x40”x56”
(10) Antiseptic treatment applications	(6) Antibiotic ointment applications

* Please see Appendix D First Aid Guidance, print, and store with ANSI approved First Aid kit on-site.

Recommended List of First Aid Supplies

Analgesic (oral, non-drowsy)	Eye covering >1/4” thick
Bandage compress >2”x2”	Eye/face wash
Breathing barrier, single use	Roller bandage >2”x4 yards
Cold pack >4”x5”	Hand sanitizer

The contents of the first aid kits shall be checked before being sent out to each job and at least weekly on each job to ensure that expended items are replaced. Where the eyes or body of any employee may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be available for use.

12.10 Uncovering an Underground Service (Intact)

In the event of any damage or dislocation of any underground facility/pipeline or utility in connection with ground disturbance activity, work activities shall cease in the area of the damaged facility. The Designated Person shall immediately call the applicable emergency phone number. Then, the affected utility and One Call service shall be notified, if applicable. The One Call service may be able to assist with contact numbers for notifying member companies in the event of any damage. NO ONE should attempt to repair, clamp, or constrict the damaged utility.

ALWAYS ASSUME THAT ANY UNDERGROUND PIPE OR SUBSURFACE LINE IS LIVE!

- Stop Work; remove tools if safe to do so.
- Clear all persons from the scene.

- Call the emergency number.
- Contact the One Call/utility member for guidance, if applicable.
- Contact the PM and/or PIC so they can contact the Client, MP, Director of H&S and HSC.

12.11 Striking an Underground Electrical/Telecom Cable

- Stop work.
- Evacuate ENVIRON employees from the immediate area to a safe distance as site conditions warrant, giving consideration to employees which may not be able to immediately evacuate (e.g., operator seats in excavators are normally electrically isolated, whereas other parts of the excavator may be energized).
- Call the emergency number.
- In the event of injuries provide first aid and summon medical assistance.
- Contact the One Call/utility member for guidance, if applicable.
- Contact the PM and/or PIC so they can contact the Client, MP, Director of H&S and HSC.
- Do not allow anyone to enter the area until the electricity/utility provider has made the cable safe.

12.12 Striking a Pressurized Gas Pipeline

- Stop work, leave tools in-place but shut off any running equipment, including engines.
- Evacuate the immediate area to a safe distance as site conditions warrant.
- Ensure there are no sources of ignition in the area.
- Call the emergency number.
- Contact the pipeline owner and/or One Call, if applicable.
- Contact the PM and/or PIC so they can contact the Client, MP, Director of H&S and HSC.
- Do not re-enter the immediate area until safe to do so.

12.13 Striking a Pressurized Water Main

- Stop work, remove tools and confine jetting water if safe, necessary and appropriate to do so.
- Evacuate immediate area.
- Ensure that water flowing away is not creating potential hazards (e.g., electrical shorting, flooding, contaminant migration etc.) and where possible warn those likely to be affected.
- Call the emergency number.
- Contact the water utility and/or One Call, if applicable.
- Contact the PM and/or PIC so they can contact the Client, MP, Director of H&S and HSC.
- Do not re-enter the immediate area until safe to do so.

12.14 Follow-up Procedures

If a site employee is injured on site and immediate medical treatment beyond first aid is needed, the designated site supervisor is instructed to call 911 and/or the designated emergency phone number and then report the incident.

Any SSC work that results in an injury, illness, incident, near miss or unsafe act or condition MUST be verbally communicated by the affected employee or an ENVIRON employee witnessing the incident to either the local HSC, PM, or PIC immediately following the incident. Notification to the regional HR representative and the Director of HR and the Directors of H&S MUST also be made for incidents involving any employee injury and/or illness that happened while on company time including first aid, and doctor/hospital visits which may or may not involve restricted work and/or lost time.

As soon as possible after the incident but no later than 72 hours after the event, Page One of the Incident Reporting Form in SPI 19 Incident Reporting is to be completed by the employee and a witness that was involved in the incident and/or observed the incident.

Post-incident investigations and root cause analysis will be conducted by the Director of H & S to discover the exact circumstances and cause of the incident. Amendments to the HASP will be approved and implemented by the Project Health and Safety Coordinator and the Director of H & S, as needed. All Site personnel will be informed of any revisions to the site-specific HASP and the resolution of any outstanding safety concerns prior to returning to their Site functions. The necessary steps to ensure that operations can safely resume include:

- Ensure that all emergency equipment (fire extinguisher, communication system, first aid kits and first aid station) is in functional order;
- Clear all incident-caused debris from the Site, if safe to do so; and
- Inspect area and equipment.

NOTE: Specific emergency contact information is contained in the first and last pages of this HASP. Applicable directions to the nearest medical facility are contained in the last page to this HASP. In the event that an emergency situation occurs*, SECURE the safety of yourself and those working under your direction and then contact appropriate site and ENVIRON representatives that are referenced in Table 1A of this HASP.*

13 Health & Safety Plan Field Team Signatures

Sign off sheet attesting that the HASP has been made available and reviewed by the individual prior to entry into the site.

13.1 Project Personnel List & Safety Plan Distribution Record

ENVIRON Employees

All project staff must sign indicating they have read and understand the Site Health and Safety Plan. A copy of this Site Health and Safety Plan must be made available for their review and readily available at the job site.

Employee Name/Job Title	Date Distributed	Signature

Contractors, Subcontractors

A copy of this safety plan shall be provided to contractors and subcontractors who may be affected by activities covered under the scope of this Site Health and Safety Plan for their information only, although the contractors and subcontractors remain responsible for the safety of their own employees. All contractors and subcontractors must comply with applicable country, state and local government rules and regulations.

Firm Name	Contact Person	Date Distributed

13.2 Health and Safety Meeting

All personnel participating in the project must receive initial Health and Safety Orientation. Thereafter, a brief tailgate safety meeting is required as deemed necessary by the Site Health and Safety Officer (or at least once every 10 working days).

Date	Topics	Name of Attendee	Employee Firm Name	Initials

13.3 Visitor

It is ENVIRON'S policy that visitors must furnish their own personal protective equipment. All visitors are required to sign the visitor log and comply with Health and Safety Plan requirements. If the visitor represents a regulatory agency concerned with site health and safety issues, the Site Health and Safety Officer shall also immediately notify HSC.

Name of Visitor	Firm Name	Date of Visit	Signature

14 Safety Meeting Checklist

The Site Supervisor should consider discussing the following topics with all field personnel conducting work as part of this HASP, as applicable.

Date and Time of Meeting: _____

Conducted By: _____

CHECK TOPIC(S) DISCUSSED:

HASP Content
- ☐Chemicals of Concern
- ☐Tasks to be Performed
- ☐Location of Tasks
- ☐Hazards/Risks of Tasks
- ☐Site Limitations (e.g., cell phone use)

First Aid
- ☐Facilities
- ☐Reporting and Records
- ☐Treatment of _____

Personal Protective Equipment
- ☐Glasses, Goggles, and Shields
- ☐Hard Hats
- ☐Respirators
- ☐Gloves
- ☐Other ___High Visibility Vest_____

Emergency Procedures
- ☐Communications
- ☐Primary Rally Point:
- ☐Secondary Rally Point:
- ☐Headcount
- ☐Hospital Location/Route
- ☐PPE/Decon
- ☐Other _____

Special Tools / Equipment
- ☐Chain saws / Chop saws
- ☐Other _____
- ☐Other _____

HASP Content
- ☐Personnel On-Site (Introductions)
- ☐Responsibilities
- ☐Monitoring equipment
- ☐Other _____
- ☐Other _____

Industrial Sanitation and Hygiene
- ☐Drinking water
- ☐Restrooms/Porta toilets
- ☐Personal Cleanliness

Housekeeping
- ☐Waste Containers
- ☐Waste Materials
- ☐Other _____

Fire Prevention
- ☐Extinguisher Locations
- ☐Designated Smoking Areas
- ☐Hot Work
- ☐Flammable Liquids Present
- ☐Explosives Present
- ☐Other _____

Vehicles/Heavy Equipment
- ☐Transportation of Employees
- ☐Operation and Inspection
- ☐Preventative Maintenance
- ☐Other _____

Discussion_____

_____

_____

Appendix A

Chemical Information and Material Safety Data Sheets

Hazardous Property Information

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point °F	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Odor Threshold Geometric mean [i] (ppm)
Volatile Organic Compounds (VOCs)									
☐	Acetic acid (64-19-7)	Miscible	1.05	103	11 mm	4.0% 19.9%	10 ppm	50 ppm	0.074 (d)
☐	Acetone (67-64-1)	Miscible	0.79	0	180 mm	2.5% 12.8%	250 ppm	2,500 ppm	62 (d) 130 (r)
☐	Acrolein (107-02-8)	40%	0.84	-15	210 mm	2.8% 31%	C 0.1 ppm Skin	2 ppm	1.8 (d)
☐	Acrylonitrile (107-13-1)	7%	0.81	30	83 mm	3% 17%	2 ppm Skin	85 ppm Ca	1.6 (d)
☒	Benzene (71-43-2)	0.07%	0.88	12	75 mm	1.2% 7.8%	1 ppm Skin	500 ppm Ca	61 (d) 97 (r)
☐	Bromodichloro-methane (75-27-4)	4500 mg/l	1.98	--	50 mm	Non-flam	None established	None determined	--
☐	Bromoform (75-25-2)	0.10%	2.89	--	5 mm	Non-flam	0.5 ppm Skin	850 ppm	1.3 [j]
☐	Bromomethane (74-83-9)	2%	1.73	--	1.9 atm	10% 16.0%	1 ppm Skin	250 ppm Ca	80 [j]
☐	Carbon Tetrachloride (56-23-5)	0.05%	1.59	--	91 mm	Non-flam	2 ppm Skin	200 ppm Ca	252 (d)
☐	Chlorobenzene (108-90-7)	0.05%	1.11	82	9 mm	1.3% 9.6%	10 ppm	1000 ppm	1.3 (d)
☐	2-Chloroethyl-vinyl Ether (110-75-8)	0.02%	1.05	61	27 mm	--	None established	None determined	--
☐	Chloroethane (75-00-3)	0.60%	0.92	-58	1000 mm	3.8% 15.4%	100 ppm Skin	3800 ppm	4.2 [j]
☐	Chloroform (67-66-3)	0.50%	1.48	--	160 mm	Non-flam	2 ppm	500 ppm Ca	192 (d)
☐	Chloromethane (74-87-3)	0.50%	0.92	--	5 ATM	8.1% 17.4%	50 ppm	2000 ppm Ca	10 [j]
☐	Dibromo-chloromethane (124-48-1)	2700 mg/l	2.5	--	76 mm	--	None established	None Determined	--
☐	Dibutyl phthalate (84-74-2)	0.001% (77°F)	1.05	315	0.00007 mm	0.5% --	5 mg/m^3	4,000 mg/m^3	--
☐	1,2-Dichlorobenzene (95-50-1)	0.01%	1.3	151	1 mm	2.2% 9.2%	25 ppm Skin	200 ppm	--
☐	1,1-Dichloroethane (75-34-3)	0.60%	1.18	2	182 mm	5.4% 11.40%	100 ppm	3,000 ppm	--
☐	1,1-Dichloroethylene (DCE) (75-35-4)	0.04%	1.21	-2	500 mm	6.5% 15.5%	1 ppm	None determined	190 [j]
☐	1,2-Dichloroethane (107-06-2)	0.90%	1.24	56	64 mm	6.2% 16%	1 ppm	50 ppm Ca	26 (d) 87 (r)
☐	1,2-Dichloroethylene (540-59-0)	0.40%	1.27	36-39	180-265 mm	5.6% 12.8%	200 ppm	1,000 ppm	17 - 170 [k]
☐	1,2-Dichloropropane (78-87-5)	0.30%	1.16	60	40 mm	3.4% 14.5%	75 ppm	400 ppm Ca	0.26 (d) 0.52 (r)
☐	1,3-Dichloropropene (542-75-6)	0.20%	1.21	77	28 mm	5.3% 14.5%	1 ppm Skin	None Determined Ca	1 [j]
☐	Bis-(2-Ethylhexyl)-phthalate (DEHP) (117-81-7)	0.00%	0.99	420	<0.01 mm	0.3% --	5 mg/m^3	5,000 mg/m^3 Ca	--

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point °F	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Odor Threshold Geometric mean [i] (ppm)
☐	Diethyl phthalate (84-66-2)	0.10%	1.12	322	0.002 mm	0.7% --	5 mg/m^3	None Determined	--
☐	Dinitrotoluene (DNT) (25321-14-6)	Insoluble	1.32	404	1 mm	-- --	0.15 mg/m^3 Skin	50 mg/m^3 Ca	--
☐	Endrin (72-20-8)	Insoluble	1.7	--	0.00001 mm Low	--	0.1 mg/m^3 Skin	2 mg/m^3	--
☒	Ethyl benzene (100-41-4)	0.01%	0.87	55	7 mm	0.8% 6.7%	5 ppm	800 ppm	2.3 [j]
☐	Hydrazine (302-01-2)	Miscible	1.01	99	10 mm	2.9% 98%	0.01 ppm Skin	50 ppm Ca	3.7 (d)
☐	Methyl ethyl ketone (MEK) (78-93-3)	28%	0.81	16	78 mm	1.4% 11.4%	200 ppm	3000 ppm	16 (d) 17 (r)
☐	Methyl tert-butyl ether (MTBE) (1634-04-4)	5.1 g/100ml	0.7	-18	245 mm	1.6% 8.4%	40 ppm	None determined	0.32 – 0.47mg/m^3 [l]
☐	Methylene chloride (75-09-2)	2%	1.33	--	350 mm	13% 23%	25 ppm	2,300 ppm Ca	160 (d) 230 (r)
☐	Phenol (108-95-2)	9% (77°F)	1.06	175	0.4 mm	1.8% 8.6%	5 ppm Skin	250 ppm	0.06 (d)
☐	1,1,2,2-Tetrachloroethane (79-34-5)	0.30%	1.59	--	5 mm	Non-flam	1 ppm Skin	100ppm Ca	7.3 (d)
☐	Tetrachloroethylene (PCE) (127-18-4)	0.02%	1.62	--	14 mm	Non-flam	25 ppm	150 ppm Ca	47 (d) 71 (r)
☒	Toluene (108-88-3)	0.07% (74°F)	0.87	40	21 mm	1.1% 7.1%	10 ppm Skin	500 ppm	1.6 (d) 11 (r)
☐	1,1,1-Trichloroethane (71-55-6)	0.40%	1.34	--	100 mm	7.5% 12.5%	350 ppm	700 ppm	390 (d) 710 (r)
☐	1,1,2-Trichloro-ethane (79-00-5)	0.40%	1.44	--	19 mm	6% 15.5%	10 ppm Skin	100 ppm Ca	--
☐	1,2,4-Trichlorobenzene (120-82-1)	0.003%	1.45	222	1 mm	2.5% 6.6% (302 °F)	C 5 ppm	None Determined	3 [j]
☐	Trichloroethylene (TCE) (79-01-6)	0.1% (77°F)	1.46	--	58 mm	8% 10.5%	25 ppm	1,000 ppm Ca	82 (d) 110 (r)
☐	Trichlorofluoromethane (75-69-4)	0.1% (75°F)	1.47	--	690 mm	Non-flam	C 1,000 ppm	2000 ppm	--
☐	1,1,2-Trichloro-1,2,2-trifluoroethane (76-13-1)	0.02%	1.56	--	285 mm	-- --	1,000 ppm	2,000 ppm	--
☐	1,2,4-Trimethylbenzene (95-63-6)	0.006%	0.88	112	1 mm	0.9% 6.4%	25 ppm	None determined	2.4 (d)
☐	Vinyl Chloride (75-01-4)	0.1% (77°F)	0.91	--	3.3 atm	3.6% 33%	1 ppm Skin	None Determined Ca	--
☒	Xylene (o, p, m, mix) (1330-20-7)	Slightly soluble	0.86-0.88	81-90	7-9 mm	0.9% 7%	100 ppm	900 ppm	20 (d) 40 (r)
	Metals								
☐	Aluminum metal and oxide (as Al)	[b]	2.7	--	0 mm	[e]	10 mg/m^3 (respirable)	None determined	--
☐	Antimony (7440-36-0)	[b]	6.69	--	0 mm	[e]	0.5 mg/m^3	50 mg/m^3	--
☐	Arsenic (inorganic compounds, as As)	[b]	5.73	--	0 mm	[e]	0.010mg/m^3	5 mg/m^3 Ca	--

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point °F	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Odor Threshold Geometric mean [i] (ppm)
☐	Arsenic (organic compounds, as As)	Properties vary depending upon the specific organic arsenic compound.					0.2mg/m^3	None determined	--
☐	Barium chloride(as Ba) (10361-37-2)	38%	3.86	--	low	Non-flam	0.5 mg/m^3	50 mg/m^3	--
☐	Barium nitrate (as Ba) (10022-31-8)	9%	3.24	--	Low	[e]	0.5 mg/m^3	50 mg/m^3	--
☐	Beryllium and compounds (as Be)	[b]	1.85	--	0 mm	[e]	0.0002 mg/m^3	4 mg/m^3 Ca	--
☐	Cadmium dust (as Cd)	[b]	8.65	--	--	[e]	0.005 mg/m^3	9 mg/m^3 Ca	--
☐	Chromium (III) compounds (as Cr)	[b]	Properties vary depending upon the specific compound.				0.5 mg/m^3	25 mg/m^3	--
☐	Cobalt metal dust and fume (as Co) (7440-48-4)	Insoluble	8.92	--	0 mm	[e]	0.02 mg/m^3	20 mg/m^3	--
☐	Copper dust and mist (as Cu)	[b]	8.94	--	0 mm	[e]	1 mg/m^3	100 mg/m^3	--
☒	Lead	Insoluble	11.34	--	0 mm	[e]	0.05 mg/m^3	100 mg/m^3	--
☐	Manganese, Fume and compounds (as Mn) (7439-96-5)	Insoluble	7.2	--	0 mm	Comb-ustible	0.2 mg/m^3	500 mg/m^3	--
☐	Mercury compounds (as Hg) Except alkyl compound	[b]	13.6	--	0.0012 mm	[e]	0.025 mg/m^3 Skin	10 mg/m^3	--
☐	Molybdenum (7439-98-7)	Insoluble	10.28	--	0 mm	Comb-ustible	10 mg/m^3 3 mg/m^3 (resp.)	5,000 mg/m^3	--
☐	Nickel and other compounds (as Ni)	Insoluble	8.9	--	0 mm	[e]	1 mg/m^3	10 mg/m^3 Ca	--
☐	Selenium (7782-49-2)	Insoluble	4.28	--	0 mm	Comb-ustible	0.2 mg/m^3	1 mg/m^3	--
☐	Silver, metal dust, and soluble compounds (as Ag)	[b]	10.49	--	0 mm	[e]	0.01 mg/m^3	10 mg/m^3	--
☐	Thallium (soluble compounds, as Ti)	[b]	Properties vary depending upon the specific compound.				0.1 mg/m^3 Skin	15 mg/m^3	--
☐	Vanadium pentoxide dust and Fume (1314-62-1)	0.8%	3.36	--	0 mm	[e]	0.05 mg/m^3 (Respirable)	35 mg/m^3	--
☐	Zinc oxide (1314-13-2)	[b]	5.61	--	0 mm	[e]	5 mg/m^3	500 mg/m^3	--
Miscellaneous									
☐	Ammonia (7664-41-7)	34%	--	--	8.5 atm	15% 28%	25 ppm	300 ppm	17 (d)
☐	Asbestos (1332-21-4)	Insoluble	--	--	0 mm	Non-flam	0.1 fibers/cc	None determined	--
☐	Chromic Acid and chromates (1333-82-0)	63%	2.7	--	Very low	Non-flam	0.005 mg/m^3	15 mg/m^3 Ca	--
☐	Cyanide (as CN)	--	--	--	--	Non-flam	5 mg/m^3 Skin	--	--
☒	DDT (50-29-3)	Insoluble	0.99	162-171	0.0000002 mm	--	1 mg/m^3 Skin	500 mg/m^3 Ca	--
☒	Diesel Fuel #2 (68476-34-6)	Insoluble	0.81-0.90	130	--	0.6-1.3 6-7.5	None established	None determined	--
☐	Fluorides, as F	--	--	--	--	--	2.5 mg/m^3	None determined	--

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point °F	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Odor Threshold Geometric mean [i] (ppm)
☐	Gasoline (8006-61-9)	Insoluble	0.72-0.76	-45	38-300 mm	1.4% 7.6%	300 ppm	Ca None determined	--
☐	Kerosene (8008-20-6)	Insoluble	0.81	100-162	5 (100°F)	0.7% 5.0%	200 mg/m^3 [3g] Skin	None determined	--
☐	Naphthalene (91-20-3)	0.003%	1.15	174	0.08 mm	0.9% 5.9%	10 ppm	250 ppm	0.038 (d)
☒	PCB (42% chlorine) (53469-21-9)	Insoluble	1.39	--	0.001 mm	Non-flam	1 mg/m^3 Skin	5 mg/m^3 Ca	--
☒	PCB (54% chlorine) (11097-69-1)	Insoluble	1.38	--	0.00006 mm	Non-flam	0.5 mg/m^3 Skin	5 mg/m^3 Ca	--
☐	Phosphorus (yellow) (7723-14-0)	0.0003%	1.82	--	0.03 mm	-- --	0.1 mg/m^3	5 mg/m^3	--
☐	Polycyclic Aromatic Hydrocarbons (PAH)	Properties vary depending upon the specific compound. Listed in NIOSH as Coal Tar Pitch Volatiles					0.2 mg/m^3	80 mg/m^3 Ca	--

SITE-SPECIFIC SUBSTANCES
(Add hazardous property information on any substances that are of concern at the site but are not listed above.)

EXPLANATIONS AND FOOTNOTES:

[a] Water solubility is expressed in different terms in different references. Many references use the term "insoluble" for materials that will not readily mix with water, such as gasoline. However, most of these materials are water soluble at the part per million or part per billion level. Gasoline, for example, is insoluble in the gross sense, and will be found as a discrete layer on top of the ground water. But certain gasoline constituents, such as benzene, toluene, and xylene, will also be found in solution in the ground water at the part per million or part per billion levels.

[b] Solubility of metals depends on the compound in which they are present.

[c] Several chlorinated hydrocarbons exhibit no flash point in a conventional sense, but will burn in the presence of high energy ignition source or will form explosive mixtures at temperatures above 200 ºF.

[d] Expressed as mm Hg under standard conditions.

[e] Explosive concentrations of airborne dust can occur in confined areas.

[f] Cal/OSHA Time-weighted Average (TWA) Permissible Exposure Limits (PELs) except where noted in g. The substances designated by "Skin" in the PEL column may be absorbed into the bloodstream through the skin, the mucous membranes and/or the eye, and contribute to the overall exposure. “C” notation indicates the number given is a ceiling value.

[g] TLV-TWA adopted by the American Conference of Governmental Industrial Hygienists (ACGIH). Currently, there is no Cal/OSHA PEL.

[h] The substances with a “Ca” notation in the IDLH column are considered to be potential occupational carcinogens by NIOSH.

[i] Odor thresholds values extracted from “*ODOR THRESHOLDS for Chemicals with established Occupational Health Standards*”, American Industrial Hygiene Association, 1997.

[j] Values extracted from the US Environmental Protection Agency Technology Transfer Network, Air Toxics website. URL: www.epa.gov/ttn/atw/, 2006

[k] Value extracted from “*HESIS Guide to Solvent Safety*” California Department of Health Services, 2004. URL: http://www.dhs.ca.gov/ohb/HESIS/solv_cht.htm

[l] Value extracted from “*Chemical Summary For Methyl-Tert-Butyl Ether”,* US Environmental Protection Agency, Office Of Pollution Prevention and Toxics, August 1994. URL: http://www.epa.gov/chemfact/s_mtbe.txt.

(d) Odor detection threshold: Lowest concentration at which a stimulus is being detected.

(r) Odor recognition threshold: Lowest concentration at which a definite odor character is detected.

Appendix B

Control Mechanisms

The following Control Methods should be implemented for Hazards that were identified as part of the Tasks that will be conducted as part of this Project.

B1 Chemical Hazards – ENVIRON personnel, contractors, subcontractors, and visitors shall wear appropriate personal protective equipment (PPE) while performing site activities. At a minimum, equipment shall include safety glasses, steel-toed boots, and hard hats (when overhead work being performed or when overhead hazards exist). Additional PPE requirements will be outlined in the site-specific Health and safety Plan (HASP) and ENVIRON personnel shall familiarize themselves with the appropriate health and safety responses for exposure to known on-site chemicals prior to beginning work at the site. See Attachment A for chemical safety data. Consult with your local Health and Safety Coordinator (HSC) for any personal air monitoring requirements.

B2 Physical Hazards – Hazards from floor and wall openings, careless movements, protruding objects, debris, spills, placement of materials on paths or foot traffic areas, present a problem with regards to slips, trips, falls, and puncture wounds.

ENVIRON personnel shall minimize the risk of slips, trips, and falls by keeping the work area clear of excess equipment and cleaning up wet surfaces as soon as possible. In addition, the floor of every workroom shall be maintained in a clean and, as much as possible, a dry condition. Employees should avoid walking through/on wet and/or cluttered surfaces and be conscious of the fact the wet surfaces could be slippery and could cause injury. Spilled materials should be cleaned up immediately.

Personnel should stay alert at all times and if tried or distracted, take this into account when working at the site. To minimize the possibility of injury:

- Wear sturdy work boots with good tread are required and steel toed boots are recommended.
- Do not run.
- Slide feet when walking on slick/wet surfaces.
- Do not walk up or down steep embankments/hills if possible. If not possible, walk at an angle when going up/down embankments/hills.
- Do not carry items that block your vision.
- Use handrails/grips when available and maintain 3-point contact whenever possible.
- Do not jump down from equipment and look down before you step down.
- Use appropriate fall protection when working at elevation.
- Report any floor openings that are not clearly marked and/or guarded.
- Do not use ladders/scaffolds during high winds or when ice or snow is on the rungs/work surface.
- Do not use ladder substitutes like a box or truck fender, and do not use ladders/scaffolding that is not in good conditions.

- Keep paths and work areas clear of tools, equipment, boxes, cords, etc. Tape or secure cords, wires, etc. to minimize trip/fall hazard.
- If a protruding object cannot be moved, make sure the object can be easily seen or guard/pad the object if possible.
- Use ancillary lighting such as flashlights and headband lights when necessary.

Sufficient illumination should be provided in all areas at all times. Employees should notify the responsible person of conditions where there is an absence of sufficient natural and/or permanent artificial light.

Emergency exit doors will be kept free of any obstacles at all times. Any employee finding an emergency door blocked should immediately report the condition and correct it when possible. Exit lights and signs will also be maintained in proper condition at all times and immediately reported if deficient.

B3 Mechanical Hazards – Working within the vicinity of operating drill rigs poses unique safety situations such as high pressure hazards from hoses, pipes or the well, and gas releases. Also, other hazards may be present such as falls from elevation, electrical contact, and improper machine guarding. ENVIRON personnel shall not attempt to operate equipment they are not familiar with and/or are not equipped with protection devices. Personnel shall familiarize themselves with the equipment being utilized on site, and shall at a minimum, know how to stop or turn off the equipment. Although ENVIRON personnel do not operate or have control over the operation of drilling equipment, it is every employees responsibility to recognize potential or existing hazards related to drill rigs, and to walk away from any unsafe operations.

Depending upon the work to be done by ENVIRON personnel; a preliminary site field survey may need to be performed prior to ENVIRON involvement in drilling operations. The survey should include verification that utilities and any hazardous buried material or structures have been located and marked and that the nearest emergency facility has been identified. It may also include information on safe access to the drilling areas, hazards on-site, location of a clean water source and weather conditions and related shelter areas.

<u>Employee Restrictions and Responsibilities</u>

Under no circumstances will an ENVIRON employee operate a drilling rig, a portion thereof, or any piece of contractor equipment. In addition, employees will not:

- Guide a drill rig to a drill location, assist in the movement of equipment, or participate in the movement or breaking down of any portion of the rig.
- Climb on the rig, stand too close to the rig (especially its moving parts), stand below or close to a pipe hoist, walk on drilling rods or casing, or walk on the edge of a mud pit.
- Watch a driller arc-weld.
- Smoke while at a drilling rig site.
- Refuel an engine while it is still running or hot, siphon gasoline, or park near a rig exhaust.

- Wear loose fitting clothing or PPE near the drill rod or stem.

ENVIRON employees will not place tools, meters, etc. in a position that could create a fall, trip or slip hazard. As much as is possible, employees will work with the appropriate site personnel to ensure the area in the vicinity of the drill rig is clean, orderly and free of slip, trip and fall hazards.

If the drilling is being done at hazardous waste site, the PPE requirements will be forwarded as noted in the site health and safety plan. Clean water will be kept available for decontamination, washing, and dust control. Kneeling, lying in, or sitting on contaminated ground or materials must be avoided or a protective barrier must be used. Avoid or minimize handling of contaminated materials.

Non-powered hand trucks should be used whenever feasible to move heavy objects, objects with poor hand holds or large bulky objects. Some things to consider are:

- Keep the center of gravity of the load as low as possible, and place heavy objects below lighter ones.
- Place loads where the weight of the load will be carried by the axle, not the handles, and where it will not slip, shift of fall during movement.
- Load only to height to allow a clear view ahead. Only walk backwards with a hand truck in specific instances such as when going up an incline.
- When going down an incline the hand truck should be in front of the operator and when going up an incline, it should be downhill from the operator.
- Move the hand truck at a safe speed.

B4 Traffic/Heavy Equipment Safety - ENVIRON personnel should, under no circumstances, operate or ride on heavy equipment which is being used by a subcontractor. Site personnel will maintain a safe distance of at least 20 feet (6.5 meters) or more, depending on circumstances and directives, from all heavy equipment in operation. If activities warrant closer proximities to operating equipment, personnel will don brightly colored vests and a second person will stand watch to keep him/her out of the path of equipment while performing the required activity. Eye contact with the equipment operator will be maintained.

Heavy Equipment can represent a substantial hazard to workers. The following procedures should be followed when heavy equipment is in use:

- Employees will not handle or attempt to operate power tools or motorized vehicles without proper training.
- Use common sense. Do no assume that the equipment operator is keeping track of your whereabouts. Never walk directly in back of, or to the side of, heavy equipment without the operator’s knowledge.
- All heavy equipment must be shut down during refueling.
- Maintain visual contact of moving equipment at all times.

- Establish hand signal communication when verbal communication is difficult.
- All heavy equipment shall have backup alarms of some type.
- Use chains, hoist, straps, and any other equipment to safely aid in moving heavy materials.
- Never use a piece of equipment unless you are familiar with its operation. This applies to heavy as well as light equipment (i.e. steam cleaners, hand tools, etc.).
- Be sure that no underground or overhead power lines, sewer lines, gas lines, or telephone lines, will present a hazard in the work area.
- Restrict all non-essential people out of the work area.
- Prohibit loose-fitting clothing or loose long hair around moving machinery.
- Instruct equipment operators to report any abnormalities such as equipment failures, unusual odors, etc.
- Implement an ongoing maintenance program for all tools and equipment. Inspect all tools and moving equipment regularly to ensure that parts are secured and intact. Promptly repair or replace any defective items.
- Store tools in clean, secure areas so that they will not be damaged, lost, or stolen.
- When an equipment operator must negotiate in tight quarters, provide a second person to ensure adequate clearance.
- All heavy equipment must be properly leveled and supported prior to use.
- Heavy equipment and trucks will be operated in specific site control zones and marked traffic lanes.
- Materials, tools, or other objects will not be thrown, tossed, or dropped. Always hand off or lower items as needed.

Working Near Railroads - In the event that work activities are conducted near and/or adjacent to railroad tracks, the following procedures will be implemented:

- The hazards of working near and/or adjacent to railroads will be included in job briefings prior to work activity commencing and subsequently when the activity changes;
- Mounting, dismounting, or crossing over moving locomotives or cars is prohibited;
- Employees will be alert for the movement of cars, locomotives, or equipment at any time, in either direction, on any track and will remain at least 25 feet (8 meters) from the end of standing cars, equipment, or locomotives, except when proper protection is provided (e.g., a flagman is present or the track is taken out of service by the proper authority, prior to starting any work on or about the tracks);
- Employees will not cross over coupled, moving freight cars; take refuge under any car, equipment, or locomotive; attempt to mount, dismount, or cross over moving equipment.

B5 Electrical Hazards – Electricity may pose a particular hazard to site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, a qualified electrician must perform it.

Properly ground all electrical equipment. Avoid standing in water when operating electrical equipment. Ground fault outlets or adapters shall be used for any electrical equipment. Apparatus, tools, equipment, and machinery will not be repaired while in operation. Lockout/Tagout (LOTO) procedures will be implemented when necessary. If equipment must be connected by splicing wires, electrical work must be performed by a licensed and competent electrician.

General electrical safety requirements include:

- All electrical wiring and equipment must be a type listed by Underwriters Laboratories (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.
- All portable generators or other portable internal combustion type devices used on site will be grounded. All grounds will be validated twice daily with a multimeter to confirm a resistance of less than ten ohms.
- All installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or United States Coast Guard regulations.
- Portable and semiportable tools and equipment must be grounded by a multiconductor cord having an identified grounding conductor and a multicontact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double-insulated tools must be distinctly marked and listed by UL or FM.
- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.
- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- All circuits must be protected from overload.
- Temporary power lines, switchboxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.
- Plugs and receptacles must be kept out of water unless of an approved submersible construction.
- All extension cord outlets must be equipped with ground-fault-circuit interrupters (GFCIs).
- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.
- Extension cords or cables must be inspected prior to each use and replaced if worn or damaged.
- Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.
- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.

B6 Fire and Explosion Hazards – The presence of petroleum and solvent contaminated material presents a potential fire hazard. Smoking and use of open flame will be prohibited. The use of non-sparking tools and equipment will be implemented if conditions warrant. Where the potential of fire exists, ENVIRON will provide portable fire extinguishers. Where applicable, all fire extinguishers shall be mounted no higher and no lower than 4 feet (1.22 m) from the floor and/or shall be readily accessible for use, where applicable. All fire extinguishers shall be maintained as follows:

- Fully charged and in operable condition
- Clean and free of defects
- Readily accessible at all times

Fire prevention and protection measures include elimination of ignition sources, where feasible, identification of combustion sources and atmospheres, and early detection and rapid response to fire/explosion situations. In addition to standard operating procedures, the following safe work practices will be implemented:

- Site activities will comply with National Electric Code and explosion proof criteria;
- Smoking will only be allowed in designated areas;
- Appropriate air monitoring procedures will be conducted, when necessary;
- Welding, open flame or spark-producing operations will not be allowed on-site;
- Solvents with a flash point of less than or equal to 100oF will not be used for cleaning purposes;
- Fire extinguishers shall be kept in all work vehicles
- Extinguishers must:
  - Be maintained in a fully charged and operable condition;
  - Be visually inspected each month; and
  - Undergo a maintenance check each year.

All fires and visible smoke that are detected at the Site will be dealt with immediately by the individual recognizing the fire and/or smoke. In the event of visible smoke, fire, or explosion, the following emergency response procedures will be implemented:

- Immediately cease operations; and
- In all emergency situations contact emergency services.

For small fires, personnel may attempt to extinguish the fire, if safe to do so and they have been trained. One fire extinguisher ONLY may be used to fight the fire. After one fire extinguisher is depleted, personnel must evacuate the area. For larger fires, perform site evacuation.

B7 Acoustical Hazards – Hearing protection will be worn by all personnel operating or working within the vicinity of equipment when noise is sufficient to interfere with general

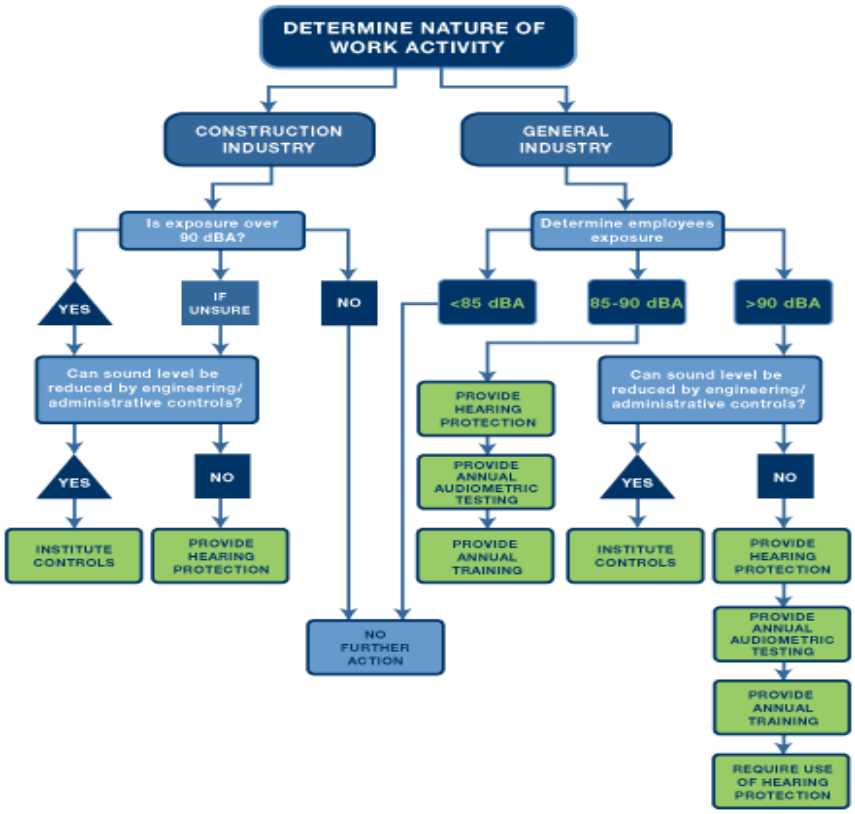
conversation at a normal speaking volume; when noise levels exceed 85dBA; and/or when manufacturers' requirements indicates that it's usage is mandatory. Personal hearing protectors, such as earplugs or earmuffs, may be used to reduce the amount of noise exposure while the above control measures are being evaluated or if such controls fail to reduce the exposure levels to below the PELs.

Any environmental condition where a person must shout to be heard from a distance of 3 feet indicates a hazardous noise environment. Under these conditions, personnel must be protected through the use of appropriate hearing protective devices.

Hearing protection shall be worn:

- In any situation where normal conversation cannot be heard at a distance of 3 feet regardless of the source of the noise or where noise levels as measured with approved noise monitoring equipment is above 85 dBA.
- When operating gasoline or electric powered machinery.
- When working within 25 feet of operating heavy equipment (earth working equipment, etc.) as working around this type of equipment can result in exposure to hazardous levels of noise (levels greater than 90 dBA).

Refer to the decision tree below:



B8 Ventilation/Oxygen Deficiency Hazards – ENVIRON personnel shall monitor the work area for oxygen deficiency hazards using monitoring devices that have been appropriately calibrated and are recommended for this specific use, as applicable. If direct air monitoring readings suggest an oxygen deficiency and/or the build-up of harmful substances, leave the area and contact your Project Manager. Implementation of corrective actions may include but not be limited to increasing work zone ventilation or evaluating alternatives (e.g., removing equipment that is generating combustion exhaust or venting the exhaust to the exterior of the building). However, work will not continue until the ventilation/oxygen deficiency hazard has been properly addressed, implemented, and verified.

B9 Heat Stress – Heat stress can be a significant hazard, especially for workers wearing protective clothing. Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly, within as little as 15 minutes. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and in the prevention of heat stress incidents.

Workers will be encouraged to immediately report any heat-related problems that they experience or observe in fellow workers. Any worker exhibiting signs of heat stress and exhaustion should be made to rest in a cool location and drink plenty of water. Emergency help by a medical professional is required immediately for anyone exhibiting symptoms of heat stroke, such as red, dry skin, confusion, delirium, or unconsciousness. Heat stroke is a life threatening condition that must be treated by competent medical authority.

ACGIH screening criteria for heat stress exposure in degrees Celsius for an 8-hour work day 5 days per week with conventional breaks will be used in determining safe exposure for acclimatized and unacclimatized employees.

Allocation of Work in a Work/Rest Cycle	Acclimatized				Action Limit (Unacclimatized)			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75-100%	31.0 (87.8F)	28.0 (82.4F)	--	--	28.0 (82.4F)	25.0 (77F)	--	--
50-75%	31.0 (87.8F)	29.0 (84.2F)	27.5 (81.5)	--	28.5 (83.3F)	26.0 (78.8F)	24.0 (75.2F)	--
25-50%	32.0 (89.6F)	30.0 (86F)	29.0 (84.2F)	28.0 (82.4F)	29.5 (85.1F)	27.0 (80.6F)	25.5 (77.9)	24.5 (76.1F)
0-25%	32.5 (90.5F)	31.5 (88.7F)	30.5 (86.9F)	30.0 (86F)	30.0 (86F)	29.0 (84.2F)	28.0 (82.4F)	27.0 (80.6F)

Heat Stress Prevention

Whenever possible or within the control of ENVIRON, engineering controls should be utilized to protect workers from heat related hazards. For example, isolation from the heat source, ventilation such as open windows, fans or other methods of creating air flow, and heat shielding such as awnings or umbrellas.

Appropriate work practices can also lessen the chances of heat related hazards. Some of these include:

- Water intake should be about equal to the amount of sweat produced (i.e., drinking 5-7 ounces of water every 15-20 minutes). Electrolyte fluids may also be necessary.
- Whenever possible, gradual exposure to heat is preferred to allow the body's internal temperature to actuate to the working conditions.
- Whenever possible, adjust the work schedule to reduce risk of heat stress. For example, postpone nonessential or heavier work to the cooler part of the day and perform work in the shade if portable.
- Rotate personnel to reduce the amount of time spent working in direct sun and heat.
- Increase the number and/or duration of rest breaks, and whenever possible, rest break areas should be in a cool area and as close to the work area as is feasible.

Wear appropriate PPE when necessary, such as thermally conditioned clothing, self-contained air conditioning in a backpack, and plastic jackets/vests with pockets that can be filled with dry ice or ice. However, based on the type of work being done, where work is being performed, or other required PPE, these options may be prohibited or make the use of this PPE impossible or impractical.

Heat-Related Illnesses

***Heat Stress**:* This is the mildest heat-related illness, but prompt action may prevent it from turning into a more severe heat-related illness. Symptoms include irritability, lethargy, significant sweating, headache, or nausea. The following guidance can be used in the identification and treatment of heat related illness.

Heat Stress First Aid:

- Take victim to a protected (e.g., shaded, cool) area, remove any excess protective clothing, and provide cool fluids.
- If an air-conditioned spot is available, this is an ideal break location.
- Once the victim shows improvement he/she may resume working, however the work pace and practices (e.g., does fluid intake need to be increased) should be moderated to prevent recurrence of the symptoms.

Heat Exhaustion: Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Symptoms include pale, clammy skin, and profuse sweating, vomiting, and the bowels may move involuntarily. The pulse is weak and fast, breathing is shallow. Fainting can occur.

Heat Exhaustion First Aid:

- Immediately remove the victim from the work area to a shady or cool area with good air circulation (avoid drafts or sudden chilling – you do not want the victim to shiver).
- Call a physician or emergency service, or transport the victim to medical care.

- Remove all protective outerwear.
- If the victim is conscious, it may be helpful to give him/her sips of water.

Heat Stroke: Heat stroke is a severe medical condition requiring first aid and emergency treatment by a medical professional as death can occur without appropriate care. Heat Stroke represents the collapse of the body's cooling mechanisms. As a result, body temperatures often rise to between 105 – 110 ºF. As the victim progresses toward heat stroke symptoms include hot and usually dry, red and spotted skin, headache, dizziness, nausea, mental confusion, delirium, possible convulsions, and loss of consciousness.

Heat Stroke First Aid:

- Immediately remove the victim from the work area to a shady or cool area with good air circulation (avoid drafts or sudden chilling – you do not want the victim to shiver).
- Summon emergency medical help to provide on-site treatment and transportation to a medical facility.
- Remove all protective outerwear and loosen personal clothing.
- Apply cool wet towels, ice bags, etc. to the head, armpits, and thighs. Sponge off the bare skin with cool water or even place the victim in a tub of cool water.

<u>Skin Hazards</u>

Sunburn and prickly heat are both symptoms of skin irritation/damage produced through exposure to sunlight and operating in hot work environments.

- Protect exposed skin with an appropriate sunscreen. A sunscreen with a sun protection factor (SPF) of 15 or greater is required for work in the sun with reapplication at breaks and lunch.
- Heat rash, also known as prickly heat, can be prevented by the application of a hydrophobic, water repellent barrier cream such as Kerodex 71.

B10 Cold Stress - The four environmental conditions that cause cold-related stress are low temperatures, high/cool winds (wind chill), dampness, and cold water. One or any combination of these factors can cause cold-related hazards. Cold stress, including frostbite and hypothermia, can result in severe health effects.

A dangerous situation of rapid heat loss may arise for any individual exposed to high winds and cold temperatures. Major risk factors for cold-related stresses include:

- Wearing inadequate or wet clothing increases the effects of cold on the body.
- Taking certain drugs or medications such as alcohol, nicotine, caffeine, and medication that inhibits the body's response to the cold or impairs judgment.
- Having a cold or certain diseases, such as diabetes, heart, vascular, and thyroid problems, may make a person more susceptible to the winter elements.

- Being male increases a person's risk to cold-related stresses. Men experience far greater death rates due to cold exposure than women, perhaps due to inherent risk-taking activities, body-fat composition, or other physiological differences.
- Becoming exhausted or immobilized, especially due to injury or entrapment, may speed up the effects of cold weather.
- Aging -- the elderly are more vulnerable to the effects of harsh winter weather.

TABLE 2. Cooling Power or Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
5	48	37	27	16	6	−5	−15	−26	−36	−47	−57	−68
10	40	28	16	4	−9	−24	−33	−46	−58	−70	−83	−95
15	36	22	9	−5	−18	−32	−45	−58	−72	−85	−99	−112
20	32	18	4	−10	−25	−39	−53	−67	−82	−96	−110	−121
25	30	16	0	−15	−29	−44	−59	−74	−88	−104	−118	−133
30	28	13	−2	−18	−33	−48	−63	−79	−94	−109	−125	−140
35	27	11	−4	−20	−35	−51	−67	−82	−98	−113	−129	−145
40	26	10	−6	−21	−37	−53	−69	−85	−100	−116	−132	−148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.
Equivalent chilll temperature requiring dry clothing to maintain core body tempearture above 36°C (96.8°F) per cold stress TLV

Cold Stress Prevention

Engineering controls should be utilized whenever possible to protect workers from cold related hazards. For example, on-site heat sources, heated shelters, work areas shielded from drafty or windy conditions, and the use of thermal insulating material on equipment handles.

Effects arising from cold exposure will be minimized by the following control measures:

- Personnel will be trained to recognize cold stress symptoms.
- Field activities will be curtailed or halted if the equivalent chill temperature is below 20 F.
- As much as possible, work that exposes personnel to the cold will be done during the warmest hours of the day.
- Inactivity in cold conditions will be kept to a minimum.
- Frequent short breaks in warm, dry shelters will be taken.
- Vehicles will be equipped with supplies in case the vehicle becomes inoperable (e.g., blanket, dry clothing, water, food, a shovel, etc.

The following PPE will be provided during work in cold environments

- Workers will be provided with insulated dry clothing when the equivalent chill temperature is less the 30 F.
- Feet, hands, the face, and the head should be protected (40% of the body's heat can be lost when the head is exposed).
- Foot and hand wear may also need to be waterproof.
- Clothing should be layered so that adjustments can be made to changing environmental temperatures and conditions. For example, an outer layer to break the wind, a middle layer that will absorb sweat and retain insulation when wet, and an inner layer that allows ventilation.

Cold-Related Illness

Hypothermia: Hypothermia occurs when the body temperature falls to a level where normal muscular and cerebral functions are impaired. Although it usually occurs in freezing air and water temperatures, it can occur in any climate if a person's internal body temperature falls below normal. Symptoms should not be ignored, and a supervisor should be notified as soon as hypothermia is suspected.

Initially, symptoms may include shivering, an inability to do complex motor functions, sluggishness and mild confusion as the body temperature drops to around 95 F. As the body temperature falls, speech may become slurred, and behavior may be irrational, simple motor functions may be difficult to do and a state of "dazed consciousness" may exist. In severe state (below 90 F), heart rate, blood flow, and breathing will slow. Unconsciousness and full heart failure can occur.

Hypothermia First Aid:

On land:

- Call for emergency, and then help move the victim (unless other injuries prohibit their being moved) to a warm, dry area and replace wet clothing with warm, dry clothing or a blanket. Move the person carefully because movement can increase the irritability of the heart.
- If the person is conscious and lucid, warm liquids can be provided, but never alcohol or caffeinated drinks. If possible, have them to move their arms and legs to create muscle heat.
- If the person is unconscious or unable to assist, place warm bottles/packs in the person's arm pits, groin, neck and head areas.
- Do not rub the person's body or place them in warm water.

In water:

- Call for emergency help and get the victim out of the water. Move them carefully because movement can increase the irritability of the heart.
- If it is you in the water, do not swim unless a floating object or person can be reached quickly as swimming uses the body's heat and reduces survival time by about 50%.

- If you are in the water, conserve body heat by folding arms across the chest, keeping thighs together, bending knees and crossing ankles, if another person is in the water with you, huddle together.
- If you are in the water, do not remove clothing-button, buckle, zip, and tighten collars, cuffs, shoes, and hoods as the water trapped next to the body provides a layer of insulation that may slow the loss of heat.

Frostbite: Frostbite occurs when the skin literally freezes, and deep frostbite can affect deeper tissues such as tendons and muscles. Frostbite usually occurs when temperatures drop below 30 F, but wind chill effects can cause frostbite at above-freezing temperatures. The ears, fingers, toes, cheeks, and nose are the most commonly affected body parts. Initially, symptoms include an uncomfortable sensation of coldness. Tingling, stinging or an aching feeling of the exposed area is followed by numbness. Frostbitten areas appear white and cold to the touch and with deeper frostbite, the area becomes numb, painless, and hard, and can turn black.

Frostbite First Aid:

- Seek medical attention as soon as possible and treat any existing hypothermia first.
- Warm liquid can be provided, but not alcohol or caffeinated drinks such as tea and coffee.
- Do not rub the affected areas, but cover them with dry, sterile gauze or soft, clean bandages.
- Do not try rewarming the affected area if you have not been specifically trained to do so and/or if there is a chance the affected area will get cold again.

Trench Foot: Trench Foot is caused by a continuous exposure to a wet, cold environment. Symptoms include tingling and/or itching sensation, burning pain and swelling and, in more extreme cases, blisters.

Trench Foot First Aid:

- Seek medical attention as soon as possible and move the victim to a warm, dry area.
- Affected tissue can be treated with careful washing and drying, slight elevation. Do not try rewarming the affected area if you have not been specifically trained to do so.

TABLE 3. Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift*

Air Temperature—Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
–26° to –28°	–15° to –19°	(Norm. Breaks) 1		(Norm. Breaks)		75 min	2	55 min	3	40 min	4
–29° to –31°	–20° to –24°	(Norm. Breaks) 1		75 min	2	55 min	3	40 min	4	30 min	5
–32° to –34°	–25° to –29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
–35° to –37°	–30° to –34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
–38° to –39°	–35° to –39°	40 min	4	30 min	5	Non-emergency work should cease					
–40° to –42°	–40° to –44°	30 min	5	Non-emergency work should cease							
–43° & below	–45° & below	Non-emergency work should cease									

Notes for Table 3

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at –35°C (–30°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:
   5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.
3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m^2; 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m^2. In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.
4. TLVs apply only for workers in dry clothing.

*Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labour.

B11 Insects, Snakes and Spiders - Care will be taken by all site workers to avoid stinging or biting insects such as ticks, spiders, bees, wasps, hornets, and yellow jackets. Workers allergic to any particular insect sting or bite should seek medical attention if stung or bitten and may need to carry emergency medicine prescribed by their doctor.

Care should always be taken to avoid these insects and increased vigilance is necessary during high infestation seasons, when opening protective casings of monitoring wells, and when walking through areas of heavy vegetation or areas known to be infested.

To minimize the chance of bites/stings:

- Wear appropriate PPE such as light colored clothing so you can see insects, long pants tucked into boots, long sleeves when possible, a hat, and gloves if you are cutting brush or need to handle or move vegetation.

- Check your body and clothing for insects, shower after work and wash/dry clothes at as high temperature as possible.
- Do not swat at insects and do not eat in areas where there are insects.
- Avoid sweet smelling personal hygiene products and, unless contraindicated by the work being performed (e.g., sampling, data collection), wear EPA approved repellants such as those containing DEET.

Black Widow Spider

Brown Recluse Spider

Spider bites generally cause only localized reactions such as swelling, pain, and redness. However, bites from a Black Widow or Brown Recluse, or if you are allergic to spiders, can cause symptoms that are more serious.

First Aid for spider bites:

- Clean the bite area with soap and water and place a cold pack over the bite area to reduce swelling.
- Monitor for allergic reactions. If victim has more than minor pain, or if nausea, vomiting, difficulty breathing, or swallowing occurs, medical attention should be sought immediately.

Tick

Removing a tick

Ticks are common, especially in the warmer weather months and may carry diseases such as Rocky Mountain Spotted Fever and Lyme disease.

First Aid for tick bites:

- Use a fine tipped tweezers, grasp tick firmly as close to skin as possible and pull the body away from skin. Avoid crushing the body and do not twist.
- If parts of the tick remain in the skin, do not be alarmed as the mouth will dislodge as skin sloughs off.
- Wash area with soap and water and apply antiseptic or antibiotic ointment to prevent infection.
- If unexplained symptoms develop such as severe headaches, fever, or rash within 10 days of the bite, seek medical attention.
- If possible, contain tick in an air tight container for identification purposes in the event of a serious reaction.

1: Chigger
2: Bites

Chiggers are tiny, s-legged wingless organisms that grow up to become a type of mite. They are found in tall grass and weeds and their bites cause severe itching.

First Aid for chiggers:

- Reduce discomfort and prevent infection
- The affected area should be kept clean by washing with soap and water
- A topical hydrocortisone cream, antihistamine, or local anesthetic may be of value in reducing the itching
- The wounds should not be scratched, if possible
- If signs of infection occur, consult your physician

Bees and wasps belong to the phylum Arthropod family, and they are crucially important to the pollination of plants, specifically flowers, fruits, and vegetables. A sting from a bee or wasp will cause itching, irritation, redness and/or swelling at the sting site.

First Aid for bee stings:

- Remove the stinger as quickly as possible - venom continues to enter the skin from the stinger for 45 to 60 seconds following a sting – using a flat dull object, like a credit card. Slid the flat object in the opposite direction of the stinger to remove it from the skin
- Wash the wound using soap and water
- Apply ice for swelling and pain
- A topical hydrocortisone cream, antihistamine, or local anesthetic may be of value in reducing itching
- If the sting occurs on the neck or mouth, seek medical attention immediately, swelling in these areas may cause suffocation

A small percentage of people are allergic to stings and a sting can be fatal, caused by a disruption to breathing and circulatory systems called anaphylactic shock. If the sting is followed by severe symptoms, seek medical attention immediately. Allergic people should never be alone for outdoor activities since help may be needed for prompt emergency treatment. Allergic people should have an identification bracelet as well as carry something like an “EpiPen” for immediate treatment for anaphylactic shock.

Fire ants are a variety of stinging ants with over 280 species worldwide. Typically, a colony produces large mounds in open areas, and feeds mostly on young plants, seeds, and insects. They nest in the soil, often near moist areas such as river banks and pond edges. Unlike other ants which bite and then spray acid on the wound, fire ants bite only to get a grip and then sting,

injecting toxic alkaloid venom. This results in a painful stinging sensation, similar to what a fire burn feels like.

First Aid for fire ant bites:

- Move rapidly away from the nest
- Quickly remove or kill ants on skin and clothing to prevent further stings
- Wash the area gently with soap and water to rid the skin of any venom
- Place cool cloth or ice cloth on sites for 15 minutes, and to relieve pain, dab the area with calamine lotion, a topical (cortisone) or oral antihistamine (e.g. Benadryl) to help with swelling
- Do not scratch the blister because this can lead to infection
- Allergic response is rare, but symptoms are difficulty breathing, light headedness, and weakness. Immediate medical attention is required

Snakes serve as an important role as predators in the ecosystem, and help maintain populations of rodents and other prey.

First Aid for venomous snake bites:

- Wash and immobilize the injured area, keeping it lower than the heart if possible
- Seek medical attention immediately
- DO NOT apply ice, cut the wound, apply a tourniquet, or suck the bite
- Remain calm and try not to move the bitten body part
- Wash the bite with soap and water
- Remove jewelry or other items that may be affected by rapid swelling of affected body parts
- Try to identify the type of snake: note color, size, patterns, and markings
- The bite will be painful and have two distinct puncture wounds
- If venom is injected there will be burning and swelling
- ONLY FOR CORAL SNAKE BITES: apply a mild wrapping on the wound

Water Moccasin (aka cotton mouth)

Rattlesnake

Coral Snake

Copperhead

B12 Poisonous Plants – Plants poison on contact, through ingestion, or by absorption or inhalation. They cause painful skin irritations upon contact and can cause internal poisoning when eaten.

Poison Ivy

Poisonous Sumac

Giant Hogweed

First Aid for poisonous plants:

- Wash exposed areas with cold running water as soon as you can
- When possible, wash your clothing
- Relieve itching by taking cool showers and applying topical anti-itch medications or hydrocortisone
- The rash is often arranged in streaks or lines where you brushed against the plant
- In a few days, the blisters become crusted and take 10 days or longer to heal
- If the reaction is severe or worsens, seek medical attention

B13 Personal Safety - If it is deemed that a work site is in an area where an employee's personal safety may be at risk from potential criminal acts, wild animals, etc. the risks will be evaluated and implementation of preventative measures will be taken to minimize the risk. Informational resources such as the client, local law enforcement officials, Park or Wildlife Service, and Animal Control could be utilized to assess the risk and to ensure the safest possible work environment. For example, local law enforcement can be made present or make frequent drive-bys while work is being done, outside security can be hired, and work can occur only during certain times of the day or work may not proceed at all. Some general guidelines are provided here, but each situation is different and actions must be taken based on the specifics of each.

In areas of risk, employees will communicate via cell phones or 2-way radios, and will check-in at predetermined times throughout each workday. If employees do not call in to the Project Manager or designated representative, the team will be contacted, and if unsuccessful, local law enforcement will be notified.

If you see wild animals while driving, stay in your vehicle. Never get out for a photo or a closer look. Keep windows up and do not try to keep the animal from crossing a road with your vehicle. If you see a wild animal while on foot, never approach the animal. If the animal has not seen you, go back the way you came. Do NOT turn your back and run which could evoke their natural predator instinct. Instead, keep facing the animal and back away at a steady pace. Let it know you are human by talking in a low voice and waving your hands slowly. If you are near a car or building, get inside. In addition, in areas of higher risk (i.e., contacted officials have indicated that wild animals are a nuisance), employees may want to consider carrying "pepper spray".

If, while on the project site, and despite any precautions set forth, if an employee feels that their personal safety is at risk, they shall cease work, leave the work area and immediately report their concerns so that appropriate steps can be taken.

B14 Working Alone and Working in Isolated Areas - Site and Operations employees will assess the risk of working alone as outlined in section 4 in this HASP. And whenever possible, employees will not work alone in isolated areas. If the isolated area involves hiking/walking into areas that are unmarked or if there is potential to become directionally disoriented (e.g., no trails, unmarked trails, forested or highly vegetated areas), employees will be trained on the use of a compass and trail/topography maps and if necessary, will take wilderness safety training.

The employee will work with the Park/Wildlife service on what emergency planning if necessary (e.g., unexpected weather, animal attack, and search/rescue).

Communicating through cell phones or 2-Way Radios will be utilized whenever possible. Employees will check-in at predetermined times throughout each workday and as the risk rating increases, employees will check-in more frequently. If employees do not call in to the Project Manager or designated representative, the team will attempt to be contacted. If contacting the employee is unsuccessful, the appropriate authorities will be notified. In addition, and especially if communication is not possible during the day, the planned start and estimated finish times for the day will be communicated, and employees will check in at the beginning and end of the work day.

If employees will be moving from isolated area to isolated area, there will be established beginning and ending locations, planned start and estimated finish times, and planned routes that will be followed throughout the day. Employees will not deviate from this schedule without first contacting the appropriate personnel. It may also be necessary to notify the client, law enforcement, or Park/Wildlife officials of these schedules.

Local authorities should be contacted about any hunting season that may be in session, and if it is possible that hunters may be present in the area in which ENVIRON personnel will be working. If so, employees will wear brightly colored hardhats/hats and reflective vests, will not work before dusk, and work will end 30 minutes before dusk.

If this is not possible to complete work during day light hours, employees will wear appropriate reflective apparel and have appropriate lighting, such as portable lighting, flashlights, or headlamps as appropriate for the activity being conducted. Personal security will be assessed and measures taken as discussed above if appropriate.

B15 Severe Weather - Severe weather conditions include high winds, electrical storms, and heavy rain. At a minimum, all work outdoors will cease during these events. When lightning is spotted, site personnel should use the following steps to avoid injury:

- Workers should note the flash-boom ratio (i.e., count the seconds after the lightning was seen until the thunder was heard).
- By counting the seconds between seeing lightning and hearing thunder and dividing by 5, you can estimate your distance from the storm (in miles or kilometers). If the storm is 6 miles (9.6 kilometers) away or less (30 seconds between when lightning was seen and thunder was heard) workers must stop work and take shelter.
- If the storm is more than 6 miles (9.6 kilometers) away (greater than 30 seconds between lightning and thunder), the site supervisor should monitor the storm and be prepared to cease work if the storm approaches an unsafe distance. Since storms can travel at varying speeds and the amount of time at takes to cease and secure operations will also vary, so prudent judgment should be exercised when storms are in the vicinity and/or developing (e.g., darkening skies, increasing wind speeds, etc.).

- Workers should not stay in exposed areas (outdoors on the ground, on a roof, in an aerial lift, on a steel truss, on an ungrounded steel structure, in a golf cart, un-sided building, etc.) after lightning has been witnessed. All personnel must move to a safe location.
- Workers should wait 30 minutes from the last sight of lightning or sound of thunder before returning to work.
- Those required to travel from one building to another during the 30 minute wait time should do so only by enclosed vehicle.
- Once the 30 minute wait time period has elapsed and no additional lightning or thunder has been seen or heard, individuals may resume normal work.

B16 Aboveground and Underground Utilities - Various forms of underground and aboveground utility lines or pipes (carrying water, wastewater, gas, and or electricity) may be encountered during work activities. Every effort shall be made to locate and mark underground utilities prior to the start of intrusive work. At a minimum, ENVIRON will conduct a historical site review to develop a plot plan with the most up to date utility information, contact the appropriate One Call service (where available), contract a Private utility locating service (where available), and clear the critical zone around any intrusive location to 5 feet (1.3 m) in every direction. Please reference section 4 of the site-specific HASP and SPI 27 Subsurface Clearance for more information.

Work involving machinery with high extensions (backhoes, etc.) will remain **at least** 10 feet (3.3 meters) from overhead power lines. As line voltage increases, your safe working distance will also increase. If overhead lines are present, call the utility company and find out what voltage is on the lines so the safe working distance can be calculated, or stay at least 28 feet (9m) from cables supported on wooden poles, and 50 feet (15m) from cables supported on metal poles.

Should any operations cause equipment to come into contact with utility lines, the appropriate authority will be notified immediately and an Incident Report will be completed. Work will be suspended until the appropriate actions for the particular situation can be taken.

B17 Trenching/Excavation - An excavation is any manmade cut, cavity, trench, or depression in an earth surface, formed by earth removal. A trench is narrow excavation (in relation to its length) made below the surface of the ground. The following safe operating guidelines apply to open trenches or excavations exceeding four (4) feet (1.3 meters) in depth **or** of any depth if in unstable soil conditions.

- Excavated materials will be stored and retained at least 2 feet (0.6 meters) from the edge of the excavation. This procedure must be observed even when excavation/trench entry will not occur.
- Trees, boulders, and other surface encumbrances that create a hazard will be removed or made safe before excavation is begun.
- Special precautions will be taken in sloping or shoring the sides of excavations adjacent to a previously backfilled excavation.

- Except in hard rock, excavations below the level of the base of the footing of any foundation or retaining wall will not be permitted, unless the wall is underpinned and all other precautions have been taken to ensure the stability of the adjacent walls.
- Excavations will be inspected at least daily, or more often as conditions warrant, by a **competent person** to ensure that changes in temperature, precipitation, shallow groundwater, overburden, nearby building weight, vibrations, or nearby equipment operation has not caused weakening of sides, faces, and flows. Before an employee enters an excavation greater than four (4) feet (1.3 meters) in depth (or less if soil is deemed unstable by a competent person), the atmosphere must be tested to ensure that an oxygen deficient or hazardous atmosphere does not exist. If the concentration of any airborne contaminant exceeds one-half its permissible exposure limit (PEL) or other applicable occupational exposure limit (OEL), the airborne oxygen concentration is less the 19.5 percent, or explosivity exceeds ten percent of the lower explosive limit (LEL), then no personnel shall be permitted to enter the excavation until such engineering controls or other hazard controls are instituted to eliminate or control the hazard.
- Diversion ditches, dikes, or other suitable means will be used to prevent water from entering an excavation and for drainage of the excavation.
- When mobile equipment is used or allowed adjacent to excavations, stop logs, or barricades will be installed. The grade will always be away from the excavation.
- A means of egress (ladder, ramps, stairways, etc.) shall be accessible at any location inside the excavation without requiring more than 25 feet (8.3 meters) of lateral travel distance.
- Dust conditions during excavation will be kept to a minimum. Wetting agents shall be used when appropriate.
- Field personnel shall not enter any excavation, without specific direction, for any reason except to rescue injured individuals who have fallen into the excavation.
- All excavations will be marked and protected at all times to ensure site personnel, visitors, or unauthorized personnel do not enter without permission or fall into the trench.
- Personnel will work in pairs when working around an excavation of 2’ (0.6 meters) or more.

B18 Water Safety - All personnel and visitors when immediately near water (i.e., within 4 feet/1.22 meter), over water, wadding in water or on any vessel, where the danger of drowning exists, must wear a USCG approved personal floatation device (PFD). This PFD must be properly secured to the wearer. The PFD must be free of all defects including rips, tears, stress, and fading, and be kept clean and free of excessive dirt and oil. However, several factors are relevant to determining whether a danger of drowning exists. These include the type of water body (i.e., a pool, a river, and a canal), depth, presence, or absence of a current, height above the water surface, and the use of fall protection when working above a water body.

Depending on the factors present, there are some circumstances where a drowning hazard could exist where workers are near or over water that is relatively shallow (i.e., less than 2 feet (0.6meters) in depth). For example, where workers are not using fall protection and are 10 feet

above a river, a worker may fall and be knocked unconscious. Without the use of a life jacket or buoyant work vest, a worker in such a scenario could drown.

A life ring equipped with 90 feet of solid braid polycarbonate line, or equivalent must close to the working area and accessible for use. This includes activities being be on board all vessels and kept readily available.

USCG boating safety guidelines or equivalent should be adhered to when operating a boat during sampling activities. Boats must be equipped with the required running lights for night-time or poor visibility conditions. Boats must be equipped with an anchor and alternate means of locomotion (e.g., extra motor, floatable oars).

B19 Material Handling/Ergonomics – Handling and storing materials involve diverse operations such as hoisting with a crane, driving a truck loaded with materials, carrying bags or materials manually, and stacking materials such as drums, barrels, or lumber. When moving materials manually, employees should attach handles or holders to loads in addition to wearing appropriate personal protective equipment and using proper lifting techniques.

Employees should seek help when handling loads that are too bulky to grasp or lift, when employees cannot see around or over a load, or when they cannot safely handle a load of any other reason. Personal protective equipment should be worn when moving materials to prevent needless injuries. Hand and forearm protection, such as gloves should be worn when working with loads that have sharp or rough edges. Blocking materials can be used to manage and move loads, but ensure the materials are large and strong enough to support the load safely.

When mechanical equipment is used to move materials, allow the weight, shape and size of the material dictate the type of equipment used to move it, based on its rated capacity and making sure not to overload. Equipment-rated capacity should be displayed on each piece of equipment in use. When picking up items with a powered truck, center the load as close to the mast as possible, avoid overloading and do not put extra weight on the rear to counterbalance the equipment, adjust the load to the lowest possible safe position when traveling, and always follow the manufacturer’s operational instructions.

Lifting, carrying, and lowering objects represents a potential physical hazard to ENVIRON personnel. Therefore, it is every employee’s responsibility to realistically evaluate the object to determine if the weight and size exceeds the employee’s ability to lift, lower, or carry it. To eliminate or minimize the risk of lifting hazards, utilize proper techniques, such as keeping the back straight and legs bent. Objects should always be lifted, lowered and carried as close to the body as possible. If the equipment cannot be lifted in this manner, it is too heavy to lift alone. Call other personnel, or use a mechanical device for aid in lifting. Mechanical aids like hand trucks and carts or the buddy system should be used to move heavy objects, objects with poor handgrips or large bulky objects. Some other things to consider:

- Evaluate the object for the presence of any physical hazards such as pinch points, sharp or jagged edges, burrs or rough and slippery surfaces.

- The route in which the object will be moved should be free from obstructions, which could cause difficulty in moving the object.
- Assess other hazards such as stairs before you move the object and consider smaller loads with multiple trips as a safe alternative
- If an object is stored at a level higher than five feet, or on the floor, an appropriate mechanical device may be necessary to move the object.
- Recognized lifting hazards should be designed out of the work process whenever possible.

Proper lifting and lowering techniques should be followed even if the object or material to be lifted is of lighter weight. Keep the objects as close to the body as possible and:

- Establish a firm footing with feet at approximately shoulder width and one foot slightly ahead of the other. This posture will aid in keeping good balance and will establish a stable lifting base.
- Always bend at the knees, not at the waist when lifting or lowering an object.
- Obtain a good secure grip on the object.
- When beginning to lift, tighten your stomach muscles and use your les to lift the object, as leg muscles are generally stronger than back muscles.
- Lift slowly and smoothly.
- If you need to turn as you lift, do not twist at the waist, but instead pivot with the feet.

When lowering the object, reverse the procedure.

B20 Power Tools – Tools can be hazardous when improperly used since these types of tools utilize energy: Electric, liquid fuel, hydraulic, pneumatic, and powder-actuated. The following precautions will be taken by employees to prevent injury:

- Power tools will always be operated within their design limitations, and only by employees who have been appropriately trained in the use, operation, and proper handling of such tools.
- Guards are not to be removed or rendered inoperative.
- Eye protection, gloves, and safety footwear are recommended during operation.
- Store tools in an appropriate dry location when not in use.
- Work only in well illuminated locations.
- Tools will not be carried by the cord or hose, and cords or hoses will not be yanked to disconnect it from the receptacle.
- Cords and hoses will be kept away from heat, oils, and sharp edges or any other source that could result in damage.
- Tools will be disconnected when not in use, before servicing, and when changing accessories such as blades, bits, and cutters.

- Observers will be kept at a safe distance at all times from the work area.
- Tools will be maintained in a clean manner, and properly maintained in accordance with the manufacturer's guidelines. Periodic inspection of hand and portable power tools should occur.
- Ensure that the work area is kept clean to maintain proper footing and good balance.
- Ensure that proper apparel is worn. Loose clothing, ties, or jewelry can become caught in moving parts.
- Tools that are damaged will be removed from service immediately and tagged "Do Not Use".

B21 Vehicle Use – Work areas and site conditions must be considered when designating and selecting a vehicle for use. The vehicle shall be maintained in safe working order as required by the manufacturer. This would include a routine preventive maintenance schedule for servicing and checking of safety-related equipment. Special consideration should be taken when weather conditions reduce the safety and visibility while driving. Appropriate measures should be taken while driving during inclement weather including snow, icy, and/or wet conditions; high winds; hail, heavy rains; debris or other impairments to safe driving caused by natural weather.

Special-use vehicles (e.g., All-Terrain Vehicles (ATV), snowmobiles, etc.) are vehicles with a light engine or electric motor, other than construction equipment, and are not intended and/or allowed for highway use. These vehicles may ***not*** have seat belts or ***do not*** have substantial roll protection (i.e., ROPS, FOPS, steel roll-cage, etc.). In addition, the following general practice will be followed:

- All vehicles will be operated in accordance with the Manufacturer's requirements and specifications;
- Drivers should use prudent judgment and proceed cautiously when driving on non-paved roads;
- Operators of special-use vehicles shall be trained by a competent person. At a minimum, training will be hands-on by a competent person and the operator shall demonstrate of basic skills. All individuals are required meet all training aspects before use;
- All vehicles shall remain on flat surfaces at all times and shall not be operated on slopes steeper than a 30% grade;
- Daily inspections of vehicles for safety and maintenance will be required (i.e., fluid leaks/levels, tire pressure, tire surfaces, lights, fuel levels, brakes, etc.); Speed limits shall be maintained to safe operating speeds;
- Make sure the engine is turned OFF before dismounting the vehicle;
- Avoid driving over any extreme obstacles (i.e. wood/logs, fences, boulders, etc.);
- Watch for pedestrians and other vehicles;
- Only drive during daylight hours;

- Do not carry passengers;
- Slow down before coming to a stop;
- Shut engine down prior to refueling; and
- Each driver will have a valid driver's license.
- Operators shall wear:
  - wear safety glasses, goggles, or face-shield at all times when moving
  - leather boots
  - a ***PROPERLY FITTED*** DOT/ANSI/SNELL approved helmet
  - Leather gloves

B22 Seasonal Hunting Hazards – During recreational hunting seasons, field personnel will wear appropriate clothing, such as fluorescent orange Hi-Vis vests, so as to be visible to hunters and not blend in with the landscape. Field personnel should also use whistles, air horns and/or other means to make their presence known to hunters and wildlife alike. The schedule of the hunting season, if applicable, will be included as an addendum to this HASP in order to inform personnel of the type of game (e.g., deer, pheasant, duck, etc.) that is being hunted and the type of weapon being used (e.g., bow & arrow, shot gun, single shot rifle, etc.). Be aware that even if "No Trespassing" and/or "No Hunting Allowed" signs are posted, trespassers and/or hunting may still be on site. At no point should field personnel or contractors confront trespassers.

B23 Demolition – Personnel shall not be permitted in any area that can be adversely affected by mechanical demolition operations. Only those workers necessary for the performance of the operations shall be permitted in the area. The area shall be barricaded as necessary to prevent unauthorized personnel or anyone not associated with the demolition operation from entering the area.

All roof cornices or other ornamental stonework shall be removed prior to removing the walls. When removing walls or portions thereof, all steel members affected shall be cut prior to wall removal. During demolition, continuing inspections by a competent person shall be made as the work progresses to detect hazards resulting from the weakened or deteriorated floors, walls, or loosened material. No employee shall be permitted to work where such hazards exist until they are corrected by shoring, bracing, or other effective means.

B24 Unexploded Ordinances – Some sites (e.g., mines, firing ranges, ordinance manufacturing facilities, etc.) may have old explosives, blasting caps, or other types of unexploded ordinances that may be stored on site (e.g., in mines, in structures surrounding the mine or buried on site). Individuals must take immediate action in the event of finding and/or suspecting that explosives may be present. These include not touching or disturbing suspected explosives or making loud noises in their immediate vicinity. Slowly retreat from the area and immediately reported to the PIC/PM, Project Health and Safety Coordinator, and Corporate Health and Safety Director so that ordinance experts can be contacted.

B25 Closed/Abandoned Mines – The underground mine and associated buildings and equipment may not have been maintained over the years. The structural soundness of the mine, buildings and equipment may be compromised and could collapse. Personnel are to avoid all contact with mine or building supports. Personnel are not to venture into mines or perform any work in areas should they appear structurally unstable. These conditions are to be immediately reported to the PC, Project Health and Safety Coordinator, and Corporate Health and Safety Director.

Appendix C

Subsurface Clearance Field Checklist

ENVIRON

SUBSURFACE CLEARANCE (SSC) FIELD CHECK LIST

(Use this form to document & identify field elements of SSC. Retain the completed form with the project file)

Site Name/Project No.: _____ Designated Person:_____

Walkover Date: _____ PIC/PM:_____

Intrusive Locations Surveyed: _____

(ENVIRON MANAGED SUBSURFACE CLEARANCE ACTIVITIES)	Yes	No	N/A	Comments
1. The potential for unexploded ordnance (UXO) has been assessed and a UXO survey performed, if applicable.	☐	☐	☐	
2. Public utility markings are present for all utility companies notified. List the companies with public utilities present on-site and cross check with expected utilities and on-site indicators:	☐	☐	☐	
Natural gas/oil/petroleum lines and associated tanks:	☐	☐	☐	
Electric:	☐	☐	☐	
Potable water pipes, hydrants:	☐	☐	☐	
Sewers (storm/process water/sanitary) and/or Manways/Grates/Culverts:	☐	☐	☐	
Public lighting (street and traffic):	☐	☐	☐	
Telephone and Data Lines:	☐	☐	☐	
Other underground utilities:	☐	☐	☐	
3. Private utilities marked and scope discussed with/provided to locator	☐	☐	☐	Subcontractor Name: Contact #:
Alternate intrusive locations chosen in case of refusal or presence of utilities/indicators in Critical Zone	☐	☐	☐	
Describe nonconformity or unexpected conditions found by locator	☐	☐	☐	
4. Site Walkover performed to confirm utility markouts and assess the presence of Visual Indicators. If visual indicators are present, note location in comments/Plot Plan:	☐	☐	☐	
Indication of underground storage tank/piping and dispenser islands	☐	☐	☐	
Non-native soils, surface depressions, new/dead vegetation	☐	☐	☐	
Saw cuts, patched surfaces, warning tape or other surficial indicators of below ground work	☐	☐	☐	
Pumps, pump galleries, piping manifolds and/or racks, process equipment, compressors, etc.	☐	☐	☐	
On or below-grade transformers	☐	☐	☐	
Fuel oil lines, tanks, fill ports, observation wells, vent stacks, hydraulic lift systems	☐	☐	☐	
Adjacent/supplemental buildings with no apparent utility feeds (electricity, water, gas)	☐	☐	☐	
Other:	☐	☐	☐	
5. Plot Plan updated to reflect most accurate site SSC information. Describe any on-site additions/changes	☐	☐	☐	
6. Ground Disturbance location(s) and Critical Zones (5ft/1.5m distance in every horizontal direction surrounding disturbance locations) cleared of utilities and visual indicators	☐	☐	☐	Contact PIC/PM and H&S Director if utilities pass through the Critical Zone of a planned ground disturbance location
A mark has been placed on each intrusive location and radial marks extending to the edge of the Critical Zone	☐	☐	☐	
Intrusive locations and Critical Zones cleared of utilities using sweep and search method or other applicable SSC investigative methods.	☐	☐	☐	
Once evaluated and cleared of utilities, intrusive locations cannot be moved and a Critical Zone must be maintained around the locations	☐	☐	☐	
Alternative intrusive locations used due to obstructions within Critical Zone. Describe abandoned and alternative locations	☐	☐	☐	
7. Pre-start H&S meeting conducted and SSC risk/hazards discussed	☐	☐	☐	
Locate results and intrusive locations/Critical Zones understood by all parties involved	☐	☐	☐	

Form completed by:_____ _____ _____

name date signature

Appendix D

First Aid Guidance

Final

First Aid Guidance

Prepared for:
ENVIRON International Corporation
Chicago, Illinois

On behalf of:
Ultimate Client (if applicable)
Location City

Date:
July 2012

ENVIRON

Contents

1 Insect Bites and Stings

Care will be taken by all site workers to avoid stinging or biting insects such as ticks, spiders, bees, wasps, hornets, and yellow jackets. Workers allergic to any particular insect sting or bite should seek medical attention if stung or bitten and may need to carry emergency medicine prescribed by their doctor.

Care should always be taken to avoid these insects and increased vigilance is necessary during high infestation seasons, when opening protective casings of monitoring wells, and when walking through areas of heavy vegetation or areas known to be infested.

To minimize the chance of bites/stings:

- Wear appropriate PPE such as light colored clothing so you can see insects, long pants tucked into boots, long sleeves when possible, a hat, and gloves if you are cutting brush or need to handle or move vegetation.
- Check your body and clothing for insects, shower after work and wash/dry clothes at as high a temperature as possible.
- Don't swat at insects and don't eat in areas where there are insects.
- Avoid sweet smelling personal hygiene products and, unless contraindicated by the work being performed (e.g., sampling, data collection), wear USEPA approved repellants such as those containing DEET.

1.1 Spider Bites

Spider bites generally cause only localized reactions such as swelling, pain, and redness. However, bites from a Black Widow or Brown Recluse, or if you are allergic to spiders, can cause symptoms that are more serious.

Black Widow Spider

Brown Recluse Spider

1.1.1 First Aid for spider and scorpion bites and stings

- Clean the bite area with soap and water and place a cold pack over the bite area to reduce swelling.
- Monitor for allergic reactions. If the victim has more than minor pain or if nausea, vomiting, difficulty breathing, or swallowing occurs: medical attention should be sought immediately. CALL 911.

1.2 Ticks

Ticks are common, especially in the warmer weather months and may carry diseases such as Rocky Mountain Spotted Fever and Lyme disease.

Tick

Removing a tick

1.2.1 First Aid for tick bites

- Use a fine tipped tweezers, grasp tick firmly as close to skin as possible and pull the body away from skin. Avoid crushing the body and don't twist.
- If parts of the tick remain in the skin, don't be alarmed as the mouth will dislodge as skin sloughs off.
- Wash area with soap and water and apply antiseptic or antibiotic ointment to prevent infection.
- If unexplained symptoms develop such as severe headaches, fever, or rash within 10 days of the bite, seek medical attention.
- If possible, contain tick in an air tight container for identification purposes, in the event that a serious illness results

1.3 Chiggers

Chiggers are tiny, s-legged wingless organisms that grow up to become a type of mite. They are found in tall grass and weeds and their bites cause severe itching.

1.3.1 First Aid for chiggers

- Reduce discomfort and prevent infection
- The affected area should be kept clean by washing with soap and water
- A topical hydrocortisone cream, antihistamine, or local anesthetic may be of value in reducing the itching
- The wounds should not be scratched, if possible
- If signs of infection occur, consult your physician

1.4 Bees and wasps

Bees and wasps belong to the phylum Arthropod family, and they are crucially important to the pollination of plants, specifically flowers, fruits, and vegetables. A sting from a bee or wasp will cause itching, irritation, redness and/or swelling at the sting site.

A small percentage of people are allergic to stings and a sting can be fatal, caused by a disruption to breathing and circulatory systems called anaphylactic shock. If the sting is followed by severe symptoms, seek medical attention immediately. Allergic people should never be alone for outdoor activities since help may be needed for prompt emergency treatment. Allergic people should have an identification bracelet as well as carry something like an “EpiPen” for immediate treatment for anaphylactic shock.

1.4.1 First Aid for bee stings

- Remove the stinger as quickly as possible - venom continues to enter the skin from the stinger for 45 to 60 seconds following a sting – using a flat dull object, like a credit card. Slid the flat object in the opposite direction of the stinger to remove it from the skin.
- Wash the wound using soap and water
- Apply ice for swelling and pain
- A topical hydrocortisone cream, antihistamine, or local anesthetic may be of value in reducing the itching
- If the sting occurs on the neck or mouth, seek medical attention immediately, swelling in these areas may cause suffocation

1.5 Fire ants

Fire ants are a variety of stinging ants with over 280 species worldwide. Typically, a colony produces large mounds in open areas, and feeds mostly on young plants, seeds, and insects. They nest in the soil, often near moist areas such as riverbanks and pond edges. Unlike other ants, which bite and then spray acid on the wound, fire ants bite only to get a grip and then sting, injecting toxic alkaloid venom. This results in a painful stinging sensation, similar to what a fire burn feels like.



1.5.1 First Aid for Fire ant bites

- Move rapidly away from the nest
- Quickly remove or kill ants on skin and clothing to prevent further stings
- Wash the area gently with soap and water to rid the skin of any venom.
- Place cool cloth or ice cloth on sites for 15 minutes, and to relieve pain, dab the area with calamine lotion, a topical (cortisone) or oral antihistamine (e.g., Benadryl) to help with swelling
- Do not scratch the blister because this can lead to infection
- Allergic response is rare, but symptoms are difficulty breathing, light-headedness, and weakness. Immediate medical attention is required.

2 Snakes

Snakes serve as an important role as predators in the ecosystem, and help maintain populations of rodents and other prey.

2.1 First Aid for venomous snake bites

- Wash and immobilize the injured area, keeping it lower than the heart if possible
- Seek medical attention immediately
- DO NOT apply ice, cut the wound, or apply a tourniquet
- Do not cut or suck the bite
- Remain calm and try not to move the bitten body part
- Remove jewelry or other items that may be affected by rapid swelling of affected body parts
- Try to identify the type of snake: note color, size, patterns, and markings
- The bite will be painful and have two distinct puncture wounds
- If venom is injected there will be burning and swelling
- ONLY FOR CORAL SNAKE BITES: apply a mild wrapping on the bite wound

Water Moccasin
(aka cottonmouth)

Rattlesnake

Coral Snake

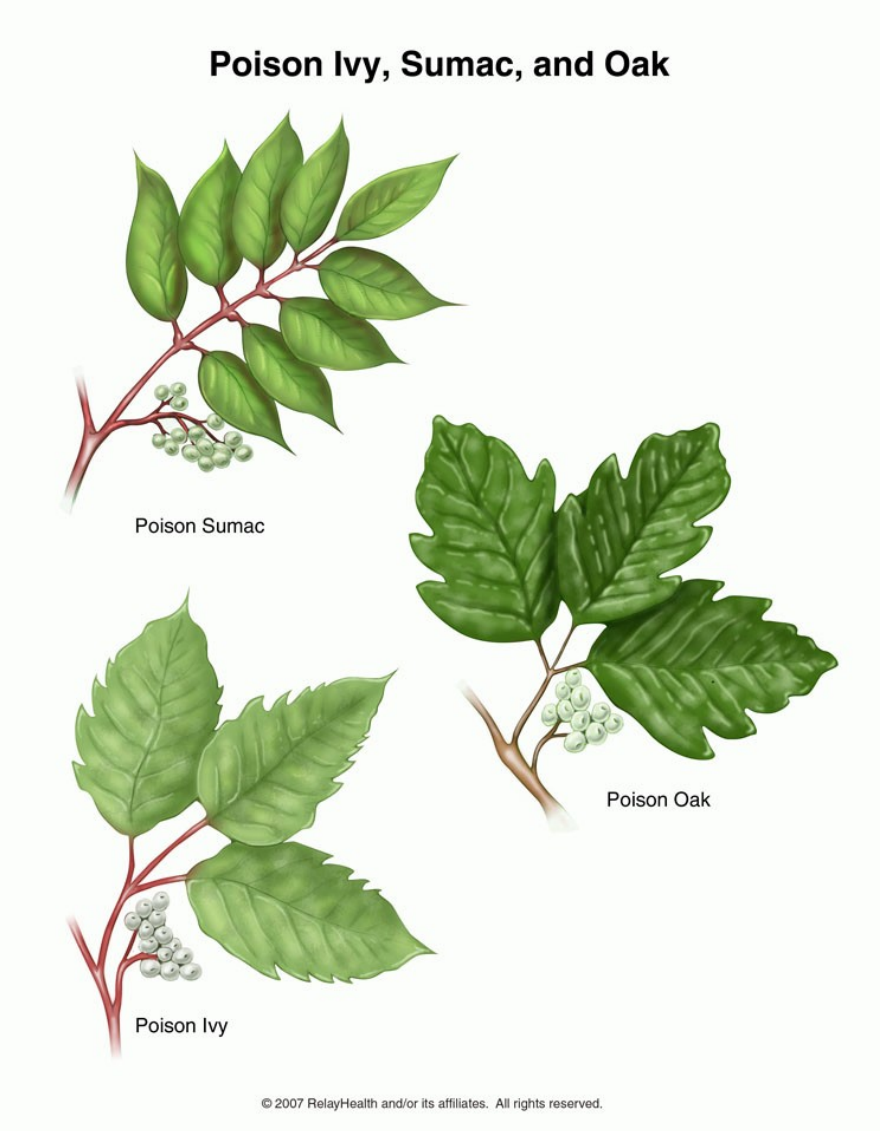
Copperhead

3 Poisonous Plants

Poisonous Plants – Plants poison on contact, through ingestion, or by absorption or inhalation. They cause painful skin irritations upon contact and can cause internal poisoning when eaten.

3.1 First Aid for poisonous plants

- Wash exposed areas with cold running water as soon as you can
- When possible, wash your clothing
- Relieve itching by taking cool showers and applying topical anti-itch medications or hydrocortisone
- The rash is often arranged in streaks or lines where you brushed against the plant
- In a few days, the blisters become crusted and take 10 days or longer to heal
- If the reaction is severe or worsens, seek medical attention



POISON IVY

POISON SUMAC

POISON OAK

GIANT HOGWEED

4 Heat Stress

Heat stress can be a significant hazard, especially for workers wearing protective clothing.

Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly, within as little as 15 minutes. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and in the prevention of heat stress incidents.

Workers will be encouraged to immediately report any heat-related problems that they experience or observe in fellow workers. Any worker exhibiting signs of heat stress and exhaustion should be made to rest in a cool location and drink plenty of water. Emergency help by a medical professional is required immediately for anyone exhibiting symptoms of heat stroke, such as red, dry skin, confusion, delirium, or unconsciousness. Heat stroke is a life threatening condition that must be treated by competent medical authority.

ACGIH screening criteria for heat stress exposure in degrees Celsius for an 8-hour workday 5 days per week with conventional breaks will be used in determining safe exposure for acclimatized and unacclimatized employees.

Allocation of Work in a Work/Rest Cycle	Acclimatized				Action Limit (Unacclimatized)			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75-100%	31	28.	--	--	28	25	--	--
50-75%	31	29.	27	--	28	26.	24	--
25-50%	32	30	29	28	29	27.	25	24
0-25%	32	31.	30	30	30	29.	28	27

4.1 Heat Stress Prevention

Whenever possible or within the control of ENVIRON, engineering controls should be utilized to protect workers from heat related hazards (e.g., heat shielding such as using awnings or umbrellas). Appropriate work practices can also lessen the chances of heat related hazards. Some of these include:

- Water and/or electrolyte fluids should be about equal to the amount of sweat produced (i.e., drinking 5-7 ounces (150 -200 mL) of water every 15-20 minutes). Ideally, fluids should be at room temperature to allow for quicker absorption. Consider keeping water at room temperature and electrolyte fluids chilled. Do NOT chill both.
- Whenever possible, gradual exposure to heat is preferred to allow the body's internal temperature to actuate to the working conditions.
- Whenever possible, adjust the work schedule to reduce risk of heat stress. For example, postpone nonessential or heavier work to the cooler part of the day and perform work in the shade if portable.
- Rotate personnel to reduce the amount of time spent working in direct sun and heat.
- Increase the number and/or duration of rest breaks, and whenever possible, rest break areas should be in a cool area and as close to the work area as is feasible.

Wear appropriate PPE when necessary, such as thermally conditioned clothing, self-contained air conditioning in a backpack, and plastic jackets/vests with pockets that can be filled with dry ice or ice. However, based on the type of work being done, where work is being performed, or other required PPE, these options may be prohibited or make the use of this PPE impossible or impractical.

4.2 Heat Related Illnesses

4.2.1 Heat Stress

This is the mildest heat-related illness, but prompt action may prevent it from turning into a more severe heat-related illness. Symptoms include irritability, lethargy, significant sweating, headache, or nausea. The following guidance can be used in the identification and treatment of heat related illness.

4.2.2 Heat Stress First Aid

- Take victim to a protected (e.g., shaded, cool) area, remove any excess protective clothing, and provide cool fluids.
- If an air-conditioned spot is available, this is an ideal break location.
- Once the victim shows improvement he/she may resume working, however the work pace and practices (e.g., does fluid intake need to be increased) should be moderated to prevent recurrence of the symptoms.

4.2.3 Heat Exhaustion

Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Symptoms include pale, clammy skin, and profuse sweating, vomiting, and the bowels may move involuntarily. The pulse is weak and fast, breathing is shallow. Fainting can occur.

4.2.4 Heat Exhaustion First Aid

Immediately remove the victim from the work area to a shady or cool area with good air circulation (avoid drafts or sudden chilling – you do not want the victim to shiver).

- Call a physician or emergency service, or transport the victim to medical care.
- Remove all protective outerwear.
- If the victim is conscious, it may be helpful to give him/her sips of water.

4.2.5 Heat Stroke

Heat stroke is a severe medical condition requiring first aid and emergency treatment by a medical professional as death can occur without appropriate care. Heat Stroke represents the collapse of the body's cooling mechanisms. As a result, body temperatures often rise to between 105° – 110° F (40.5° – 43.3° C). As the victim progresses toward heat stroke symptoms, include hot and usually dry, red and spotted skin, headache, dizziness, nausea, mental confusion, delirium, possible convulsions, and loss of consciousness.

4.2.6 Heat Stroke First Aid

- Immediately remove the victim from the work area to a shady or cool area with good air circulation (avoid drafts or sudden chilling – you do not want the victim to shiver).
- Summon emergency medical help to provide on-site treatment and transportation to a medical facility.
- Remove all protective outerwear and loosen personal clothing.
- Apply cool wet towels, ice bags, etc. to the head, armpits, and thighs. Sponge off the bare skin with cool water or even place the victim in a tub of cool water.

4.2.7 Skin Hazards

Sunburn and prickly heat are both symptoms of skin irritation/damage produced through exposure to sunlight and operating in hot work environments.

- Protect exposed skin with an appropriate sunscreen. A sunscreen with a sun protection factor (SPF) of 15 or greater is required for work in the sun with reapplication at breaks and lunch.
- Heat rash, also known as prickly heat, can be prevented by the application of a hydrophobic, water repellent barrier cream such as Kerodex 71.

5 Cold Stress

The four environmental conditions that cause cold-related stress are low temperatures, high/cool winds (wind chill), dampness, and cold water. One or any combination of these factors can cause cold-related hazards. Cold stress, including frostbite and hypothermia, can result in severe health effects.

A dangerous situation of rapid heat loss may arise for any individual exposed to high winds and cold temperatures. Major risk factors for cold-related stresses include:

- Wearing inadequate or wet clothing increases the effects of cold on the body.
- Taking certain drugs or medications such as alcohol, nicotine, caffeine, and medication that inhibits the body's response to the cold or impairs judgment.
- Having a cold or certain diseases, such as diabetes, heart, vascular, and thyroid problems, may make a person more susceptible to the winter elements.
- Being male increases a person's risk to cold-related stresses. Men experience far greater death rates due to cold exposure than women, perhaps due to inherent risk-taking activities, body-fat composition, or other physiological differences.
- Becoming exhausted or immobilized, especially due to injury or entrapment, may speed up the effects of cold weather.
- Aging -- the elderly are more vulnerable to the effects of harsh winter weather.

TABLE 2. Cooling Power or Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
5	48	37	27	16	6	−5	−15	−26	−36	−47	−57	−68
10	40	28	16	4	−9	−24	−33	−46	−58	−70	−83	−95
15	36	22	9	−5	−18	−32	−45	−58	−72	−85	−99	−112
20	32	18	4	−10	−25	−39	−53	−67	−82	−96	−110	−121
25	30	16	0	−15	−29	−44	−59	−74	−88	−104	−118	−133
30	28	13	−2	−18	−33	−48	−63	−79	−94	−109	−125	−140
35	27	11	−4	−20	−35	−51	−67	−82	−98	−113	−129	−145
40	26	10	−6	−21	−37	−53	−69	−85	−100	−116	−132	−148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.
Equivalent chilll temperature requiring dry clothing to maintain core body tempearture above 36°C (96.8°F) per cold stress TLV

5.1 Cold Stress Prevention

Engineering controls should be utilized whenever possible to protect workers from cold related hazards. For example, on-site heat sources, heated shelters, work areas shielded from drafty or windy conditions, and the use of thermal insulating material on equipment handles. Effects arising from cold exposure will be minimized by the following control measures:

- Personnel will be trained to recognize cold stress symptoms.
- Field activities will be curtailed or halted if the equivalent chill temperature is below 20 F (7C).
- As much as possible, work that exposes personnel to the cold will be done during the warmest hours of the day.
- Inactivity in cold conditions will be kept to a minimum.
- Frequent short breaks in warm, dry shelters will be taken.
- Vehicles will be equipped with supplies in case the vehicle becomes inoperable (e.g., blanket, dry clothing, water, food, a shovel, etc.

TABLE 3. Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift*

Air Temperature—Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
–26° to –28°	–15° to –19°	(Norm. Breaks)	1	(Norm. Breaks)		75 min	2	55 min	3	40 min	4
–29° to –31°	–20° to –24°	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4	30 min	5
–32° to –34°	–25° to –29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
–35° to –37°	–30° to –34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
–38° to –39°	–35° to –39°	40 min	4	30 min	5	Non-emergency work should cease					
–40° to –42°	–40° to –44°	30 min	5	Non-emergency work should cease							
–43° & below	–45° & below	Non-emergency work should cease									

Notes for Table 3

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at –35°C (–30°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:
   5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.
3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m^2; 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m^2. In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.
4. TLVs apply only for workers in dry clothing.

*Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labour.

5.2 Cold-Related Illness

5.2.1 Hypothermia

Hypothermia occurs when the body temperature falls to a level where normal muscular and cerebral functions are impaired. Although it usually occurs in freezing air and water temperatures, it can occur in any climate if a person's internal body temperature falls below normal. Symptoms should not be ignored, and a supervisor should be notified as soon as hypothermia is suspected.

Initially, symptoms may include shivering, an inability to do complex motor functions, sluggishness and mild confusion as the body temperature drops to around 95 F. As the body temperature falls, speech may become slurred, and behavior may be irrational, simple motor functions may be difficult to do and a state of "dazed consciousness" may exist. In severe state (below 90 F or 32 C), heart rate, blood flow, and breathing will slow. Unconsciousness and full heart failure can occur.

5.2.2 Hypothermia First Aid

5.2.2.1 On land

- Call for emergency, and then help move the victim (unless other injuries prohibit their being moved) to a warm, dry area and replace wet clothing with warm, dry clothing or a blanket. Move the person carefully because movement can increase the irritability of the heart.
- If the person is conscious and lucid, warm liquids can be provided, but never alcohol or caffeinated drinks. If possible, have them to move their arms and legs to create muscle heat.
- If the person is unconscious or unable to assist, place warm bottles/packs in the person's armpits, groin, neck and head areas.
- Do not rub the person's body or place them in warm water.

5.2.2.2 In water

- Call for emergency help and get the victim out of the water. Move them carefully because movement can increase the irritability of the heart.
- If it is you in the water, do not swim unless a floating object or person can be reached quickly as swimming uses the body's heat and reduces survival time by about 50%.
- If you are in the water, conserve body heat by folding arms across the chest, keeping thighs together, bending knees and crossing ankles, if another person is in the water with you, huddle together.
- If you are in the water, do not remove clothing-button, buckle, zip, and tighten collars, cuffs, shoes, and hoods as the water trapped next to the body provides a layer of insulation that may slow the loss of heat.

5.2.3 Frostbite

Frostbite occurs when the skin literally freezes, and deep frostbite can affect deeper tissues such as tendons and muscles. Frostbite usually occurs when temperatures drop below 30 F (1C), but wind chill effects can cause frostbite at above-freezing temperatures. The ears,

fingers, toes, cheeks, and nose are the most commonly affected body parts. Initially, symptoms include an uncomfortable sensation of coldness. Tingling, stinging or an aching feeling of the exposed area is followed by numbness. Frostbitten areas appear white and cold to the touch and with deeper frostbite, the area becomes numb, painless, and hard, and can turn black.

5.2.4 Frostbite First Aid

- Seek medical attention as soon as possible and treat any existing hypothermia first.
- Warm liquid can be provided, but not alcohol or caffeinated drinks such as tea and coffee.
- Do not rub the affected areas, but cover them with dry, sterile gauze or soft, clean bandages.
- Do not try rewarming the affected area if you have not been specifically trained to do so and/or if there is a chance the affected area will get cold again

6 Small Chemical Spills

Chemical hazards present in environmental samples or in the environment being sampled are NOT the only "chemicals of concern." Toxic chemicals may also be brought onto a site as part of the sampling event in the form of sample preservatives. In general, sample preservation is required for most water samples. Two practices exist for adding a preservative: 1) addition of the preservative to the samples in the field; and 2) addition of the preservative to the sampling containers prior to sending the samplers into the field. In either case, EXTREME caution MUST be exercised when adding a preservative to a sample vial or using vials which already contain a preservative since these preservatives will vary in concentration and type. Some examples of the type of preservatives, which may be encountered, include sodium thiosulfate to remove chlorine; hydrochloric acid or ammonium chloride to stabilize pH and reduce biological activity; or sodium bisulfate.

6.1 Chemical First Aid (Body)

In the event that you suspect that you have been exposed to a chemical, whether or not you were wearing PPE, you should:

- Remove yourself or the victim from the accident area.
- Remove any contaminated clothing.
- Wash the injured area to dilute or remove the substance, using large volumes of water.
- Wash for at least 20 minutes, taking care not to allow runoff to contact unaffected parts of your body.
- Gently brush away any solid materials, again avoiding unaffected body surfaces.
- Especially wash away any chemical in your eye. Sometimes the best way to get large amounts of water to your eye is to step into the shower.

6.2 Chemical First Aid (Eye)

For all chemical injuries to the eye, the first thing you should do is immediately irrigate the eye copiously. Ideally, specific eye irrigating solutions should be used for this, but if none are available, regular tap water will do just fine.

- Begin washing your eye before taking any other action and continue for at least 10 minutes. The longer a chemical is in your eye, the more damage will occur. Diluting the substance and washing away any particles that may have been in the chemical are extremely important.
- Ideally, in a work setting, you would be placed in an emergency eyewash or shower station and your eye washed with sterile isotonic saline solution. If sterile saline is not available, use cold tap water.

- All acid or alkali eye burns require immediate treatment and evaluation by a doctor. You should be taken immediately to the closest emergency department. If you suspect a serious injury may have occurred or are otherwise not able to make the trip to the emergency room quickly, then you should call an ambulance to shorten transport time. Take the MSDS on the chemical you were exposed to with you to the hospital. Further Reading:
  - Chemical Eye Burns
  - Corneal Flash Burns
  - Wilderness: Eye Injuries Treatment
  - Chemical Burns Treatment
  - Corneal Flash Burns Treatment
  - Chemical Eye Burn Treatment
  - Burns to the Eye-Emergencies
  - See All Eye Burns Topics
  - Top Picks
  - See Pinkeye and Learn to Treat It
  - Symptoms of Styes in the Eyes
  - Choosing an Eye Doctor
  - Men's Super Foods Including Eye Health Boosters
  - Learning to Live With Blindness
  - Correcting Double Vision After Brain Injury

Any time you experience pain, tearing, redness, irritation, or vision loss, go to a hospital's emergency department for immediate evaluation, even if you believe the chemical is only a mild irritant.

Appendix E

Emergency Information

Table 1A: Emergency Response Telephone Roster

		Office
PERSONNEL		
ENVIRON Corporation		
Principal In Charge: Carol Serlin		949.798.3660
Project Manager: Safaa Dergham		949.798.3610
Designated Site Supervisor: Amy Caron		213.943.6323
Health & Safety Coordinator: Fan Xu		213.943.6343
Corporate H&S Director: Mark Watka		312.288.3875
Contractors		
Company: BC2	Contact: Sam Walker	714.744.2990
Company: Spectrum	Contact: Brett Baker	818.886.4500
Company: Jones Environmental	Contact: Karen Prame	714.449.9937
Company: Innovative Construction Solutions	Contact: John Farmer	714 893.6366
Company: Sawaya Engineering	Contact: Selim Sawaya	626.715.2320
Client/Security:		
Site Contact: Terry Kamibayashi		
EMERGENCY RESPONSE AGENCIES		
Hospital Kaiser Permanente (called 5/12/14)		805.374.7600
Emergency Fire		310.457.2578
Emergency Police		805.375.5630
County Health Department		310.419.5362
Ambulance Service		911
Other:		
OTHER EMERGENCY ASSISTANCE		
CHEMTREC		800.424.9300
National Response Center (oil and chemical spills)		800.424.8802
Poison Control Center		800.222.1222
Federal Emergency Management Agency		202.646.2500
OFF-SITE AGENCIES – NON EMERGENCY PHONE NUMBERS		
Police		805.375.5630
Medical Center		805.374.7600
Hospital		805.374.7600
Fire		310.457.2578
Ambulance Service		911
Federal Agency		
State Agency		
Regional and Local Agencies		
Other		
Other		

Table 1B: Emergency Services Instructions

For Emergency Medical Incidents, Emergency Fire Response, or Hazardous Materials Incidents

Emergency Telephone Numbers:

- Hospital: Kaiser Permanente – 805.374.7600
- Police: City of Thousand Oaks Police – 805.375.5630
- Fire Department: Los Angeles Fire Dept. Station #71 – 310.457.2578
- Site Security/Client: Santa Monica-Malibu Unified School District – 310.450.8338

3. Remember to speak SLOWLY and CLEARLY. Do NOT hang up first: let the dispatcher conclude the call.
4. Provide the following information:
    a. **Location: Juan Cabrillo Elementary School and Malibu Middle/High School**
       30237 and 30215 Morning View Drive
       Malibu, California
    b. **Your name and phone number**
5. Describe nature of Incident:
    a. **Emergency Medical Incident**
    b. **How many victims**
    c. **Type of incident - physical injury, etc.**
    d. **Assessment of victims' condition if known (whether victim is conscious/unconscious, breathing/not breathing, pulse/no pulse, nature of injuries, first aid measures used, etc.)**
    e. **Where incident occurred**
    f. **Fire:**
    g. **Location of Fire**
    h. **Hazardous Materials Incident:**
    i. **This is a hazardous materials incident requiring dispatch of HAZMAT unit**
    j. **Type of incident (fire, explosion, spill, etc.)**
    k. **Type of material (specific chemicals or general description)**
    l. **Whether there is also a Medical Emergency**
6. Give your location at the Site

Note: Security, Site Supervisor or designee must meet the emergency personnel at the staging area to brief them on the situation.

Route Description and Map to Hospital

Hospital Information:

Hospital Name: Kaiser Permanente

Hospital Address: 365 East Hillside Drive

Hospital Phone Number: 805.374.7600

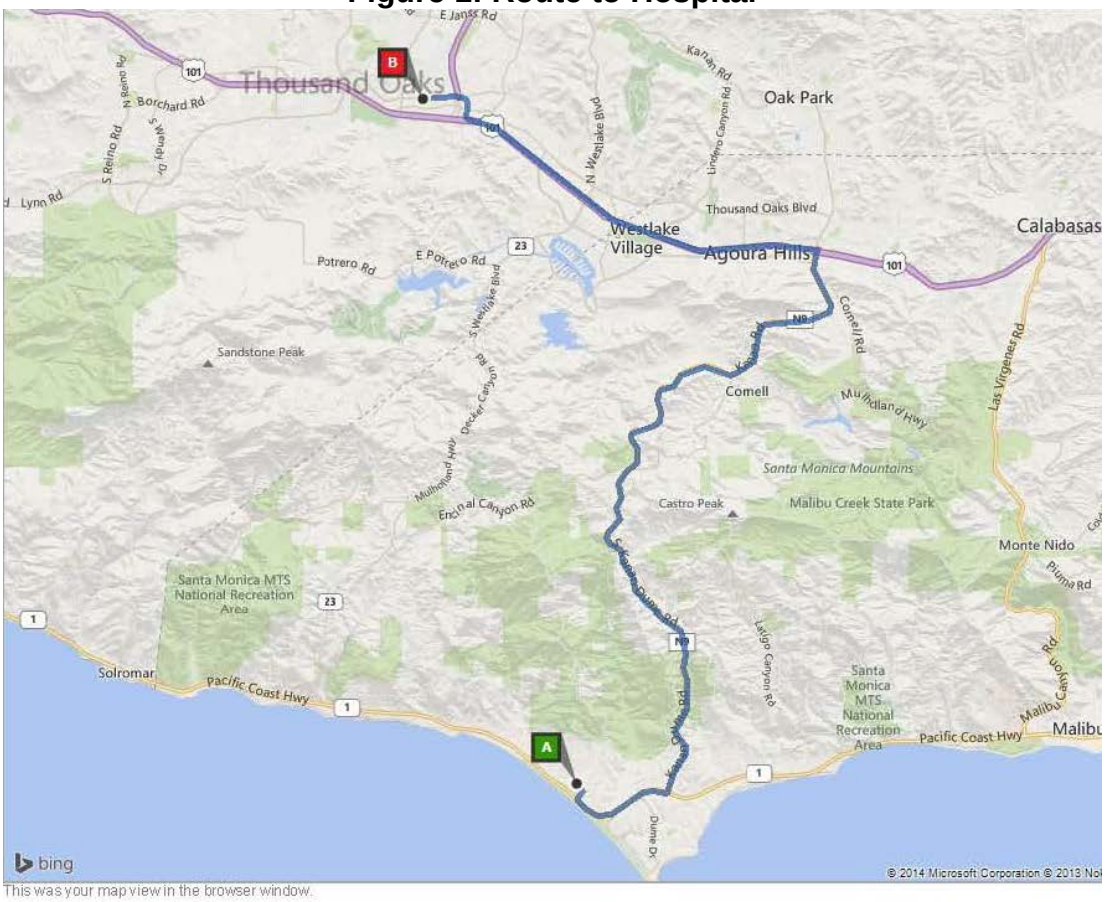
Directions to Area Hospital:

From: 30217 and 30215 Morning View Drive
Malibu California 90265

To: 365 East Hillcrest Drive
Thousand Oaks, California 91360

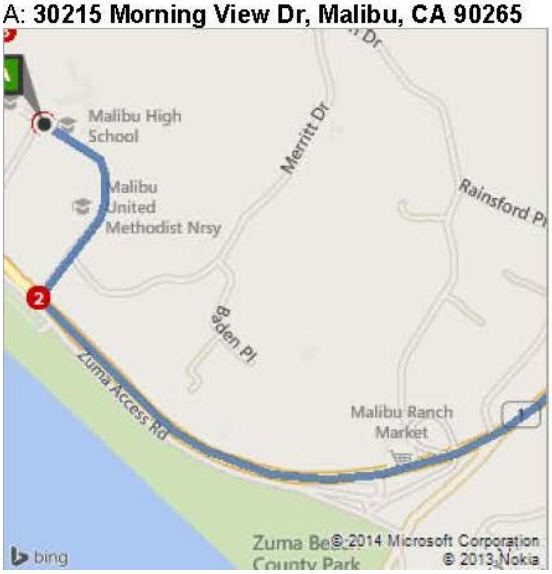
1.	**Head southeast on Morning View Drive toward Merritt Drive**	**0.3 miles**
2.	**Turn left onto CA-1S**	**1.7 miles**
3.	**Turn left onto Kanan Dume Road**	**6.2 miles**
4.	**Continue on Kanan Rood**	**2.0 miles**
5.	**Turn right to stay on Kanan Road**	**4.1 miles**
6.	**Turn right to stay on Kanan Road**	**0.2 miles**
7.	**Turn right to merge onto US101 North**	**6.1 miles**
8.	**Take the Rancho Road exit**	**0.2 miles**
9.	**Slight right onto South Rancho Road**	**0.3 miles**
10.	**Take the 3rd left onto Hillcrest Drive** **Destination will be on the right**	**0.7 miles**

Figure 1: Route to Hospital

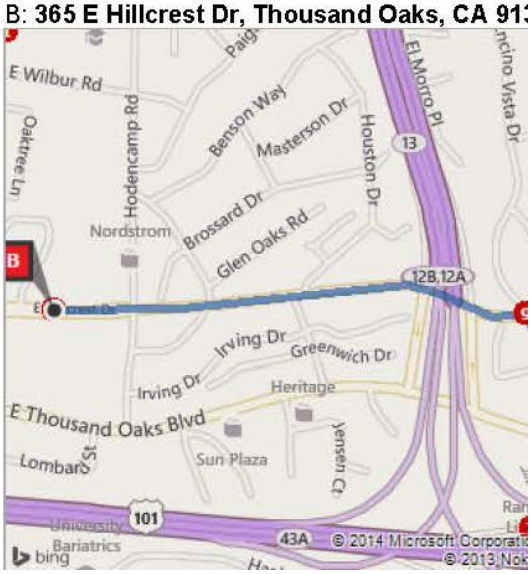


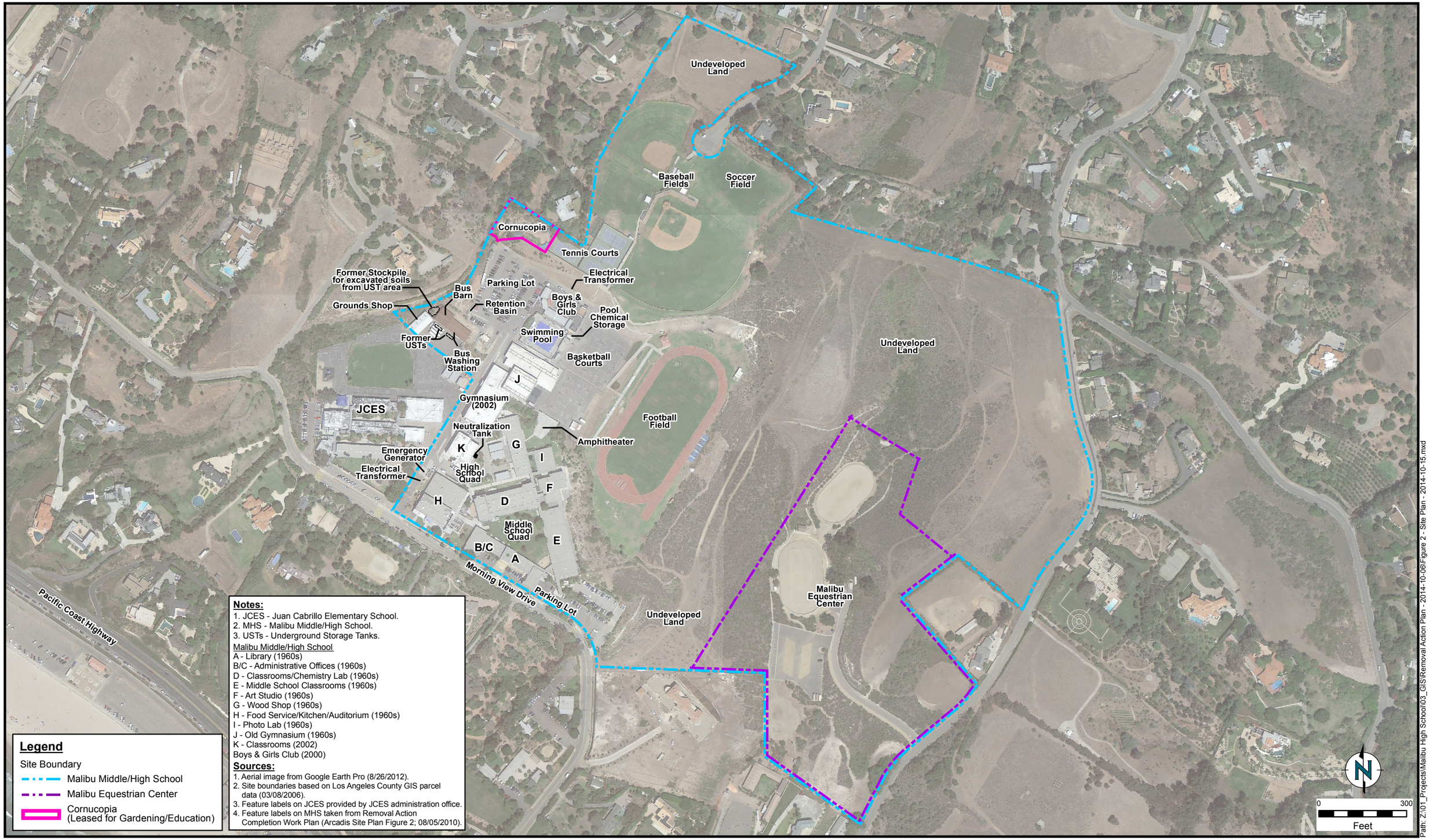
This was your map view in the browser window.

A: **30215 Morning View Dr, Malibu, CA 90265**



B: **365 E Hillcrest Dr, Thousand Oaks, CA 913**





Legend

Site Boundary
- Malibu Middle/High School
- Malibu Equestrian Center
- Cornucopia (Leased for Gardening/Education)

Notes:
1. JCES - Juan Cabrillo Elementary School.
2. MHS - Malibu Middle/High School.
3. USTs - Underground Storage Tanks.

Malibu Middle/High School
- A - Library (1960s)
- B/C - Administrative Offices (1960s)
- D - Classrooms/Chemistry Lab (1960s)
- E - Middle School Classrooms (1960s)
- F - Art Studio (1960s)
- G - Wood Shop (1960s)
- H - Food Service/Kitchen/Auditorium (1960s)
- I - Photo Lab (1960s)
- J - Old Gymnasium (1960s)
- K - Classrooms (2002)
- Boys & Girls Club (2000)

Sources:
1. Aerial image from Google Earth Pro (8/26/2012).
2. Site boundaries based on Los Angeles County GIS parcel data (03/08/2006).
3. Feature labels on JCES provided by JCES administration office.
4. Feature labels on MHS taken from Removal Action Completion Work Plan (Arcadis Site Plan Figure 2; 08/05/2010).

Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\Figure 2 - Site Plan - 2014-10-15.mxd

ENVIRON

DRAFTED BY: SShin | Date: 10/15/2014

Site Plan

Malibu High School
30215 Morning View Drive, Malibu, California

Figure 2

PROJECT: 04-33980J

Legend

Site Boundary
- Juan Cabrillo Elementary School
- Malibu Middle/High School
- Malibu Equestrian Center
- Existing Monitoring Well Location
- Septic Tanks
- Leach Pits
- Soil Confirmation, Soil Step-out, and Soil Boring Sample Locations
- Soil Sample Locations
- Soil Vapor Sample Locations
- Background Sample Locations
- Abandoned Monitoring Well Locations

Notes:
1. USTs - Underground Storage Tanks.

Juan Cabrillo Elementary School (JCES)
- A - Teachers' Lounge/ Administrative Offices (1958)
- B - Classrooms (1955)
- C - Classrooms (1957)
- D - Classrooms (1958)
- E - Library (1965)
- F - Art/Computer Labs (1961-1965)
- G - Multi-Purpose Room/Cafeteria (1995)

Malibu Middle/High School (MHS)
- A - Library (1960s)
- B/C - Administrative Offices (1960s)
- D - Classrooms/Chemistry Lab (1960s)
- E - Middle School Classrooms (1960s)
- F - Art Studio (1960s)
- G/G2 - Wood Shop (1960s)
- H - Food Service/Kitchen/ Auditorium (1960s)
- I - Photo Lab (1960s)
- J - Old Gymnasium (1960s)
- K - Classrooms (2002)
- Boys & Girls Club (2000)

Sources:
1. Aerial image from Google Earth Pro (8/26/2012).
2. Site boundaries based on Los Angeles County GIS parcel data (03/08/2006).
3. Feature labels on JCES provided by JCES administration office.
4. Feature labels and sample locations on MHS from Arcadis Removal Action Completion Report (06/12/2012).
5. Sample Locations in Bus Barn Area from Blue Ocean Engineers, Inc. (8/21/1996).

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Feet

Path: Z:\01_Projects\Malibu High School\03_GIS\HAS\PIF\Figure 3 - Historical Sample Locations - 2014-10-13.mxd

ENVIRON

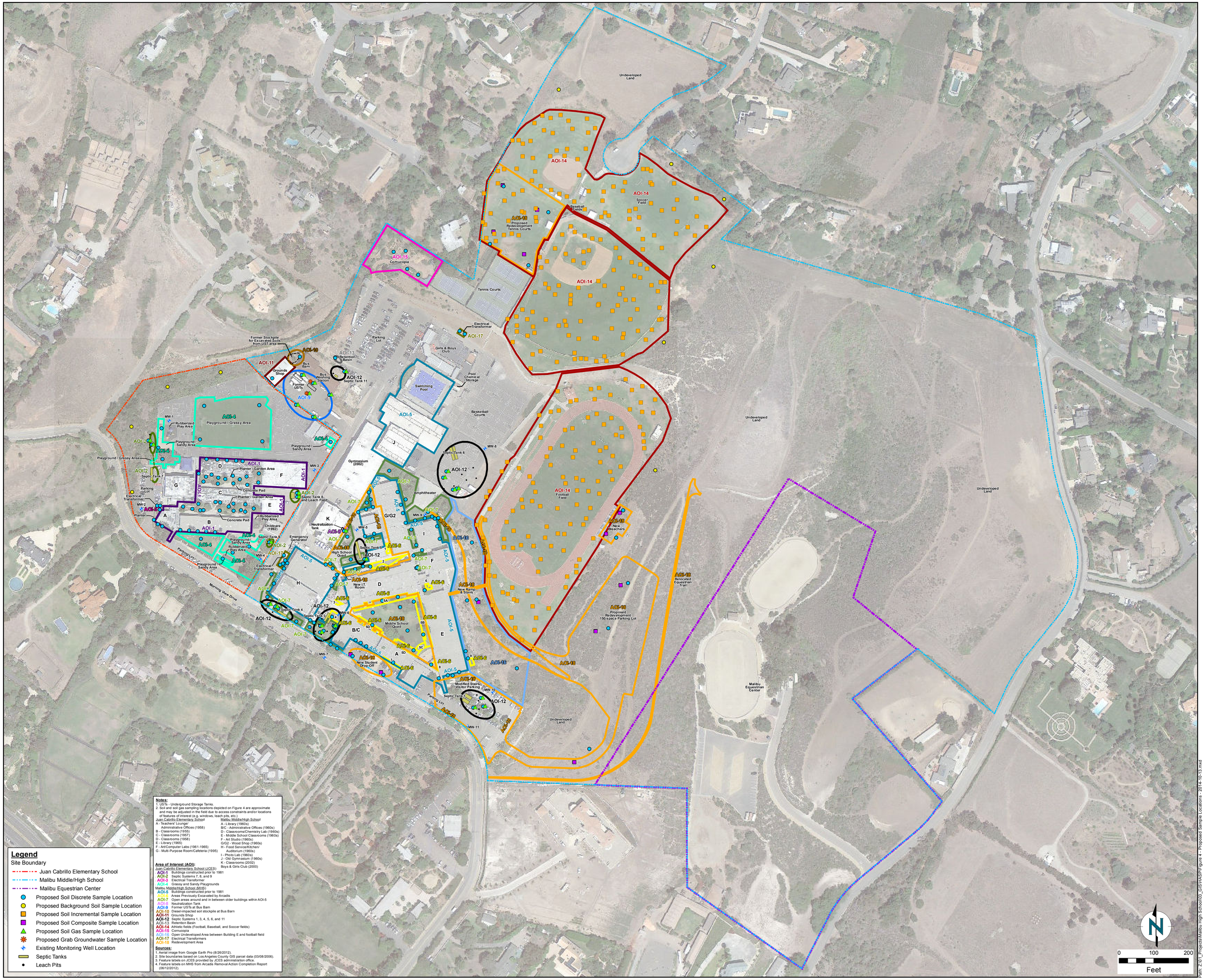
DRAFTED BY: SShin | Date: 10/13/2014

Historical Sample Locations

30237 and 30215 Morning View Drive, Malibu, California

Figure 3

PROJECT: 04-33980A



Notes:
1. USTs - Underground Storage Tanks.
2. Soil and soil gas sampling locations depicted on Figure 4 are approximate and may be adjusted in the field due to access constraints and/or locations of features of interest (e.g. windows, leach pits, etc.)

Juan Cabrillo Elementary School
- A - Teachers' Lounge/ Administrative Offices (1958)
- B - Classrooms (1955)
- C - Classrooms (1957)
- D - Classrooms (1958)
- E - Library (1965)
- F - Art/Computer Labs (1961-1965)
- G - Multi-Purpose Room/Cafeteria (1995)

Malibu Middle/High School
- A - Library (1960s)
- B/C - Administrative Offices (1960s)
- D - Classrooms/Chemistry Lab (1960s)
- E - Middle School Classrooms (1960s)
- F - Art Studio (1960s)
- G/G2 - Wood Shop (1960s)
- H - Food Service/Kitchen/ Auditorium (1960s)
- I - Photo Lab (1960s)
- J - Old Gymnasium (1960s)
- K - Classrooms (2002)
- Boys & Girls Club (2000)

Area of Interest (AOI):

Juan Cabrillo Elementary School (JCES)
- **AOI-1** Buildings constructed prior to 1981
- **AOI-2** Septic Systems 7, 8, and 9
- **AOI-3** Electrical Transformer
- **AOI-4** Grassy and Sandy Playgrounds

Malibu Middle/High School (MHS)
- **AOI-5** Buildings constructed prior to 1981
- **AOI-6** Areas Previously Excavated by Arcadis
- **AOI-7** Open areas around and in between older buildings within AOI-5
- **AOI-8** Neutralization Tank
- **AOI-9** Former USTs at Bus Barn
- **AOI-10** Diesel-impacted soil stockpile at Bus Barn
- **AOI-11** Grounds Shop
- **AOI-12** Septic Systems 1, 3, 4, 5, 6, and 11
- **AOI-13** Retention Basin
- **AOI-14** Athletic fields (Football, Baseball, and Soccer fields)
- **AOI-15** Cornucopia
- **AOI-16** Open Undeveloped Area between Building E and football field
- **AOI-17** Electrical Transformers
- **AOI-18** Redevelopment Area

Sources:
1. Aerial image from Google Earth Pro (8/26/2012).
2. Site boundaries based on Los Angeles County GIS parcel data (03/08/2006).
3. Feature labels on JCES provided by JCES administration office.
4. Feature labels on MHS from Arcadis Removal Action Completion Report (06/12/2012).

Legend

Site Boundary
- Juan Cabrillo Elementary School
- Malibu Middle/High School
- Malibu Equestrian Center
- Proposed Soil Discrete Sample Location
- Proposed Background Soil Sample Location
- Proposed Soil Incremental Sample Location
- Proposed Soil Composite Sample Location
- Proposed Soil Gas Sample Location
- Proposed Grab Groundwater Sample Location
- Existing Monitoring Well Location
- Septic Tanks
- Leach Pits

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Feet

Path: Z:\01_Projects\Malibu High School\03_GIS\HASP\Figure 4 - Proposed Sample Locations - 2014-10-13.mxd

ENVIRON

DRAFTED BY: SShin | Date: 10/13/2014

Proposed Sample Locations

30237 and 30215 Morning View Drive, Malibu, California

Figure 4

PROJECT: 04-33980A

Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\HASP Figure 5 - Building G Area - 2014-10-15.mxd

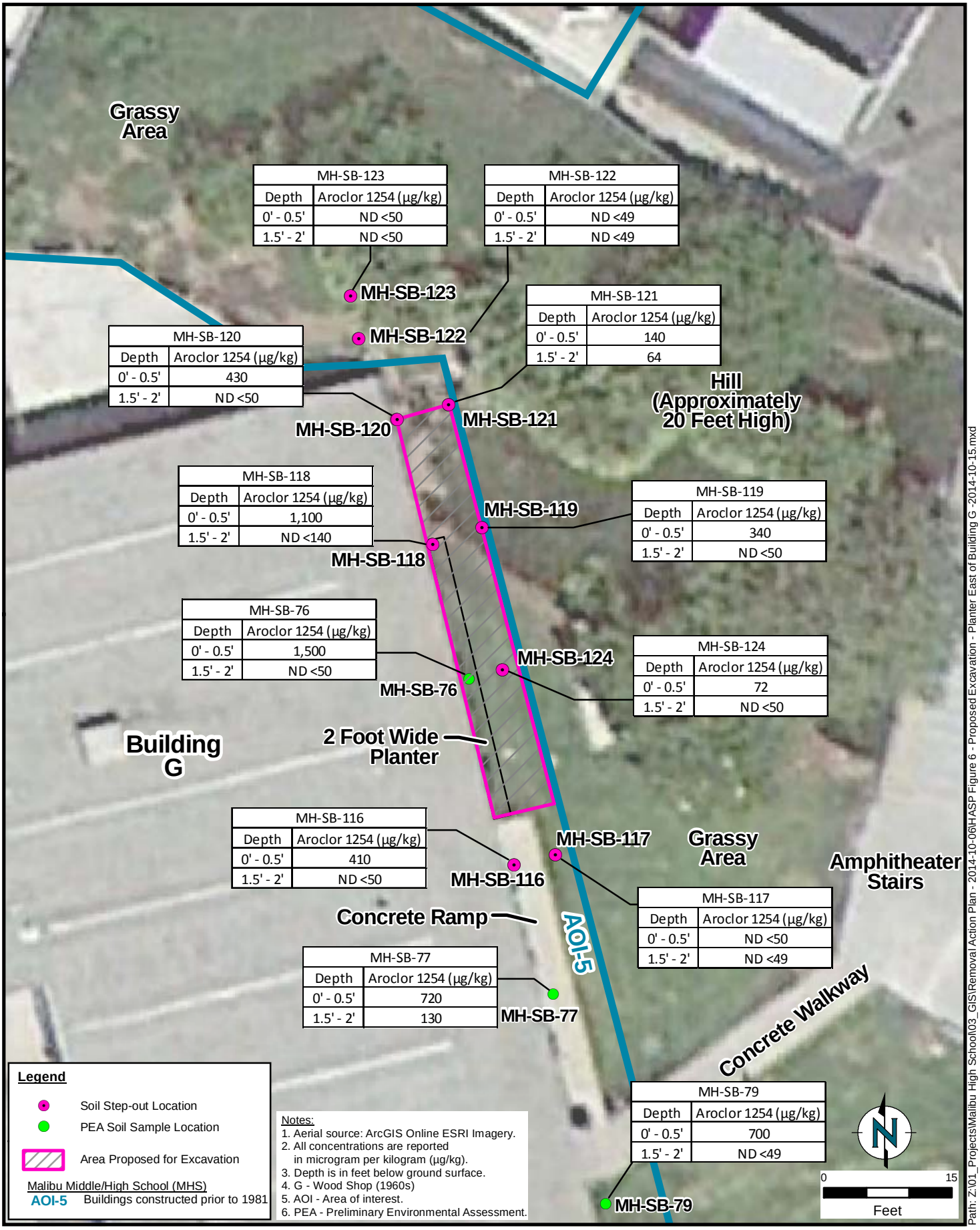
ENVIRON

Building G Area

Malibu High School
30215 Morning View Drive, Malibu, California

Figure
5

DRAFTED BY: SShin | Date: 10/24/2014 | PROJECT: 04-33980J



Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\HASP Figure 6 - Proposed Excavation - Planter East of Building G -2014-10-15.mxd

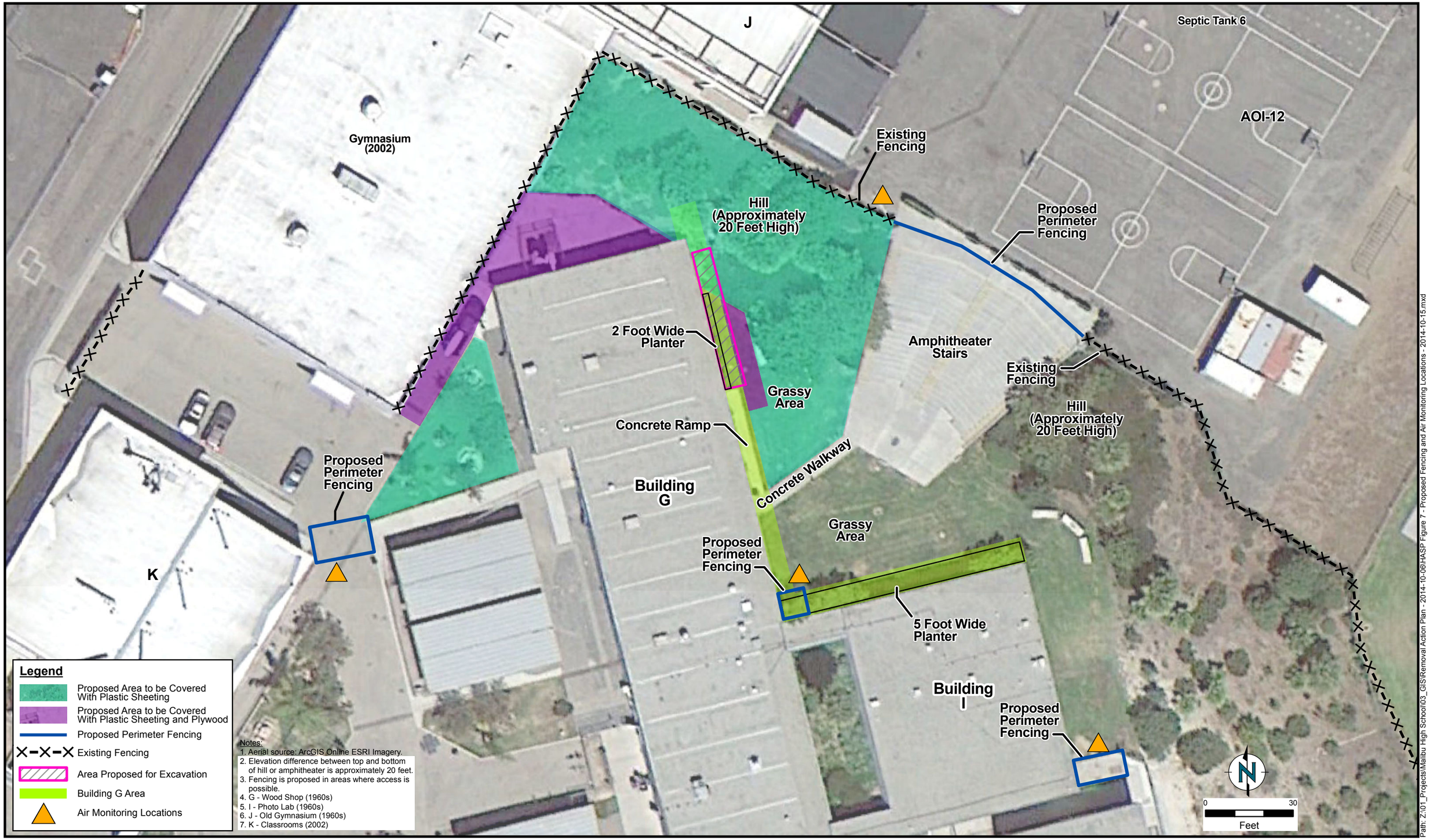
ENVIRON

Proposed Excavation Building G Area

Malibu High School
30215 Morning View Drive, Malibu, California

Figure 6

DRAFTED BY: SShin | Date: 10/24/2014 | PROJECT: 04-33980J



Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\HASP Figure 7 - Proposed Fencing and Air Monitoring Locations - 2014-10-15.mxd

ENVIRON

DRAFTED BY: SShin | Date: 10/24/2014

Proposed Fencing and Air Monitoring Locations
Building G Area

Malibu High School
30215 Morning View Drive, Malibu, California

Figure
7

PROJECT: 04-33980J

Baseball Fields
Soccer Field
Cornucopia
Tennis Courts
Former Stockpile for excavated soils from UST area
Parking Lot
Electrical Transformer
Bus Barn
Grounds Shop
Retention Basin
Boys & Girls Club
Pool Chemical Storage
Swimming Pool
Former USTs
Bus Washing Station
Basketball Courts
J
Gymnasium (2002)
JCES
Truck Loading Zone
Football Field
Amphitheater
G
K
Emergency Generator
Neutralization Tank
I
Electrical Transformer
High School Quad
F
H
D
Middle School Quad
E
B/C
A
Truck Route Entrance onto MHS Campus from Morning View Drive
Morning View Drive
Parking Lot
Undeveloped Land
Google Street View
Pacific Coast Highway
Morning View Drive
Truck Route Entrance onto Morning View Drive from Pacific Coast Highway

Notes:
1. JCES - Juan Cabrillo Elementary School.
2. MHS - Malibu Middle/High School.
3. USTs - Underground Storage Tanks.

Malibu Middle/High School
A - Library (1960s)
B/C - Administrative Offices (1960s)
D - Classrooms/Chemistry Lab (1960s)
E - Middle School Classrooms (1960s)
F - Art Studio (1960s)
G - Wood Shop (1960s)
H - Food Service/Kitchen/Auditorium (1960s)
I - Photo Lab (1960s)
J - Old Gymnasium (1960s)
K - Classrooms (2002)
Boys & Girls Club (2000)

Sources:
1. Aerial image from Google Earth Pro (8/26/2012).
2. Site boundaries based on Los Angeles County GIS parcel data (03/08/2006).
3. Feature labels on JCES provided by JCES administration office.
4. Feature labels on MHS taken from Removal Action Completion Work Plan (Arcadis Site Plan Figure 2; 08/05/2010).

Legend
- Truck Route
- Site Boundary
- Malibu Middle/High School
- Malibu Equestrian Center
- Cornucopia (Leased for Gardening/Education)

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Feet

Path: Z:\01_Projects\Malibu High School\03_GIS\Removal Action Plan - 2014-10-06\HASP Figure 8 - Truck Route - 2014-10-15.mxd

ENVIRON

DRAFTED BY: SShin | Date: 10/24/2014

Truck Route

Malibu High School
30215 Morning View Drive, Malibu, California

Figure
8

PROJECT: 04-33980J

Appendix C

Removal Action Work Plan Schedule

Removal Action Work Plan
Building G Area
Malibu High School
30215 Morning View Drive
Malibu, California

ID	Task Name	Duration	Start	Finish	Predecessors
1	**SCOPING MEETING**	1 day	Wed 9/17/14	Wed 9/17/14	
2	**Removal Action Work Plan (RAW)**	**65 days**	**Mon 9/22/14**	**Fri 12/19/14**	
3	ENVIRON submits draft RAW	25 days	Mon 9/22/14	Fri 10/24/14	1
4	DTSC finalizes Public Notice and CEQA NOE	5 days	Mon 10/27/14	Fri 10/31/14	3
5	ENVIRON € mails Fact Sheets to the DTSC approved mailing list	1 day	Fri 11/7/14	Fri 11/7/14	
6	Public Notice	1 day	Fri 11/7/14	Fri 11/7/14	
7	**Public Comment Period**	**33 edays**	**Fri 11/7/14**	**Wed 12/10/14**	6
8	DTSC prepares/issues Response to Comments	6 days	Thu 12/11/14	Thu 12/18/14	7
9	DTSC approves RAW	1 day	Thu 12/18/14	Thu 12/18/14	
10	DTSC mails out Start Work Notice Fact Sheet	1 day	Fri 12/19/14	Fri 12/19/14	9
11	**RAW Implementation**	**10 days**	**Mon 12/22/14**	**Fri 1/2/15**	
12	ENVIRON conducts fieldwork	10 days	Mon 12/22/14	Fri 1/2/15	10
13	**RAW Report**	**75 days**	**Wed 1/7/15**	**Tue 4/21/15**	
14	ENVIRON submits draft RAW Report	38 days	Wed 1/7/15	Fri 2/27/15	12
15	DTSC reviews draft RAW Report	15 days	Mon 3/2/15	Fri 3/20/15	14
16	ENVIRON addresses DTSC's comments/revises RAW Report	15 days	Mon 3/23/15	Fri 4/10/15	15
17	DTSC approves RAW Report	7 days	Mon 4/13/15	Tue 4/21/15	16