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February 16, 2018

VIA OVERNIGHT CARRIER

Mr. James R. Carroll Program Administrator Land Restoration Program Land Management Administration Maryland Department of the Environment 1800 Washington Road, Suite 625 Baltimore, Maryland 21230

Re: Transmittal of the 2018 Groundwater Monitoring Work Plan

Martin State Airport, 701 Wilson Point Road, Middle River, Maryland

Dear Mr. Carroll:

For your review, please find enclosed two hard copies with CDs of the above-referenced document. This work plan addresses the groundwater monitoring to be conducted at the Martin State Airport in Middle River, Maryland.

We respectfully request to receive MDE's comments or approval by March 30, 2018.

If you have any questions or require any additional information please contact me by phone at 301-548-2223, or via e-mail at charles.trione@lmco.com.

Sincerely,

Charles Trione

Project Lead, Environmental Remediation

Lockheed Martin Corporation

cc: (via email without enclosure) Anuradha Mohanty, MDE Christine Kline, Lockheed Martin Norm Varney, Lockheed Martin Paul E. Calligan, Lockheed Martin Michael Martin, Tetra Tech Peter Shilland, CDM Smith

cc: (via mail with CD enclosure)
Jann Richardson, Lockheed Martin
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2018 GROUNDWATER MONITORING WORK PLAN MARTIN STATE AIRPORT 701 WILSON POINT ROAD MIDDLE RIVER, MARYLAND

Prepared for: Lockheed Martin Corporation
Prepared by: Tetra Tech, Inc.
February 2018
Approved by: Lockheed Martin, Inc.
Revision: 0
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Michael Martin, P.G. Regional Manager
Latery from
Anthony Apanavage, P.G Project Manager

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ACRONYMS AND ABBREVIATIONS

DCE dichloroethene

DO dissolved oxygen

DRA Dump Road Area

DRO diesel-range organic

EESH energy, environment, safety and health

EGIS Environmental Geographic Information System

FOL field operations leader

GIS geographic information system

GRO gasoline-range organic

HASP health and safety plan

IDW investigation derived waste

Lockheed Martin Corporation

MAA Maryland Aviation Administration

MDANG Maryland Air National Guard

MDE Maryland Department of the Environment

μg/L microgram(s) per liter

ml/min milliliter(s) per minute

MSA Martin State Airport

MT Main Terminal

NAA natural attenuation assessment

ORP oxygen reduction potential

PDF portable document format

PM project manager

PPE personal protective equipment

PVC polyvinyl chloride

QA/QC quality assurance/quality control

REC recognized environmental condition

RTO Remediation Technical Operations

SDG sample delivery group

SVOC semivolatile organic compound

TB trip blank

TCE trichloroethene

TDS total dissolved solids

Tetra Tech, Inc.

TIC tentatively identified compound

TPH total petroleum hydrocarbon

USDOT United States Department of Transportation

USEPA United States Environmental Protection Agency

UST underground storage tank

VC vinyl chloride

VOC volatile organic compound

WMP waste management plan

SECTION 1 INTRODUCTION

On behalf of Lockheed Martin Corporation (Lockheed Martin), Tetra Tech Inc. (Tetra Tech) has prepared the following work plan for conducting groundwater monitoring and sampling in 2018 at Martin State Airport (MSA) in Middle River, Maryland (see Figure 1-1). The objectives are to:

- provide a current round of groundwater data for selected monitoring wells
- better understand the nature and extent of contamination in groundwater
- evaluate time-based trends of on-site groundwater plumes
- evaluate the natural attenuation of the chemicals of concern in groundwater at Martin State Airport
- evaluate the interaction between shallow groundwater and Frog Mortar Creek
- provide information that can be used to update the modeling of shallow groundwater flow patterns and discharge to Frog Mortar Creek
- repair monitoring wells (if necessary) to preserve well integrity

Meeting these and related objectives is essential and will aid in the selection and implementation of cost-effective site remediation. This work plan is organized as follows:

<u>Section 2—Site Background</u>: briefly describes site history, subsurface conditions, and previous investigations.

<u>Section 3—Investigation Approach and Methodology</u>: presents the technical approach to groundwater monitoring, well repair activities, and describes the field methodology to be employed.

<u>Section 4—Project Deliverables</u>: describes the report that will summarize the investigation findings.

<u>Section 5—References</u>: cites references used to compile this work plan.

SECTION 2 SITE BACKGROUND

Martin State Airport (MSA) is at 701 Wilson Point Road in Middle River, Maryland. It is bounded by Frog Mortar Creek to the east and Stansbury Creek to the west (Figure 2-1). These creeks conjoin at the southern boundary of the site and continue south to feed Middle River and Chesapeake Bay. The Dump Road Area (DRA), in the southeastern portion of MSA, is bounded by Frog Mortar Creek to the east and the main airport runway to the west. The Main Terminal (MT) area comprises approximately 280 acres in the northwestern portion of MSA, just east of Wilson Point Road and Dark Head Cove. The MT area consists of the main terminal building, aircraft hangars and fueling stations, several taxiways, and the northern portion of the runway. Figure 2-1 shows the locations of MSA, the DRA, and the MT area.

Lockheed Martin Corporation (Lockheed Martin) has conducted detailed investigations at the DRA and at the MT since 1999 and 2010, respectively. Lockheed Martin has also conducted additional investigations at Strawberry Point, Greater Strawberry Point, and Frog Mortar Creek (Figure 2-1). Investigations of these latter areas are not discussed in this report because they are being addressed under separate investigation programs.

2.1 DUMP ROAD AREA

Environmental investigations of MSA began in the mid-1980s, when the Maryland Department of the Environment (MDE) conducted site inspections related to stored drums and a reported chemical dump. In 1989, MDE conducted a preliminary assessment of MSA that identified fill areas and ponds, the latter of which were reportedly used from the 1930s through the 1960s to dispose of spent battery acid, acid-type strippers, and other acidic solutions (MDE, 1989). Detailed investigations of the DRA began after July 1991, when the Maryland Aviation Administration (MAA) encountered four buried drums adjacent to Taxiway Tango during trenching to install an electrical cable (Figure 2-2). Discovery of these drums led to investigation of the surrounding area

for possible soil and groundwater contamination, as MDE required in its letters of January 6, 1992 and January 14, 1997 to MAA (MDE, 1992; 1997).

MAA conducted several investigations of the DRA from 1991–1998. These studies identified four areas where environmental sampling investigations have been focused: the Taxiway Tango Median Area, the Petroleum Hydrocarbon Area, Pond 1, and the Drum Area. These early investigation areas are shown in Figure 2-2.

From 1999–2010, Lockheed Martin conducted a remedial investigation (Tetra Tech, Inc., 2012c) and supplemental fieldwork to further delineate the extent of soil, groundwater, and pond-sediment chemical contamination that had been indicated by earlier DRA studies. Through geophysical surveys, membrane-interface probes, test pits, soil borings, and chemical analyses of soil and pond-sediment samples, the remedial investigation identified large areas of buried fill and debris and surface and subsurface soil contamination, in and around buried fill material and in pond sediment. The extent of buried fill and debris at the DRA was estimated to be approximately 25 acres (see Figure 2-2).

A 2012 review of historical aerial photographs (Tetra Tech, 2013b) identified and mapped what appear to be open burning areas, open pits or ponds, soil or debris piles, possible ammunition bunkers, ground scars, and fill areas (see shaded areas on Figure 2-2). Several of these historical features coincide with areas of elevated contaminant concentrations in soil and/or groundwater; these areas were later identified as possible contaminant-source areas and were subsequently investigated in 2012–2016 (Tetra Tech, 2013a, 2014a-b, 2016a, 2017). Groundwater sampling of DRA groundwater monitoring wells has been conducted annually from 2006-2017.

Trichloroethene (TCE) (a metal degreaser) and TCE-degradation daughter-products have been detected in groundwater throughout the investigation area, with the highest concentrations appearing in the upper and intermediate regions of the surficial aquifer. TCE has been detected in DRA groundwater at concentrations ranging from 0.5–490,000 micrograms per liter (μ g/L), and is therefore a primary contaminant of concern in groundwater at the DRA. The MDE groundwater standard for TCE is 5 μ g/L. 1,4-Dioxane, benzene, toluene, xylenes, and several metals (typically co-located with chlorinated solvents) are also considered groundwater chemicals of concern. TCE-degradation daughter-products (e.g., dichloroethene [DCE], vinyl chloride [VC], etc.) are

typically co-located with TCE at MSA, and are considered primary contaminants of concern in DRA groundwater.

An extraction and treatment system for DRA groundwater was constructed in 2017 and is currently operational at the DRA site. This extraction and treatment system consists of 16 groundwater extraction wells, underground piping, and a building that houses components to treat groundwater containing volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals detected at concentrations above Maryland Department of the Environment (MDE) groundwater standards. The wells and underground piping pump groundwater from the surficial aquifer to the aboveground treatment building, creating a "hydraulic barrier" that captures groundwater and prevents such contaminants from migrating off-site. The treatment building is 60-feet-wide and 170-feet-long (10,200 square feet), and is near Frog Mortar Creek in the east-central portion of the DRA (Figure 2-2). Treated groundwater will be tested routinely and subsequently discharged to Frog Mortar Creek via an MDE-permitted outfall.

Additional details regarding DRA background and history, including details of previous environmental investigations and discussions of contaminant-source areas at the DRA, are in the *Dump Road Area Characterization of Possible Source Areas Report* (Tetra Tech, 2013a) and *Taxiway Tango Soil Characterization Report* (Tetra Tech, 2014c), and therefore are not repeated herein. A detailed chronological discussion of investigations at the DRA from 1985–2012 is provided as Appendix A of the *Dump Road Source-Areas Investigation Work Plan* (Tetra Tech, 2012a). Recent DRA groundwater sampling results are provided in annual groundwater monitoring reports (Tetra Tech, 2015, 2016b, 2017).

2.2 MAIN TERMINAL

Previous investigations directly related to the MT area include the Environmental Evaluation Report for Martin State Airport Main Terminal (Tetra Tech, 2010b) and the Environmental Evaluation Addendum for Martin State Airport Main Terminal (Tetra Tech, 2010a). These evaluations concentrated on environmental impacts that may have resulted from practices carried out between 1929–1975, when the Glenn L. Martin Company and Martin Marietta owned and operated on the property. Possible areas of environmental concern in the MT area were identified through historical aerial photographs, facility records, local and federal library documents,

museum records, regulatory data, environmental database reviews, interviews with former employees, and locating/reviewing environmental reports and data.

The environmental evaluation identified nine recognized environmental conditions (RECs)¹ (RECs #1–9) and five potential RECs (RECs #10–14) in the MT area (Tetra Tech, 2010b). The addendum report (Tetra Tech, 2010a) identified eight additional RECs (RECs #15–22), and contains supplemental details on 10 of 14 initial/possible RECs. Additional information obtained during development of the addendum report led to upgrading potential REC #14 to a full REC because an underground storage tank (UST) had once been located there. MT area RECs (exclusive of potential RECs #10–13) are shown on Figure 2-3.

A Phase II environmental site assessment of the MT area was conducted in 2010–2012 (Tetra Tech, 2012b and 2013c). Soil and groundwater samples were collected and analyzed for possible organic and inorganic constituents. Twelve shallow aquifer wells were installed around the perimeter of the airport hangars and airport terminal building near the identified MT-area RECs (MT-area wells MT-MW-1S through MT-MW-12S). Groundwater studies indicated benzene (a petroleum-related VOC) in samples collected from well MT-MW02S in 2011 (50.5 μ g/L) and 2012 (87 μ g/L); both concentrations exceed the MDE groundwater standard (5 μ g/L) for benzene.

Seven other VOCs (acetone, carbon disulfide, carbon tetrachloride, chloroform, chloromethane, naphthalene, and toluene) were detected in groundwater samples collected in 2012, but detected concentrations of these analytes were below MDE groundwater standards. However, concentrations of total petroleum hydrocarbons (TPH)-gasoline-range organics (GRO), TPH-diesel-range organics (DRO), beryllium, nickel, and vanadium exceeded MDE groundwater standards in several samples. Detected concentrations of SVOCs, including 1,4-dioxane, did not exceed MDE groundwater standards in the 2010–2012 samples. Groundwater sampling of MT area groundwater monitoring wells was conducted annually from 2013-2017.

Additional details regarding the background and history of the MT area, including details of environmental investigations, REC discussions, and results of groundwater sampling, are available

¹ Recognized environmental conditions are based on the presence or likely presence of hazardous substances and/or petroleum products under conditions that could indicate a historical, existing, or potential release to the property's structures, soil, groundwater, or surface water.



SECTION 3 INVESTIGATION APPROACH AND METHODOLOGY

This groundwater sampling plan was developed in response to previous investigations and as part of long-term groundwater monitoring at Martin State Airport (MSA). The overall objective of groundwater characterization is to provide up-to-date groundwater data for selected groundwater monitoring wells to: better understand the nature and extent of contamination in groundwater; evaluate the time-based trends of on-site groundwater plumes; evaluate the natural attenuation of chemicals of concern in groundwater at MSA; evaluate the interaction between shallow groundwater and Frog Mortar Creek; and update the modeling of shallow groundwater flow patterns and discharge to Frog Mortar Creek. Field tasks include recording groundwater and surface-water levels, groundwater sampling for chemical analyses, well repair assessments, and well repairs.

Before starting any field tasks, appropriate Tetra Tech, Inc. (Tetra Tech) personnel will assure their familiarity with the site-specific health and safety plan (HASP) and respective "Safe Work" permits and the emergency response plan included in the HASP. Tetra Tech will conduct a mandatory health and safety tailgate meeting before each daily field event. The Tetra Tech site health and safety officer will document the topics covered and personnel in attendance. Safety requirements are addressed in detail in the site-specific Tetra Tech HASP included as Appendix A.

3.1 GROUNDWATER SAMPLING

Groundwater samples will be collected from 120 groundwater monitoring wells. This section describes the field procedures that will be implemented as part of this groundwater-monitoring program. Figure 3-1 depicts the locations of monitoring wells at MSA to be sampled as part of the event. The 2018 sampling program includes 108 monitoring wells in the Dump Road Area (DRA), and 12 wells in the Main Terminal (MT) area. Monitoring wells located in Greater Strawberry Point will be sampled under separate site characterization activities.

Synoptic Water Level Measurements and Well Condition 3.1.1 Assessment

sampling, static synoptic water levels will be obtained from all existing groundwater-monitoring wells (Table 3-1) and from the two on-site ponds (Ponds 1 and 2) staff gauges using a graduated electronic sounding water level meter. The static water level will be determined by lowering the meter's probe into the well until the liquid level indicator emits an audible tone, indicating the air/water interface. The same method will be used for the stilling wells in Ponds 1 and 2. The water level is read from the probe cable and recorded to the nearest 0.01 foot (as the depth to water with respect to the top of the casing). The water level will be recorded on the appropriate groundwater level measurement field form and in the field log book. The water level on the staff gauge located along the eastern shore of Frog Mortar Creek (at a privately-owned dock) will also be recorded at the beginning and end of each day water level measurements occur.

As part of the groundwater-level monitoring task, Tetra Tech will assess the condition of each well. The Tetra Tech field geologist will document the condition of each well on a well inspection form. The field geologist will inspect the well casing, well pad, protective cover, and other parts such as the well cap and bolts, to verify that the well has not been compromised, and has not sustained any damage by causes such as weather or heavy vehicle traffic. Subsequent to the well inspection, Tetra Tech will provide recommendations to the Remediation Technical Operations (RTO) contractor and Lockheed Martin Corporation (Lockheed Martin) with regard to suggested well repairs and maintenance. Tetra Tech will pay specific attention to wells in high traffic areas that may be a trip hazard and therefore a health and safety concern. Monitoring well repair activities are described in greater detail in Section 3.4.

3.1.2 Groundwater Sampling and Chemical Analyses

The proposed list of wells included in the groundwater-monitoring program are shown in Table 3-1. The distribution of sampling data collected from select wells will provide sufficient horizontal and vertical coverage to determine if significant changes are taking place within and at the edges of the contaminant plume(s). The same wells sampled in 2017 will be sampled in 2018.

Well purging—Monitoring wells will be purged using low flow purging techniques (United States Environmental Protection Agency [USEPA], 2010, 2002) before sample collection. Groundwater will be purged with a peristaltic pump fitted with dedicated, disposable Teflon[®]-lined tubing or a submersible pump positioned midway in the length of the well's saturated screen. While purging, the pumping rate will range between 100-300 milliliters per minute (ml/min) and will be measured constantly using a graduated cylinder. The purge rate will be adjusted, but will not go above 300 ml/min (if possible), to prevent a water level drawdown greater than 0.2 feet from the initial static water level.

During groundwater purging, water level drawdown measurements and groundwater parameters, including pH, temperature, specific conductance, dissolved oxygen (DO), oxygen reduction potential (ORP), and turbidity will be collected and recorded in the appropriate site-specific logbook every five to 10 minutes until purging is complete; these data will also be recorded on low flow purge data sheets. The water quality parameters will be measured using a Horiba U-52 water quality meter or a similar inline water-quality meter. Turbidity readings will be collected using a separate LaMotte 2020 portable turbidity meter. Before sampling each day, the water quality meters will be calibrated using calibration standards and procedures provided in the instrument's user manual. The equipment and calibration information will be entered daily onto the Tetra Tech field "Equipment Calibration Log" sheet that can be found in the *Forms* section of the Tetra Tech intranet.

Purging will be considered complete when the monitored water quality parameters have stabilized, when three saturated well casing volumes have been removed, when the well is purged dry, or after 90-minutes, whichever occurs first. Stabilization will be considered achieved when three consecutive readings, taken at five to 10 minute intervals, are within ± 0.1 for pH, $\pm 3\%$ for specific conductance and temperature, $\pm 10\%$ for DO and ORP, and less than 10 nephelometric turbidity units for turbidity. If the monitoring well is purged dry, the water level in the well will be allowed to recover a minimum of 80% of its initial static water level before groundwater sampling. All purged water will be collected in United States Department of Transportation (USDOT)-approved 55-gallon steel drums, as detailed in Section 3.1.6.

Sample collection—After purging, groundwater from monitoring wells will be sampled using the same dedicated tubing or submersible pump that was used during purging. Groundwater samples will be collected using low-flow sampling protocols (USEPA, 2010, 2002) and collected at the

same pumping rate as was used during well purging. Samples will be collected immediately after purging without stopping the pump or changing the pumping rate. Water will be pumped directly into the appropriate sample containers (supplied by the laboratory). Samples collected for hexavalent chromium analysis will be collected in the afternoon, Mondays through Thursday only (and not on holidays), to minimize sample holding time before analysis (24 hours). Hexavalent chromium samples will be lab filtered. Both total (unfiltered) and dissolved (filtered) metals samples will be collected. Dissolved metals samples will be filtered in the field using disposable 0.45-micron in-line filters. A new filter will be used for each dissolved metals sample to ensure no cross-contamination between samples. All samples will be shipped to the lab the same day they are collected.

Laboratory analyses—Groundwater monitoring wells will be sampled for the following laboratory analyses:

- volatile organic compounds (VOCs) plus tentatively identified compounds (TICs) Freon 22 (chlorodifluoromethane) and Freon 113, by USEPA Method 8260C—(119 monitoring wells)
- 1,4-dioxane by USEPA Method 8270C SIM—(119 monitoring wells)
- perchlorate by USEPA SW846 Method 6850—(45 monitoring wells)
- mercury by USEPA SW846 Method 7470A—(119 monitoring wells)
- hexavalent chromium by USEPA Method 218.6—(39 monitoring wells)
- total and dissolved priority pollutant metals by USEPA Method 6020B—(119 monitoring wells)
- radium 224, 226, and 228 by USEPA 900 series methods—(10 groundwater monitoring wells upgradient and downgradient of the DRA in the upper, intermediate and lower surficial aquifers, and deep-confined aquifer)
- haloacetic acids by USEPA Method 552.1–552.4—(three groundwater monitoring wells in the upper surficial aquifer within the chlorinated solvent plume)
- gasoline-range organics (GRO) and diesel-range organics (DRO) by SW846 Method 8015B—(57 shallow monitoring wells screened in the upper surficial aquifer)

• natural attenuation assessment (NAA) parameters—(nine monitoring wells will be analyzed using USEPA SW846 protocols for NAA parameters [nitrate, nitrite, ammonia nitrogen, phosphate, sulfate, total alkalinity, dissolved organic carbon, total iron, total manganese, total potassium, total calcium, total magnesium, total chloride, total sodium, total silica, and total dissolved solids (TDS)]. Methane, ethane and ethene will be analyzed using Microseeps® AM 20GAX protocols. Ferrous iron will be field tested using HachTM or ChemetricsTM test kits.)

All groundwater samples collected for perchlorate will be analyzed by USEPA Method 6850 with a specified detection limit of 1 μ g/L. All groundwater analyses for hexavalent chromium will be analyzed by USEPA Method 218.6 (ion chromatography) with a specified detection limit of 0.02 micrograms per liter (μ g/L), which is lower than the method's published detection limit (0.10 μ g/L). The selected laboratory will be state certified with demonstrated ability to achieve the specified detection limits.

No duplicates will be collected during this investigation. One trip blank per cooler per day of VOC analysis samples will be collected for quality assurance/quality control (QA/QC) purposes. Matrix spike and matrix spike duplicate samples will be collected on a 1:20 basis. All analyses will be turned around in 21 business days. Monitoring well locations to be sampled and associated samples and analyses are detailed in Table 3-2.

3.1.3 Documentation

A master site logbook will be maintained as an overall record of field activities. Sample documentation will comprise completed chain of custody forms and matrix specific sample log sheets. The chain of custody forms are standardized to summarize and document pertinent sample information such as sample identification and type, matrix, date and time of collection, preservation, and requested analysis. Sample custody procedures document sample acquisition and integrity.

3.1.4 Sample Nomenclature and Handling

Each groundwater sample collected during the characterization study will be identified with a unique sample identification tag. The sample identification tag will consist of the site location, the well number, and a six-digit sampling date. For example, a groundwater sample collected on May 15, 2018 from monitoring well MSA-DMW-2S would be labeled as MSA-DMW-2S-051518. Trip

blanks will be labeled with a "TB" prefix followed by the blank's six-digit submittal date (e.g., TB-051518).

Sample handling includes field related considerations concerning the selection of sample containers, preservatives, allowable holding times, and analyses requested. Proper custody procedures will be followed throughout all phases of sample collection and handling. Chain of custody protocols will be used throughout sample handling to establish the evidentiary integrity of sample containers. These protocols will demonstrate that the samples were handled and transferred in a manner that would prevent or detect possible tampering. Sample containers will be released under signature from the laboratory and will be accepted under signature by the sampler(s) or responsible individual that maintains custody until the sample containers are transferred to the sampler(s). Transport containers returning to the laboratory will be sealed with strapping tape and a tamper proof custody seal. The custody seal will include the signature of the individual releasing the transport container, along with the date and time.

3.1.5 Equipment Decontamination

Dedicated as well as disposable equipment will be used for groundwater purging and groundwater sampling; therefore, decontamination activities for groundwater sampling will be minimal. Reusable equipment such as pumps and water level meters will be decontaminated before and after each use. Decontamination of reusable equipment will consist of the following activities/procedures:

- scrubbing or pumping of Liquinox® and potable water solution throughout the contaminated components of the equipment
- thoroughly rinsing components with distilled water
- air drying
- collecting decontamination solutions for disposal

3.1.6 Waste Management

Investigation derived waste (IDW) consisting of decontamination rinsate water, purge water, and personal protective equipment (PPE) will be generated during the groundwater characterization study. PPE IDW will be brushed off, placed in trash bags, and disposed of in a facility trash

receptacle designated by Lockheed Martin personnel. Purge water will be collected and stored in USDOT-approved 55-gallon steel drums. All drums will be appropriately labeled and logged on a drum inventory form. The waste will be characterized and disposed of in accordance with applicable state and federal regulations. After waste generation, drums will be labeled and relocated to a drum staging area identified by Maryland Air National Guard (MDANG) personnel.

IDW will be managed in accordance with the Lockheed Martin MSA waste management plan (WMP) (Appendix B). Accordingly, samples of the IDW will be collected and submitted to profile the wastes for appropriate transportation and disposal. Upon receipt of the IDW analytical data, the generated IDW will be removed from the facility and properly disposed of in accordance with federal, state, and local regulations. The site WMP (Appendix B) conforms to the Lockheed Martin Energy, Environment, Safety, and Health (EESH) Remediation Waste Management Procedure No. EROP-03, Revision 1 (effective April 17, 2009).

3.2 DATA MANAGEMENT

Data handling procedures to be followed by the laboratory will meet the requirements of the laboratory subcontract. All analytical and field data will be maintained in the project files. The project files will contain copies of the chain of custody forms, sample log forms, sampling location maps, and documentation of quality assurance and data manipulation.

3.2.1 Data Tracking and Control

A cradle to grave sample tracking system will be used from the beginning to the end of the sampling event. Before field mobilization, the field operations leader (FOL) will coordinate/initiate sample tracking. Sample jar labels will be handwritten in the field. The labels will be reviewed for adherence to work plan requirements and accuracy. The project manager (PM) will coordinate with the analytical laboratory to ensure that the laboratory is aware of the number and type of samples and analyses to expect.

When field sampling is underway, the FOL will forward the chain of custody forms to the PM or designee and the laboratory for each day that samples are collected. The PM or designee will confirm that the chain of custody forms provide the information required by the work plan. This

process will allow for early detection of field errors so that adjustments can be made while the field team is in place.

After successful completion of all requested analyses, the laboratory will submit an electronic deliverable for every sample delivery group (SDG). When all electronic deliverables have been received from the laboratory, the PM or designee will ensure that the laboratory has performed all requested analyses. Discrepancies will be noted early enough so that all samples can be analyzed within the prescribed holding times.

3.2.2 Sample Information

Data from field measurements will be recorded using appropriate log sheets. Reduction of field data entails summarizing and presenting these data in tabular form. Reduction of laboratory data entails manipulation of raw data instrument output into reportable results. The FOL will verify field data (e.g., temperature readings) daily. Laboratory data will be verified by the group supervisor and then by the laboratory's quality control/documentation department.

3.2.3 Project Data Compilation

The analytical laboratory will generate a portable document format (PDF) file of the analytical data packages, as well as electronic database deliverables. The electronic database will be checked against the PDF file provided by the laboratory and updated as required, based on data qualifier flags applied during data validation. Data generated during groundwater monitoring will be incorporated into the Environmental Geographic Information System (EGIS) database. All data, such as units of measure and chemical nomenclature, will be manipulated to maintain consistency with the project database.

3.2.4 Geographical Information System (GIS)

Data management systems consist of a relational database and GIS used to manage environmental information pertaining to MSA. The relational database stores chemical, geological, hydrogeological, and other environmental data collected during environmental investigations. The GIS is developed from the relational database, and contains subsets of the larger data pool. The GIS allows environmental data to be posted onto base maps to present the information graphically.

Upon compilation of sample, chemical, and positional data, the data will be compiled and incorporated into the EGIS.

3.3 DATA REVIEW

Data from this sampling event will consist of groundwater analytical results intended to better understand the nature and extent of groundwater contamination, to evaluate any changes in the on-site groundwater plumes, and to evaluate the natural attenuation of the chemicals of concern in groundwater. Data received from the laboratory will be entered into a sample database and evaluated against risk-based criteria. Data validation, consisting of data completeness, holding time, calibrations, laboratory and field blank contamination, field duplicate precision, and detection limits, will be completed concurrent with the data evaluation. Chemical data will be reviewed by Tetra Tech in accordance with established USEPA protocols to assess the reliability and accuracy of the data. This review will be based on the USEPA National Functional Guidelines for Organic Superfund Data Review (September 2016) and the specifics of the analytical method used.

3.4 MONITORING WELL REPAIRS

Numerous monitoring wells have been installed at MSA, beginning in the 1990s. Over time, the condition of some of these wells has deteriorated, and they require maintenance. Based on the well inspection log filled out during the collection of groundwater level measurements, the designated repairs will be incorporated into a well-repair work plan prepared for submittal to Lockheed Martin and the RTO contractor for approval. The work described in this section is for potential repairs to MSA monitoring wells, including replacing bladder pumps, replacing surface concrete pads, replacing missing or damaged parts (compression plugs, bolts, locks, etc.), bollard repair, well casing and cover repair (repainting), and re-surveying. The objective of these monitoring well repairs is to maintain secure and sound wells for groundwater sampling and to monitor groundwater conditions at the site. The following subsections provide a description of well repairs that may be conducted in 2018 due to natural deterioration or accidental damage.

If repairs are deemed necessary, Tetra Tech will obtain any required site access, utility clearances, and permits to complete the well repair activities and follow the standard protocol. If any intrusive work will be conducted outside the limits of the existing well pads, a utility mark-out will be

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performed at each intrusive repair location by a private mark-out contractor. The local One-Call service (Miss Utility of Maryland) will be contacted for utility clearance in the area of the proposed well repairs requiring intrusive work and available county engineering and utility maps will be reviewed. Based on similar historical repairs, all intrusive work is expected to be confined to the existing limits of the current well pads, and will not require any additional utility clearance.

3.4.1 Replacement of Dedicated Bladder Pumps

Tetra Tech assumes that the bladder pump in at least one well (to be determined at time of the 2018 well inspection) will not be functioning and will need to be replaced in 2018 due to possible equipment failure or deterioration. The existing bladder pump will be removed from the well and disposed of according to the site WMP (Appendix B). The location of the new pump intake will be established and documented relative to the well screen. The malfunctioning pump, along with its associated dedicated tubing, will be decontaminated using a phosphate-free detergent (Liquinox®) and distilled water. The decontamination rinsate will be placed in USDOT-approved steel 55-gallon drums for chemical profiling and disposal. The pump and tubing will then be double bagged and placed in an MSA-approved standard trash receptacle.

A new stainless-steel QED® bladder pump will be installed in the monitoring well, along with the required lengths of Teflon®-lined tubing. The QED® bladder pump will be fitted with a pump screen, a wellhead manifold with all fittings, a well-discharge adapter, Teflon®-lined tubing, and a frost kit to prevent damage during winter. Each pump will be preassembled at the factory to the required specifications, based on the depth of each well and the location of the screened interval. The new pump will be tested using potable or de-ionized water prior to being installed to ensure proper function. The new bladder pump intake will be placed at the same depth as the pump being replaced. All dedicated tubing associated with the malfunctioning bladder pump will also be removed from the well and disposed of properly. The new bladder pump will be installed along with all required tubing.

3.4.2 Replacement of Concrete Well Pads

Tetra Tech assumes that at least one concrete well pad (to be determined at time of the 2018 well inspection) will need to be replaced in 2018. Using a jackhammer, the cracked and/or deteriorated concrete pad will be broken up and removed. Appropriate safety procedures will be followed when

operating the jackhammer. All debris will be disposed of according to the WMP including any manhole covers or stick-ups. The two-by two-foot pad area will then be cleaned out using a shovel and/or trowel to at least six inches below ground surface to remove any over grown grassy or remaining debris. A two-by-two-foot wooden form will be used to support the wet concrete. New manhole covers or stickups will be installed around the polyvinyl chloride (PVC) well before concrete is poured. Concrete material will be a mixture of Portland cement and water, and will be mixed in a bucket or wheelbarrow. Dry concrete and water must not be poured and mixed directly in the hole. Reinforced bar will be placed into the wet concrete in 12-inch lengths to provide additional support to the new concrete pad throughout all weather seasons.

3.4.3 Replacement of Missing Parts

Tetra Tech assumes that missing parts will be replaced on at least three wells in 2018, including one well each missing bolts, locks on the compression plug securing the well, and compressions plugs. Tetra Tech will replace all missing bolts, locks, and missing compression plugs to secure the wells properly.

3.4.4 Bollard Repair

Tetra Tech assumes that the bollards around at least one stickup well will require repair in 2018. The protective bollards around stickup monitoring wells may have been damaged over time, and the bollards must be repaired to maintain the security and integrity of existing groundwater monitoring wells. Broken or leaning bollards will be removed using a jackhammer to break up the concrete. All bollard and concrete debris will be disposed of according to the WMP. New bollards will be installed and secured using concrete.

3.4.5 Well Casing and Cover Repair

Tetra Tech assumes that casing/cover repairs will be performed on at least three wells in 2018, including one well each requiring the following repairs:

Rusted casings will be re-painted to maintain the longevity of the well. Loose paint and
rust will be removed with a wire brush; the casing will then be re-painted its original color
with latex paint and a brush. The PVC casing will be tightly capped with an expansion plug
before painting the protective casing.

- Stickup casings that have been bent or manipulated will be replaced.
- Broken manhole covers will be replaced.

3.4.6 Survey of Repaired Monitoring Wells

Any repair or update that results in an elevation change will be surveyed. This activity includes resurveying all monitoring well locations where well pads were replaced due to possible changes in elevation, and locations with updated well components (e.g., piezometers, casings, pads, stickups, etc.) where existing surveyed elevations may have changed due to well repair activities. The survey will be completed by a qualified, Maryland licensed land-surveying firm to provide horizontal and vertical coordinates for each repaired well. Vertical elevations will be accurate to the nearest 0.01 foot in North American Vertical datum 1988. Horizontal well locations will be surveyed with an accuracy of 0.1 foot in the North American Datum 1983. Tetra Tech will document all well repair activities with photos.

SECTION 4 PROJECT DELIVERABLES

An annual groundwater monitoring report summarizing the results of the groundwater investigation will be prepared. The report will include a technical evaluation of the investigation program, groundwater-potentiometric surface maps, concentrations of chemicals detected, staff gauge and water level recorder results, and laboratory analytical reports. Once the analytical data have been obtained from the laboratory, the data will be validated. Results reported for the sampling event will be included in a report with summary tables. The report will include at a minimum: a summary and description of activities performed, including field procedures and monitoring wells sampled; figures illustrating sampling locations, the extent of contaminant plumes, and groundwater elevation maps for the upper, middle, and lower zones; a laboratory report; summary tables of laboratory analytical results, field measurements, and groundwater elevations; documentation of the data validation and data usability assessment; a summary of monitoring well status with recommendations for possible repairs or improvements; documentation of waste handling and disposal; and other relevant documentation. Recommendations regarding subsequent rounds of groundwater monitoring, including monitoring wells to be sampled and analyses to be performed, will also be provided.

In addition, if required, a memorandum summarizing groundwater monitoring well repairs, complete with photographs and updated survey data, will be prepared and submitted for review. The new survey data will be uploaded into the project environmental-geographic information system (EGIS) database. The memorandum will be finalized based on comments received from Lockheed Martin Corporation (Lockheed Martin) and the Remediation Technical Operations (RTO) contractor. This memorandum will also be included as an appendix/attachment to the annual groundwater monitoring report described above.

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FIGURES

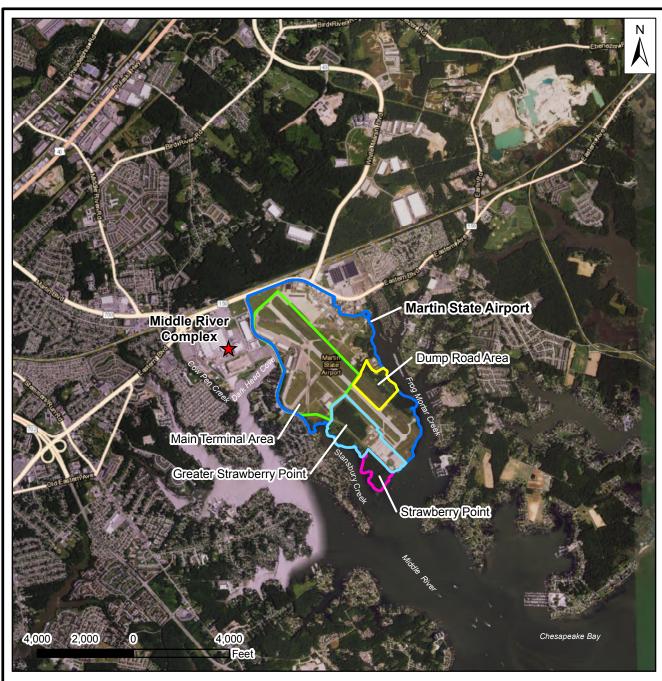
Figure 1-1 Martin State Airport Site Location Map

Figure 2-1 Martin State Airport and Surrounding Features

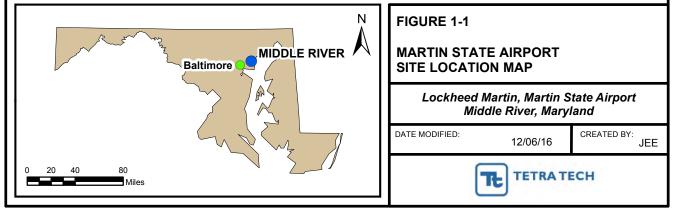
Figure 2-2 Site Features and Areas of Concern—Dump Road Area

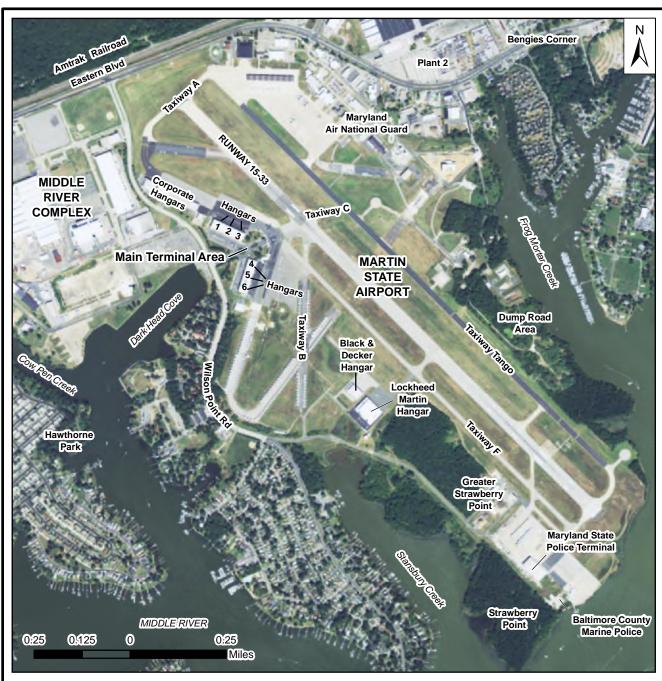
Figure 2-3 Recognized Environmental Conditions—Main Terminal Area

Figure 3-1 Groundwater Monitoring Well Locations—Dump Road Area and Main Terminal Area



Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2013 ESRI and its data suppliers).





Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2013 ESRI and its data suppliers).

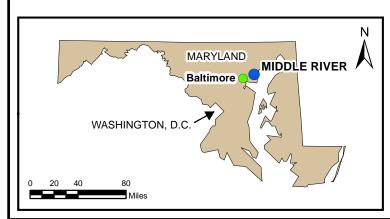
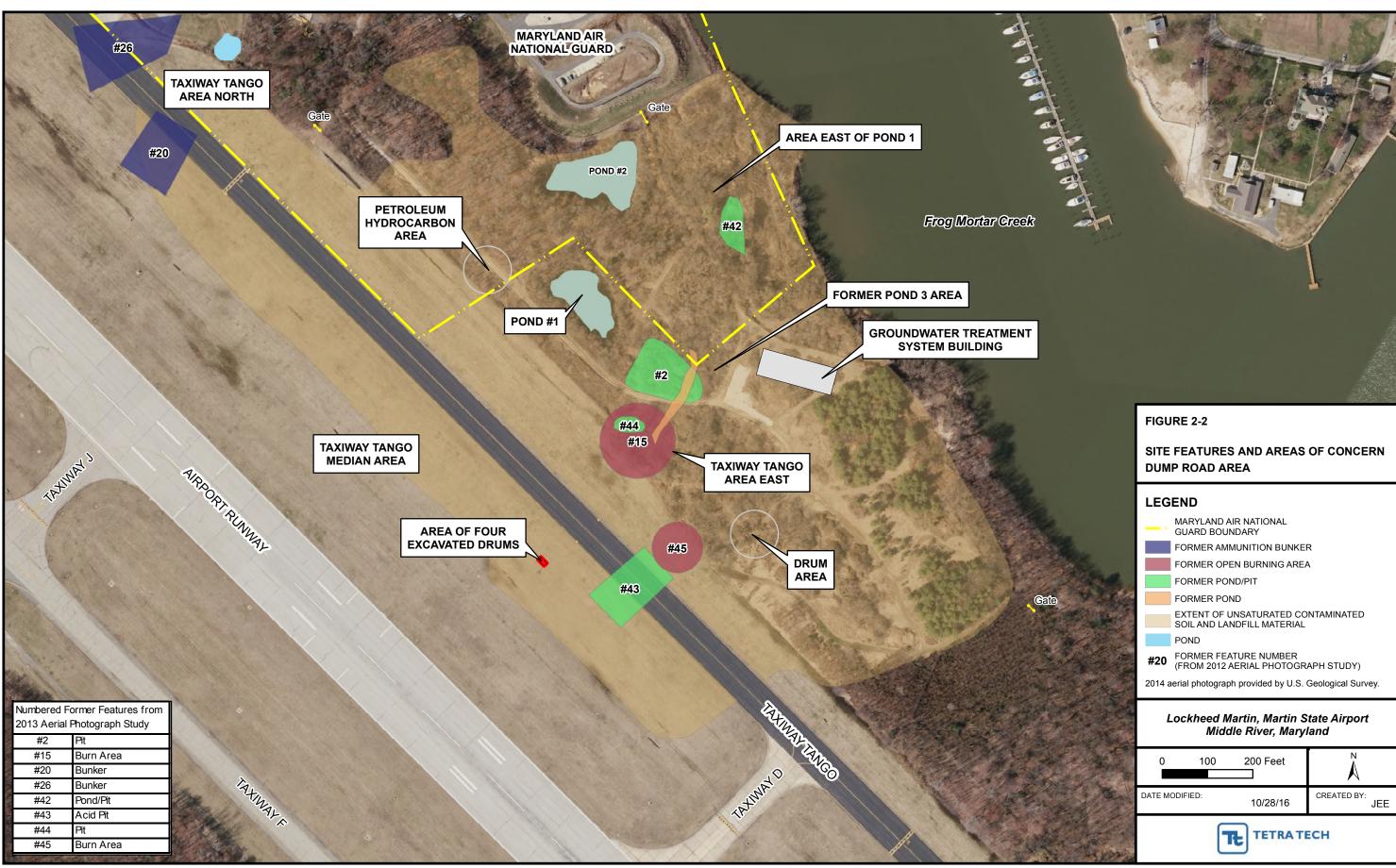
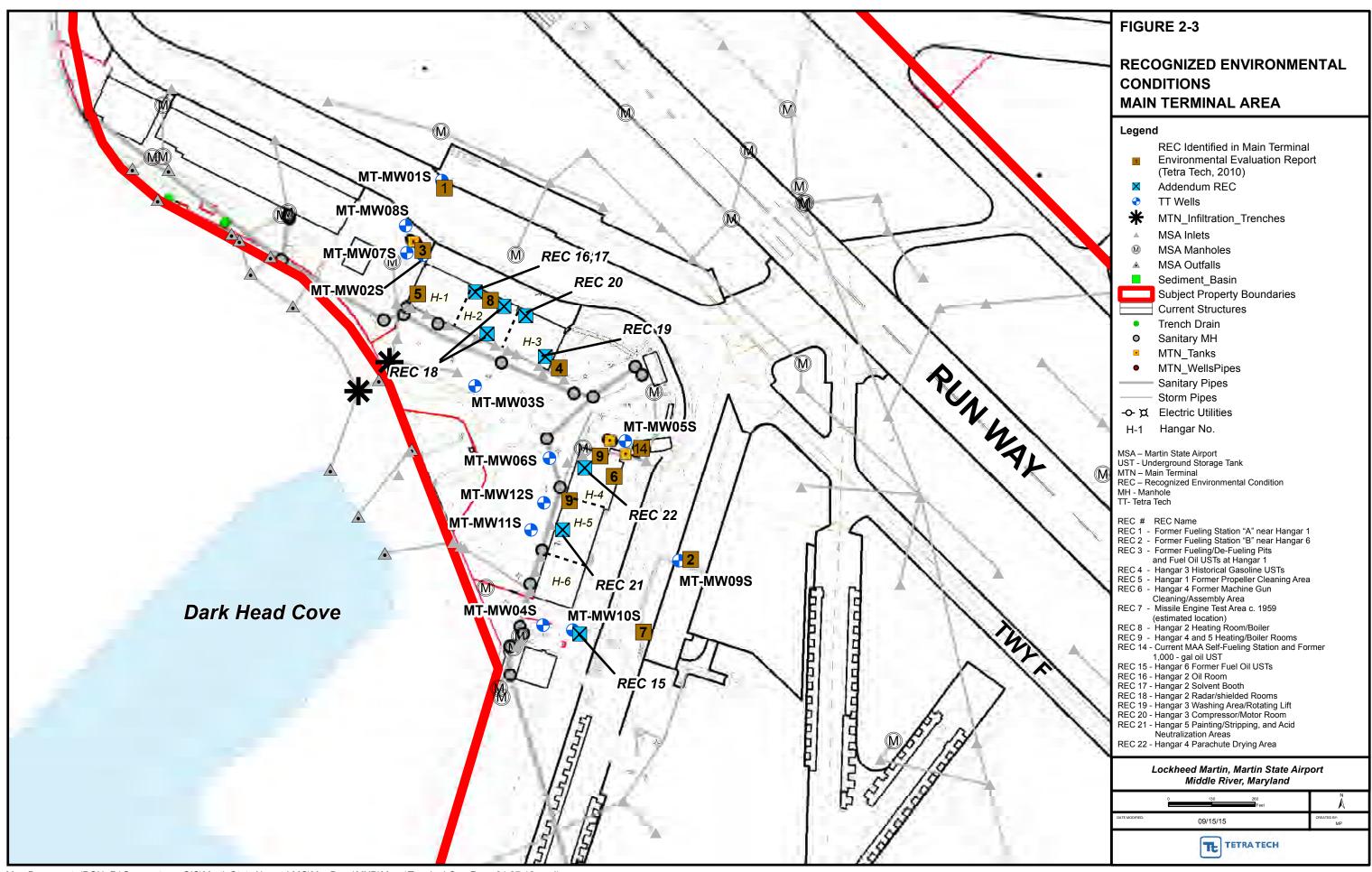
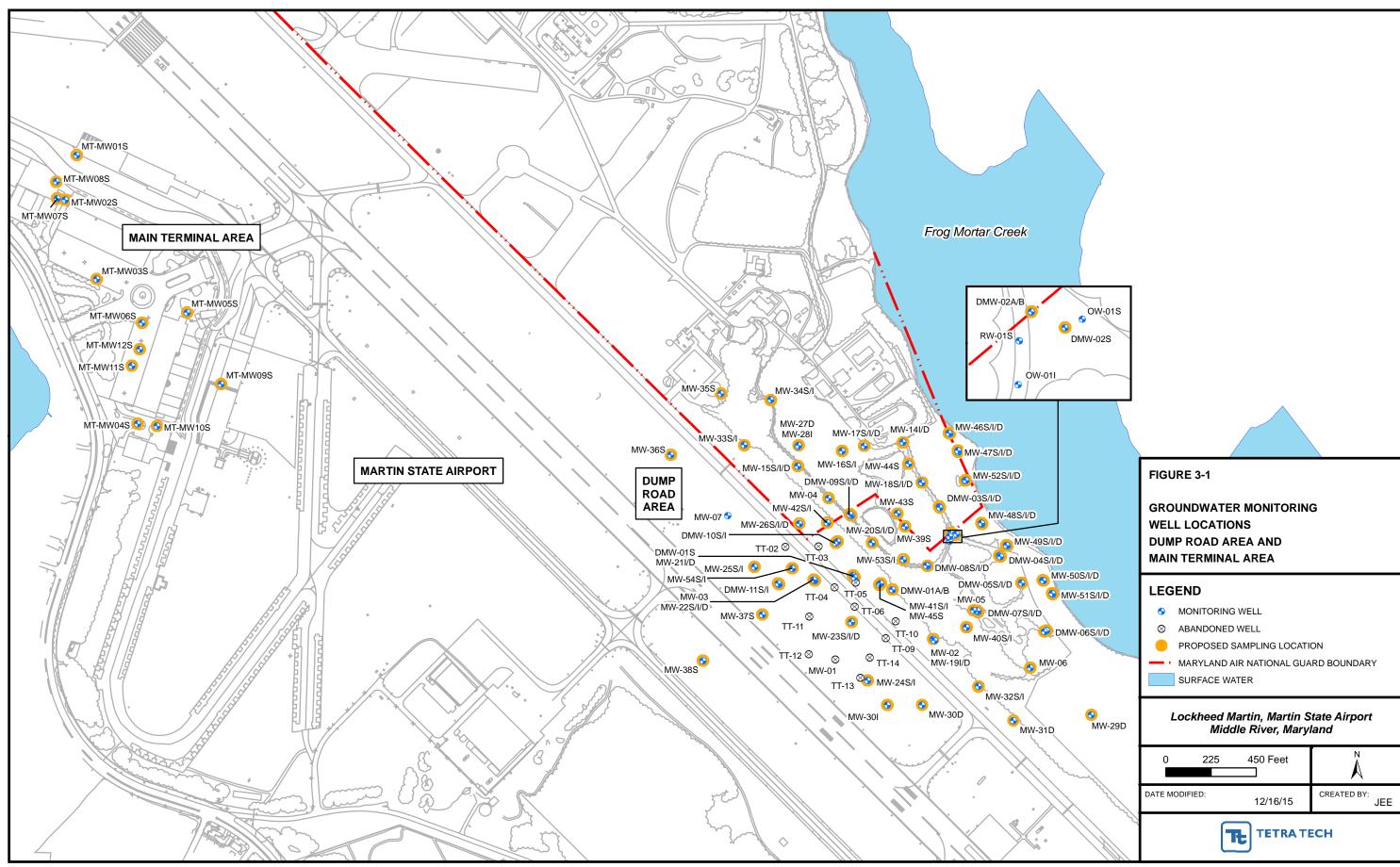


FIGURE 2-1 MARTIN STATE AIRPORT AND SURROUNDING FEATURES Lockheed Martin, Martin State Airport Middle River, Maryland DATE MODIFIED: 09/15/15 CREATED BY: JEE TETRATECH







TABLES

Table 3-1 Proposed Wells for the 2018 Groundwater Monitoring Program Table 3-2 Chemical Analyses, and Laboratory Analytical Methods for Wells to be Sampled in 2018

Table 3-1
Proposed Wells for the 2018 Groundwater Monitoring Program
Martin State Airport, Middle River, Maryland
Page 1 of 2

Upper surficial aquifer	Intermediate surficial aquifer	Lower surficial aquifer	Deep aquifer
MW-3	DMW-1A	DMW-1B	MW-27D
MW-4	DMW-2A	DMW-2B	MW-29D
MW-5	DMW-3I	DMW-3D	MW-30D
MW-6	DMW-4I	DMW-4D	MW-31D
DMW-1S	DMW-5I	DMW-6D	
DMW-2S	DMW-6I	DMW-7D	
DMW-3S	DMW-7I	DMW-9D	
DMW-4S	DMW-8I	MW-14D	
DMW-5S	DMW-9I	MW-15D	
DMW-6S	DMW-10I	MW-16D	
DMW-7S	DMW-11I	MW-17D	
DMW-9S	MW-14I	MW-19D	
DMW-10S	MW-15I	MW-20D	
DMW-11S	MW-16I	MW-21D	
MW-16S	MW-17I	MW-22D	
MW-17S	MW-18I	MW-23D	
MW-18S	MW-20I	MW-46D	
MW-20S	MW-21I	MW-47D	
MW-23S	MW-24I	MW-48D	
MW-24S	MW-25I	MW-49D	
MW-25S	MW-30I	MW-50D	
MW-26S	MW-32I	MW-51D	
MW-32S	MW-33I	MW-52D	
MW-33S	MW-34I		
MW-34S	MW-40I		
MW-35S	MW-41I		
MW-36S	MW-42I		
MW-37S	MW-46I		
MW-38S	MW-47I		
MW-39S	MW-48I		

Table 3-1

Proposed Wells for the 2018 Groundwater Monitoring Program Martin State Airport, Middle River, Maryland Page 2 of 2

Upper Surficial Aquifer	Intermediate Surficial Aquifer	Lower Surficial Aquifer	Deep Aquifer
MW-40S	MW-49I		
MW-41S	MW-50I		
MW-42S	MW-51I		
MW-43S	MW-52I		
MW-44S	MW-53I		
MW-45S	MW-54I		
MW-46S			
MW-47S			
MW-48S			
MW-49S			
MW-50S			
MW-51S			
MW-52S			
MW-53S			
MW-54S			
MT-MW-01S			
MT-MW-02S			
MT-MW-03S			
MT-MW-04S			
MT-MW-05S			
MT-MW-06S			
MT-MW-07S			
MT-MW-08S			
MT-MW-09S			
MT-MW-10S			
MT-MW-11S			
MT-MW-12S			

DMW or MW– Dump Road Area monitoring well MT – Main Terminal area monitoring well

Chemical Analyses and Laboratory Analytical Methods for Wells to be Sampled in 2018
Lockheed Martin, Martin State Airport, Middle River, Maryland
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					A	nalytical Requiren	nents				
	VOCs (TICs, Freon 22, Freon 113)	1,4-Dioxane	Perchlorate ¹	Hexavalent Chromium ²	Total PPM	Dissolved PPM	Mercury	GRO and DRO	Radium 224, 226, and 228	Haloacetic Acids	Natural Attenuation Parameters ³
Monitoring Well	(USEPA 8260C)	(USEPA 8270 SIM)	(USEPA 6850)	(USEPA 218.6)	(USEPA 6020)	(USEPA 6020)	(USEPA 7470A)	(USEPA 8015B)	(USEPA 900 Series)	(USEPA 552.1 - 552.4)	(see below)4
	3x40mL vials w/ hydrochloric acid	2 liters Amber	125mL plastic (filtered)	250mL plastic	500mL w/ nitric	500mL filtered w/nitric acid	See Metals	2x40mL vials w/hydrochloric acid & 2 liters Amber	(Different labs) 2 liter plastic w/nitric acid	(Different lab) 2x250mL amber	(see below) ^{5,6}
Upper Surficial-A	quifer										
MW-3	X	X			X	X	X	X			
MW-4	Χ	X			Х	Х	X	X			
MW-5	Х	X			Х	Х	X	X			
MW-6	Χ	X			X	Х	X	X			
DMW-1S	Х	X		Х	Х	Х	X	Х			
DMW-2S	Х	X	Х		Х	Х	X	Х		X	
DMW-3S	Х	X		Х	Х	Х	X	Х		X	
DMW-4S	X	X			X	X	X	X			
DMW-5S	X	X			X	X	X	X		X	
DMW-6S	Χ	X		Х	X	Х	X	X	X		
DMW-7S	Χ	X			X	Х	X	X			
DMW-9S	Χ	X			X	Х	X	X			X
DMW-10S	X	X			X	X	X	X			
DMW-11S	Χ	X			X	Х	X	X			X
MW-16S	Χ	X			X	Х	X	X	X		
MW-17S	Χ	X			Х	Х	X	X			
MW-18S	Χ	X			Х	Х	X	X			Х
MW-20S	Χ	X			Х	Х	X	X			
MW-23S	Χ	X			X	Х	X	X			
MW-24S	Χ	X			Х	Х	X	X			
MW-25S	Χ	X			Х	Х	X	X			
MW-26S	Х	X			Х	Х	X	Х			
MW-32S	X	X			X	X	X	X			
MW-33S	Х	X			Х	Х	X	Х			
MW-34S	Х	X			Х	Х	X	Х			
MW-35S	Х	X			Х	Х	X	Х			
MW-36S	Х	X			Х	Х	X	Х			
MW-37S	Х	X			Х	Х	X	Х			
MW-38S	Х	X			Х	Х	X	Х			
MW-39S	Χ	X			Х	Х	X	Х			
MW-40S	Χ	X			Х	Х	X	Х			
MW-41S	Х	X			Х	Х	X	Х			
MW-42S	Х	X			Х	Х	X	Х			
MW-43S	Χ	X			Х	Х	X	Х			
MW-44S	Χ	X			Х	Х	X	Х			
MW-45S	Х	X			Х	Х	X	Х			
MW-46S	X	X	Х	Х	X	X	X	X			
MW-47S	X	X	X	X	X	X	X	X			
MW-48S	Х	Х	Х	Х	Х	Х	Х	Х			Х
MW-49S	X	X	X	X	X	X	X	X			
MW-50S	X	X	X	X	X	X	X	X			

Chemical Analyses and Laboratory Analytical Methods for Wells to be Sampled in 2018
Lockheed Martin, Martin State Airport, Middle River, Maryland
Page 2 of 4

					A	nalytical Requiren	nente				
	VOCs (TICs, Freon 22, Freon 113)	1,4-Dioxane	Perchlorate ¹	Hexavalent Chromium ²	Total PPM	Dissolved PPM	Mercury	GRO and DRO	Radium 224, 226, and 228	Haloacetic Acids	Natural Attenuation Parameters ³
Monitoring Well	(USEPA 8260C)	(USEPA 8270 SIM)	(USEPA 6850)	(USEPA 218.6)	(USEPA 6020)	(USEPA 6020)	(USEPA 7470A)	(USEPA 8015B)	(USEPA 900 Series)	(USEPA 552.1 - 552.4)	(see below)4
Upper Surficial-A	quifer (continued)									302	
MW-51S	X	Х	X	X	Х	Х	Х	Х			
MW-52S	Х	Х	Х	Х	X	Х	X	Х			
MW-53S	X	X	Х	X	X	Х	X	X			
MW-54S	X	X	Х	Х	Х	X	X	X			
MT-MW-01S	X	X			X	Х	X	X			
MT-MW-02S	X	X			Х	Х	X	Х			
MT-MW-03S	Х	Х			X	Х	X	Х			
MT-MW-04S	X	X			X	Х	X	X			
MT-MW-05S	X	Х			Х	Х	X	Х			
MT-MW-06S	Х	X			X	Х	X	Х			
MT-MW-07S	X	Х			X	Х	X	Х			
MT-MW-08S	Х	Х			X	Х	X	Х			
MT-MW-09S	X	Х			X	Х	Х	Х			
MT-MW-10S	Х	Х			X	Х	X	Х			
MT-MW-11S	Х	X			Х	Х	X	Х			
MT-MW-12S	Х	Х			Х	Х	Х	Х			
Intermediate Sur				L							
DMW-1A	Х	Х		Х	Х	X	Х				
DMW-2A	Х	Х	Х		Х	Х	Х				
DMW-3I	Х	Х			Х	Х	X		X		
DMW-4I	Х	Х	Х		Х	Х	Х				
DMW-5I	Х	X	Х		X	Х	X				
DMW-6I	Х	X			Х	Х	X		X		
DMW-7I	X	X	Х		Х	Х	X				
DMW-8I	Х	Х		Х	Х	Х	Х				
DMW-9I	Х	Х			Х	Х	Х				Х
DMW-10I	Х	Х			Х	Х	Х				
DMW-11I	X	Х			X	Х	Х				
MW-14I	Х	Х			X	Х	Х				
MW-15I	Х	Х	Х		Х	Х	Х				
MW-16I	Х	Х			Х	Х	X		X		
MW-17I	Х	Х	Х		Х	Х	X				
MW-18I	X	X	X		X	X	X				X
MW-20I	Х	Х	Х		Х	Х	Х				
MW-21I	X	X	X		X	X	X				
MW-24I	X	X	X		X	X	X				
MW-25I	X	X			X	X	X				
MW-30I	X	X			X	X	X				
MW-32I	X	X			X	X	X				
MW-33I	X	X		Х	X	X	X				
MW-34I	X	X			X	X	X				
MW-40I	X	X			X	X	X				
MW-41I	X	X			X	X	X				
MW-42I	X	X			X	X	X				
MW-46I	X	X	Х	Х	X	X	X				
MW-47I	X	X	X	X	X	X	X				

Chemical Analyses and Laboratory Analytical Methods for Wells to be Sampled in 2018
Lockheed Martin, Martin State Airport, Middle River, Maryland
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					Α	nalytical Requirer	nents				
	VOCs (TICs, Freon 22, Freon 113)	1,4-Dioxane	Perchlorate ¹	Hexavalent Chromium ²	Total PPM	Dissolved PPM	Mercury	GRO and DRO	Radium 224, 226, and 228	Haloacetic Acids	Natural Attenuation Parameters ³
Monitoring Well	(USEPA 8260C)	(USEPA 8270 SIM)	(USEPA 6850)	(USEPA 218.6)	(USEPA 6020)	(USEPA 6020)	(USEPA 7470A)	(USEPA 8015B)	(USEPA 900 Series)	(USEPA 552.1 - 552.4)	(see below)4
Intermediate Sur	ficial-Aquifer (cont	inued)									
MW-48I	X	X	X	X	X	X	X				Χ
MW-49I	Χ	X	X	X	X	X	X				
MW-50I	X	X	X	X	X	X	X				
MW-51I	X	X	X	X	X	X	X				
MW-52I	X	X	X	X	X	X	X				
MW-53I	X	X	X	X	X	X	X				
MW-54I	X	X	X	X	X	X	X				
Lower Surficial-A											
DMW-1B	X	X			X	X	X				
DMW-2B	X	X			X	X	Х				
DMW-3D	X	X			X	X	X		X		
DMW-4D	X	X	X		X	X	Х				
DMW-6D	X	X	X		X	X	X		X		
DMW-7D	X	X			X	X	X				.,
DMW-9D	X	X			X	X	Х				X
MW-14D	X	X		X	X	X	X				
MW-15D	X	X	X	X	X	X	X				
MW-16D	X	X	Х	X	X	X	Х		X		
MW-17D				Х							
MW-19D	X	X			X	X	X				
MW-20D	X	X	Х		X	X	X				
MW-21D	X	X			X	X	X				
MW-22D MW-23D	X	X			X	X	X				
	X	X	V	V	X	X	X				
MW-46D	X	X	X	X	X	X	X				
MW-47D MW-48D	X	X	X	X	X	X	X				X
MW-48D MW-49D	X	X	X	X	X	X	X				٨
MW-49D MW-50D	X	X	X	X	X	X	X				
MW-51D	X	X	X	X	X	X	X				
MW-51D MW-52D	X	X	X	X	X	X	X				
IVI W -52D	Χ	Α				Λ		I		ı	

Chemical Analyses and Laboratory Analytical Methods for Wells to be Sampled in 2018 Lockheed Martin, Martin State Airport, Middle River, Maryland Page 4 of 4

		Analytical Requirements									
	VOCs (TICs, Freon 22, Freon 113)	1,4-Dioxane	Perchlorate ¹	Hexavalent Chromium ²	Total PPM	Dissolved PPM	Mercury	GRO and DRO	Radium 224, 226, and 228	Haloacetic Acids	Natural Attenuation Parameters ³
Monitoring Well	(USEPA 8260C)	(USEPA 8270 SIM)	(USEPA 6850)	(USEPA 218.6)	(USEPA 6020)	(USEPA 6020)	(USEPA 7470A)	(USEPA 8015B)	(USEPA 900 Series)	(USEPA 552.1 - 552.4)	(see below)4
Deep Confined A	quifer										
MW-27D	X	X	X	X	X	X	X		X		
MW-29D	X	X	X	X	X	X	X		X		
MW-30D	X	X	X	X	X	X	X				•

Notes:	Wells not Sampled:				
 Perchlorate will be analyzed by USEPA Method 6850 with a specified detection limit of 1 µg/L. 	RW1S	MW19I	DMW5D	GSP-SBWP33	GSP-SBWP66
2. Hexavalent chromium will be analyzed by USEPA Method 218.6 (ion chromotography)	OW1S	MW22I	DMW8D	GSP-SBWP39	GSP-SBWP71
with a specified detection limit of 0.02 ug/L which is lower than the method's published	MW2	MW23I	MW18D	GSP-SBWP40	GSP-SBWP83
detection limit of $0.10 \mu g/L$.	DMW8S	MW26I		GSP-SBWP44	GSP-SBWP84
3. Natural attenuation parameters: nitrate, nitrite, ammonium nitrogen,	MW15S	MW28I		GSP-SBWP50	GSP-SBWP89
phosphate, sulfate, total alkalinity, dissolved organic carbon, total iron				GSP-SBWP54	
total calcium, total manganese, total potassium, total magnesium, total				GSP-SBWP61	
chloride, total silica, total dissolved solids, methane, ethane and ethene.					

- 4. Natural attenuation parameters will be analyzed by USEPA Method SW846, and methane, ethane, and ethene will be analyzed using Microseeps © AM 20GAX
- 5. Dissolved gases (2 x 40 mL with hydrochloric acid); ammonia (250mL plastic with sulfuric acid); dissolved organic carbon (2 x 40 mL vial with sulfuric acid); remaining parameters of alkalility, total dissolved solids, anions (1 liter plastic)
- 6. Methane, ethane and ethene (2 x 40 mL vials with hydrochloric acid)

Abbreviations:

μg/L - micrograms per liter PPM - priority pollutant metals DRO - diesel-range organics TICs - tentatively identified compounds

mL - milliliter VOCs - volatile organic compounds

APPENDICES



HEALTH AND SAFETY PLAN FOR LOCKHEED MARTIN CORPORATION

SOIL AND GROUNDWATER CHARACTERIZATION

MARTIN STATE AIRPORT

MIDDLE RIVER, MARYLAND



TETRA TECH, INC. FOSTER PLAZA 7 661 ANDERSEN DRIVE PITTSBURGH, PA 15220

> JANUARY 2016 REVISION 3

HEALTH AND SAFETY PLAN FOR LOCKHEED MARTIN CORPORATION

SOIL AND GROUNDWATER CHARACTERIZATION MARTIN STATE AIRPORT

701 WILSON POINT ROAD MIDDLE RIVER, MARYLAND

Submitted by: Tetra Tech, Inc. Foster Plaza 7 661 Andersen Drive Pittsburgh, PA 15220

> JANUARY 2016 REVISION 3

PREPARED UNDER THE SUPERVISION OF: APPROVED BY:

MICHAEL MARTIN, P.G. REGIONAL MANAGER GERMANTOWN, MARYLAND

PROJECT HEALTH AND SWFETYOFFICER

PITTSBURGH, PENNSYLVANIA

CLYDE SMYDER

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been developed to provide the minimum practices and procedures for Tetra Tech, Inc. (Tetra Tech) and subcontractor personnel engaged in the Martin State Airport (MSA) at the Lockheed Martin Corporation (LMC), in Middle River, Maryland.

This HASP must be used in conjunction with the Tetra Tech Health and Safety Standard Operating Procedures (TtSOPs). The TtSOPS can be found on the my Tetra Tech site <a href="https://my.tetratech.com/go3/index.php?option=com_wrapper&view=wrapper<emid=376">https://my.tetratech.com/go3/index.php?option=com_wrapper&view=wrapper<emid=376 which contains Tetra Tech Health and Safety Standard Operating Procedures (SOPs) referenced in this HASP. This HASP was developed to comply with the requirements stipulated in 29 CFR 1910.120 (OSHA's Hazardous Waste Operations and Emergency Response Standard) and applicable sections of 29 CFR 1926 (Safety and Health Regulations for Construction).

All contractor responsibilities stipulated in Section 1 of the Lockheed Martin Remediation Contractor's ESH Handbook (LM Handbook) will be adhered to. The LM Handbook can be found in Attachment I of this HASP.

Copies of all pertinent environmental, safety and health (ESH) records must be maintained <u>at the job site</u>. This includes, but is not limited to, this site-specific HASP, the Tetra Tech Health and Safety Guidance Manual, personnel training documentation, evidence of enrollment in a medical surveillance program, accident/injury reporting, work area inspections, periodic safety meetings, SDS, air monitoring data, waste container inspections, etc. These records must also be provided electronically to the Lockheed Martin Project Lead.

This HASP has been developed using the latest available information regarding known or suspected chemical contaminants and potential physical hazards associated with the proposed work and site. The HASP will be modified if the scope of work changes or if new information regarding site conditions, hazards, or contaminants of concern becomes available. If deviations are encountered from the field work plan, the contractor shall A) notify to the Lockheed Martin Project Lead and B) suspend work to assess changes to the work plan(s) and the HASP shall be reviewed by the Project Lead. Procedures addressing changes to this HASP as described in Section 6 of the LM Handbook (Attachment I) will be followed.

1.1 TETRA TECH SAFETY STATISTICS

Table 1-1 presents safety statistics for Tetra Tech for the last 3 calendar years compared to the national averages for our industry. This comparison uses data collected by the United States Department of Labor, Bureau of Labor Statistics (BLS) for different types of employers, segregated by North American Industry Classification System (NAICS) codes.

TABLE 1-1

TETRA TECH INCIDENT RATES

COMPARISON OF TETRA TECH AND 2011 BLS DATA FOR NAICS CODE 541620 (TRIR AND LWDIR CASE RATES)

	NAICS 541620 Professional and Business Services 2013	Tetra Tech 2012	Tetra Tech 2013	Tetra Tech 2014
Total Recordable Incident Rate (TRIR)	1.00	0.67	0.69	0.51
Lost Workday Incident Rate (LWDIR)	0.40	0.10	0.15	0.12

The data comparison illustrates that Tetra Tech's performance compares favorably with the most-recent national averages for the environmental engineering and hazardous waste services industries. Raw data for these statistics can be found in the Occupational Safety and Health Administration (OSHA) Form 300A attached as Figure 1-1.

Tetra Tech Man Hours Worked

2012	24,904,295
2013	24,812,849
2014	23.586.978

Tetra Tech Experience Modification Rates (Policy Year October 1 - September 30):

2013 - 2014	0.80
2014 - 2015	0.83
2015 – 2016	0.77

1.2 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibilities for site safety and health for Tetra Tech employees conducting field activities under this field effort. All personnel assigned to participate in the field work have the primary responsibility for performing all of their work tasks in a manner that is consistent with the Tetra Tech Health and Safety Policy, the health and safety training that they have received, the contents of this HASP, and in an overall manner that protects their personal safety and health and that of their co-workers. The following persons are the primary point of contact and have the primary responsibility for observing and implementing this HASP and for overall on-site health and safety.

- The Tetra Tech Project Manager (PM) is responsible for the overall direction and implementation of this HASP.
- The Field Operations Manager (FOL) manages field activities, executes the work plan, and enforces safety procedures as applicable to the work plan.
- The Project Health and Safety Officer (PHSO) is responsible for developing this HASP in accordance with applicable OSHA regulations. Specific responsibilities include:
 - Providing information regarding site contaminants and physical hazards.
 - Establishing air monitoring and decontamination procedures.
 - Assigning personal protective equipment based on task and potential hazards.
 - Determining emergency action procedures.
 - Identifying appropriate emergency contacts.
 - Stipulating training and medical surveillance requirements.
 - Providing standard work practices to minimize potential injuries and exposures associated with hazardous waste site work.
 - Modify this HASP, where and when necessary.
- The Site Safety Officer (SSO) supports site activities by advising the PM on the aspects of health and safety on site. These duties may include the following:
 - Coordinate health and safety activities with the FOL.
 - Select, inspect, implement, and maintain personal protective equipment.
 - Establish work zones and control points.
 - Implements air-monitoring program for onsite activities.
 - Verify training and medical status of onsite personnel status in relation to site activities.
 - Implements hazard communication, respiratory protection, and other associated safety and health programs as necessary.
 - Coordinates emergency services.

- Provides site specific training for onsite personnel.
- Investigates accidents and injuries (see Attachment II Incident Report Form)
- Provides input to the PHSO regarding the need to modify, this HASP, or other applicable health and safety associated documents as per site-specific requirements.

Radiation Site Officer

- Provide direction to Radiation Control Technicians (RCTs) and site workers
- Suspend work if any suspect or unknown radiological hazard is discovered
- Report all potential contamination events.
- Compliance with the requirements of this HASP are monitored by the SSO and coordinated through the Tetra Tech Project Health and Safety Officer (PHSO)

Note: In some cases one person may be designated responsibilities for more than one position. For example, the FOL may also be responsible for the SSO duties. This action will be performed only as credentials, experience, and availability permits.

1.3 STOP WORK

All employees are empowered, authorized, and responsible to stop work at any time when an imminent and uncontrolled safety or health hazard is perceived. In a Stop Work event (immediately after the involved task has been shut down and the work area has been secured in a safe manner) the employee shall contact the Project Manager and the Project Health and Safety Officer. Through observations and communication, all parties involved shall then develop, communicate, and implement corrective actions necessary and appropriate to modify the task and to resume work.

Site Name: Martin State Airport Lockheed Martin Address: Middle River, Maryland LMC Contact: Paul Calligan Phone Number: (240) 676-5392 Proposed Dates of Work: January 2016 until completion **Project Team: Tetra Tech Management Personnel:** Discipline/Tasks Assigned: **Telephone** Michael Martin, P.G. Regional Manager (301) 528-3022 (410) 707-5259 Tony Apanavage Project Manager (PM) (301)-528-3021 (301)-233-8230 Site Safety Officer (SSO) TBD James Laffey Tetra Tech NUS Health and Safety Manager (412) 921-8678 Project Health and Safety Officer (PHSO) Clyde J. Snyder (412) 921-8904 Lawson Bailey Radiation Safety Officer (706) 830-7530 Amy Stanford Alt Radiation Safety Officer (706) 832-7394 TBD _____ *Excavation Competent Person TBD * MUST BE FILLED OUT PRIOR TO BEGINNING WORK **Non-Tetra Tech Personnel** Affiliation/Discipline/Tasks Assigned Telephone Hazard Assessment (for purposes of 29 CFR 1910.132) for HASP preparation has been conducted by:

SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Prepared by: Clyde J. Snyder and Jennifer Carothers, PhD

1.4

FIGURE 1-1 OSHA 300 LOGS

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U.S. Department of Labor Form approved OMB no. 12:18-0нтв Year 2013 15220 30-Jan-13 Date I certify that I have examined this document and that to the best of my knowledge the entries are line, accurate, and 07 Pennsylvania OR North American Industrial Classification (NAICS), if snown (e.g., 386212) Standard Industrial Classification (SIC), if known (e.g., SIC 2715) Your establishment name Tetra Tech- NUS Operating Unit Industry description (e.g., Manufacture of motor truck frailers) 874,205 Knowingly faisifying this document may result in a fine. 480 Street 661 Anderson Dave, Foster Plaza Total hours worked by all employees last year Annual average number of employees (412) 92"-7217 Establishment information Employment Information City Pitlesburgh Sign here Summary of Work-Related Injuries and Illnesses Post this Summary page from February 1 to April 30 of the year following the year covered by the form Public reporting burdan for this calkedion of information is settingted to exercise 26 minimates par response, including time to make the instruction, wenth, many times it in the part of the control of the collection of including and control of the collection of including and the collection of including and the collection of the colle Total number of ather recordable cases Employees format employees, and their representelives have the right to review the OSH4 Form 300 in its entirely. They also have furthed access to the OSH4 Form 301 or his equivalent. See 29 CFR 1904.33, in OSH4 is Reconfinating the, for further details on the access printeters for these forms. Alt establishments covered by Part 1904 must compilete this Summery cege, even if no injuries or Whesses occurred cluthsy the year. Pernember to review the Log to verify that the entries are compilete Using the Log, count the individual anthias you made for each calegory. Then write the totals below, making suns you've added the enthias from every page of the top. If you had no usases write "0." E Total number of days of job transfer or restriction Total number of cases with job transfer or (6) All Other Illnesses OSHA's Form 300A (Rev. 04/2004) (4) Poisoning (5) Hearing Loss 8 m 2 restriction Total number of cases with days away from work £ Injury and Illness Types (1) Injury (2) Skin Disorder (3) Respiratory Condition **Humber of Cases** Total number of... mber of Days Total number of Total number of days away from 9 08 0 deaths



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Summary of Work-Related Injuries and Illnesses OSHA's Form 300A (Rev. 01/2004)

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2.0 EMERGENCY ACTION PLAN

2.1 INTRODUCTION

This section has been developed as part of a planning effort to direct and guide field personnel in the event of an emergency. In the event of an emergency, the field team will primarily evacuate and assemble to an area unaffected by the emergency and notify the appropriate local emergency response personnel/agencies. Workers who are ill or who have suffered a non-serious injury may be transported by site personnel to nearby medical facilities, provided that such transport does not aggravate or further endanger the welfare of the injured/ill person. The emergency response agencies listed in this plan are capable of providing the most effective response, and as such, will be designated as the primary responders. These agencies are located within a reasonable distance from the area of site operations, which ensures adequate emergency response time.

Tetra Tech personnel may participate in minor event response and emergency prevention activities such as:

- Initial fire-fighting support and prevention
- Initial spill control and containment measures and prevention
- Removal of personnel from emergency situations
- Provision of initial medical support for injury/illness requiring only first-aid level support
- Provision of site control and security measures as necessary

2.2 EMERGENCY PLANNING

Through the initial hazard/risk assessment effort, emergencies resulting from chemical, physical, or fire hazards are the types of emergencies which could be encountered during site activities. To minimize or eliminate the potential for these emergency situations, pre-emergency planning activities will include the following (which are the responsibility of the SSO and/or the FOL):

- Coordinating with Lockheed Martin Martin State Airport and/or local emergency response personnel to ensure that Tetra Tech emergency action activities are compatible with existing emergency response procedures.
- Establishing and maintaining information at the project staging area (support zone) for easy access in the event of an emergency. This information will include the following:
 - Chemical Inventory (of chemicals used onsite), with Safety Data Sheets (SDS).

- Onsite personnel medical records (Medical Data Sheets).
- A log book identifying personnel onsite each day.
- Hospital route maps with directions (these should also be placed in each site vehicle).
- Emergency Notification phone numbers.

The Tetra Tech FOL will be responsible for the following tasks:

- Identifying a chain of command for emergency action.
- Educating site workers to the hazards and control measures associated with planned activities at the site, and providing early recognition and prevention, where possible.
- Periodically performing practice drills to ensure site workers are familiar with incidental response measures.
- Providing the necessary equipment to safely accomplish identified tasks.

2.3 EMERGENCY RECOGNITION AND PREVENTION

2.3.1 Recognition

Through the hazard assessment, it has been determined that the following potential hazards that could be encountered:

Physical Injury resulting from:

Struck By: High-pressure lines could become disconnected and whip resulting in possible injury. Prevention methods include having locking/ or pinned hose connections and whip checks to prevent disconnection.

Entanglement: Entanglement hazards exist with the conveyor auger and rotating pump components. To minimize these hazards equipment will be inspected to ensure guarding is in place. If the auger conveyor is not equipped with a safety interlock on the lid to the auger, then administration controls will be put in place to control persons accessing an unguarded rotating auger. See the TtSOP SWP 05-36 Drill Rigs Attachment V for additional direction.

Chemical Exposure: The scope of this work involves possible exposure to chemical contaminants site personnel will:

- Reviewed the SDS and will have ready any emergency response measures necessary for response.
 This includes an eyewash station and safety shower or drench hose if required.
- Locate a hospital that has decontamination capabilities and can provide care to chemical-exposed personnel. If employees are injured due to chemical contamination the nearest medical facility with the capability to decontaminate exposed individuals is John Hopkins Bayview Hospital at 4940 Eastern Ave. Baltimore Maryland (see Figure 2-2 for directions).

Foreseeable emergency situations that may be encountered during site activities will generally be recognizable by visual observation. A clear knowledge of the signs and symptoms of overexposure to contaminants of concern may alert personnel of the potential hazards concerning themselves or their fellow workers.

Tetra Tech will minimize or eliminate exposure to recognized hazardous substances covered by OSHA. OSHA requires that exposure to hazardous materials that are not directly covered be monitored and maintained below the limits set forth by the American Conference of Governmental Industrial Hygiene (ACGIH), National Institute for Occupational Safety and Health (NIOSH), and manufacturers' recommended limits. OSHA and the ACGIH have established required or suggested exposure limits for various chemicals in use today. For materials that have more than one established exposure limit, the most stringent exposure limit will apply when determining exposure limits, monitoring requirements, effective control technologies, employee training, and reporting.

In determining the substances that are in use and the areas of exposure, the SSO will develop a program to monitor the operation. The PHSO will determine the potential for exposure and will monitor appropriately for the determination of hazard levels. In addition, the SSO will make any recommendations deemed necessary for the protection of worker health and safety. When hazards are identified, they will be addressed in accordance with the following prevention measures to eliminate the workplace hazards:

- Whenever possible, engineering controls will be implemented to eliminate or control hazards,
- Followed by administrative controls
- As a last resort, the use of personal protective equipment.

These potential hazards, are discussed in detail in Sections 5.0 and 6.0. Additionally, early recognition will be supported by periodic site surveys to eliminate any conditions that may predispose site personnel or properties to an emergency. These surveys will consist of ensuring:

- Approach paths to monitoring wells are maintained (cleared, mowed, etc.)
- Monitoring well protective casings are cleared of spider and insect nests.
- All equipment is inspected and ready for use looking for items such as guards, connections are pinned or whip checked control potential flailing in the event the connect disconnects.
- Ensure emergency equipment is staged, inspected, and is ready for immediate response.
- Ensure personnel are employing protective equipment as described in this HASP.

The FOL and the SSO will constitute the site evaluation committee responsible for these periodic surveys. Site surveys will be conducted at least once a week during the initiation of this effort. These surveys will be documented in the Project Logbook.

2.3.2 <u>Prevention</u>

Tetra Tech and subcontractor personnel will minimize the potential for emergencies by following the TtSOP's and ensuring compliance with the HASP and applicable OSHA regulations. Daily site surveys of work areas, prior to the commencement of that day's activities, by the FOL and/or the SSO will also assist in prevention of illness/injuries when hazards are recognized early and control measures initiated.

2.3.3 Fire Prevention / Flammable Liquids

Tetra Tech and subcontractor personnel are responsible for fire prevention and protection in all of their work areas at all times during the duration of this field effort (24 hours per day/seven days per week). All site vehicles (both Tetra Tech and contractor vehicles) will be equipped with Fire Extinguishers and First Aid Kits. Since fuels will be maintained on site approved ABC fire-fighting extinguishers must be provided. Tt personnel and subcontractor personnel will only fight fires in the incipient stage (small fires) when there is no danger of injury to personnel. Fire beyond the incipient stage requires immediate site evacuation and notification of the Fire Department.

The Lockheed Martin Project Lead will be notified as soon as possible of any fire, if Tetra Tech or subcontractor personnel use a Lockheed Martin fire extinguisher, and of any and all fires that are extinguished. In case of fire, Tetra Tech and subcontractor personnel will call 9-1-1.

All flammable and combustible liquids must be stored, dispensed and used in accordance with OSHA regulations and the Uniform Fire Code. Bonding and grounding of containers containing flammable liquids will be required.

All fire prevention/flammable liquids safety procedures and requirements stipulated in Section 3.15 of the LM Handbook (Attachment I) will also be adhered to.

2.4 MARINE EMERGENCIES

Many emergency and incident scenarios which occur on land may also occur in the marine environment. The severity and response actions for incidents may be very different when they occur on the water. Marine applications of emergency planning and response have been included in this document, however marine operations can be quite different in the planning and response requirements, and will be dependent on the type of equipment and watercraft being used. Individual vessels may have distinctly different features which cannot be addressed in a single plan, and therefore the cooperation and assistance of all contractors for marine activities is required.

One of the most potentially serious types of marine emergencies that could occur is when a person falls into the water (a "Man Overboard" event, or "MOB" emergency). This is particularly dangerous when ambient temperature and water temperature conditions are low, which is anticipated on this project as the dredging operations will occur during the winter months. This is of particular concern because a person who becomes immersed into cold water and then is removed from the water into a cold environment is susceptible to the risks of severe cold stress, including hypothermia. The procedures and controls that will be in place and followed in the event of an MOB event are addressed in section 5.2.3.2 ("Man Overboard (MOB) Procedures") of this Plan.

Support vessels consisting of a 30ft. Jack Boat and a Tug Boat will be on scene at all times during dredging operations. These support vessels will be maintained in fueled and fully operational status. They will serve as emergency vessels to be used to evacuate workers from the barges, and to rescue retrieve and transport any field crew to the shore who may need emergency treatment or assistance.

2.4.1 <u>Marine Emergency Equipment</u>

The following additional emergency equipment is required for marine applications.

2.4.1.1 General

Each watercraft shall carry fire extinguishers (for use in gasoline, oil and grease fires) approved by
Underwriters Laboratories (UL). Each fire extinguisher shall be inspected by the owner/operator
monthly to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire
extinguishers shall be replaced or recharged immediately. Extinguisher requirements are as follows:

Length of Watercraft	Extinguisher Type	Number Required
26 Feet or Less	1-A:10-B:C	1
26 Feet or More	1-A:10-B:C	2

• All watercraft shall carry at least one air horn or similar sound-signaling device.

2.4.1.2 Flotation Devices

Personal

- A USCG approved Personal Floatation Device (PFD) shall be provided to and properly worn by all
 persons in the following circumstances:
 - On all watercraft, including barges, floating plants, powered and non-powered vessels and boats, floating work platforms, floating pipelines, pontoons, etc.
 - On structures extending over or next to water except where guardrails or safety nets are provided for employees.
 - Any work on or near water where falling into the water is a potential hazard.
 - Working alone at night where there are drowning hazards, regardless of other safeguards provided.
 - Wherever there is a drowning hazard.
- PFDs are required for all marine work.

<u>Life Rings – Watercraft</u>

• Each watercraft shall be equipped with at least one Type IV PFD, designed to be thrown to a person in the water and grasped and held by the user until rescued. A life ring or horseshoe buoy are two common examples of a Type IV PFD. All Type IV PFDs must be approved by the ESS prior to use. Life rings (rope attachment not required) and ring buoys (rope attachment required) shall conform to the requirements of 46 CFR 160 (USCG approval) and shall have at least 70 feet (21 meters) of 3/8 inch (1 centimeter) solid braid polypropylene line, or equivalent, attached. Throw bags may be used in addition to life rings or ring buoys.

- Life rings or ring buoys shall be readily available and shall be provided as follows:
- A minimum of one on each vessel.
- A minimum of one on all motor boats up to 40 feet (12 meters) in length and at least two for motor boats
 40 feet (12 meters) in length or longer.
- A minimum of two on any other piece or group of floating plant up to 100 feet (30 meters) in length and one additional for each increase in length of 100 feet (30 meters) or fraction thereof.

<u>Life Rings – Shoreline Locations</u>

- Life rings (Type IV PFD) with at least 90 feet of line, shall be provided and readily available for emergency rescue operations as follows:
- A minimum of one life ring at intervals of not more than 200 feet (60 meters). Examples of applicable
 locations include: floating pipelines, walkways, wharves, piers, bulkheads, scaffolds, platforms, and
 similar structures extending over or immediately next to water.

2.4.1.3 MOB "Pike Poles"

These are 20-foot long wooden poles that have a hook affixed on one end. The purpose of the poles is to be used to reach to a person in the water to assist them by pulling them in toward the boat or shoreline. The hook on the end of each pike pole is designed so that it can readily hook onto the loop on the back of a PFD (in the event the person is unconscious or otherwise cannot grab the pole and requires such assistance. If the injured person is unconscious and face down in the water, it s obvious that time is of the essence to affect a rescue. In such a dire emergency, other field team members may jump into the water to aid in assisting their incapacitated co-worker.

2.5 EVACUATION ROUTES, PROCEDURES, AND PLACES OF REFUGE

An evacuation will be initiated whenever recommended hazard controls are insufficient to protect the health, safety or welfare of site workers. Specific examples of conditions that may initiate an evacuation include, but are not limited to the following: severe weather conditions; fire or explosion; monitoring instrumentation readings which indicate levels of contamination are greater than instituted action levels; and evidence of personnel overexposure to potential site contaminants.

In the event of an emergency requiring evacuation, personnel will immediately stop activities and report to the designated safe place of refuge unless doing so would pose additional risks. When evacuation to the primary place of refuge is not possible, personnel will proceed to a designated alternate location and remain until further notification from the Tetra Tech FOL. Safe places of refuge will be identified prior to the commencement of site activities by the SSO and will be conveyed to personnel as part of the pre-activities training session. This information will be reiterated during daily safety meetings. Whenever possible, the safe place of refuge will also serve as the telephone communications point for that area. During an evacuation, personnel will remain at the refuge location until directed otherwise by the Tetra Tech FOL or the on-site Incident Commander of the Emergency Response Team. The FOL or the SSO will perform a head count using the site sign in sheet for accountability to account for and to confirm the location of site personnel. Emergency response personnel will be immediately notified of any unaccounted personnel. The SSO will document the names of personnel onsite (on a daily basis) in the site Health and Safety Logbook. This information will be utilized to perform the head count in the event of an emergency.

Evacuation procedures will be discussed during the pre-activities training session, prior to the initiation of project tasks. Evacuation routes from the site and safe places of refuge are dependent upon the location at which work is being performed and the circumstances under which an evacuation is required. Additionally, site location and meteorological conditions (i.e., wind speed and direction) may dictate evacuation routes. As a result, assembly points will be selected and communicated to the workers relative to the site location where work is being performed. Evacuation should always take place in an upwind direction from the site.

2.6 EMERGENCY CONTACTS

Prior to initiating field activities, personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. Table 2-1 provides a list of emergency contacts and their associated telephone numbers. This table must be posted where it is readily available to site personnel. Facility maps should also be posted showing potential evacuation routes and designated meeting areas.

Any pertinent information regarding allergies to medications or other special conditions will be provided to medical services personnel. This information is listed on Medical Data Sheets filed onsite (see Attachment III). If an exposure to hazardous materials has occurred, provide hazard information from Medical Data Sheet to medical service personnel.

The Lockheed Martin Project Lead shall be contacted immediately in the event of a fatal or serious injury, and unpermitted environmental release, or any ESH incident that is likely to generate significant publicity or an adverse situation for Lockheed Martin. Detailed requirements are describe in Section 1.15 of the LM Handbook (Attachment I).

FIRE PREVENTION AND PROTECTION

In the event of a fire or explosion, procedures will include immediately evacuating the site (air horn will sound for a single continuous blast), and notification of local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

Fire Prevention

The major workplace fire hazards are flammable liquids and fuels, motorized vehicles, and equipment. Fires will be prevented by adhering to the following precautions:

- · Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- No smoking in the EZ or any work area.
- No hot work without a properly executed hot work permit.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 5 pounds ABC located on all heavy equipment, in the on-site office, and near all hot work activities.
- Monthly inspections of all fire extinguishers.

Fire Protection

A map of all fire extinguisher locations will be developed. The person responsible for the maintenance of fire prevention and/or control equipment is the SSO. The person responsible for the control of fuel source hazards is the SSO.

2.7 OVERT CHEMICAL EXPOSURE

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Safety Data Sheet (SDS) or recommended by the Corporate Medical Consultant will be followed, when necessary. .

- SKIN AND EYE CONTACT: Use copious amounts of water. Rinse affected areas thoroughly, then
 provide appropriate medical attention. Eyes and skin should be rinsed for 15 minutes upon chemical
 contamination.
- INHALATION: Move to fresh air. Decontaminate and transport to hospital or local medical provider.

- INGESTION: Decontaminate and transport to emergency medical facility.
- PUNCTURE WOUND OR LACERATION: Decontaminate and transport to emergency medical facility.

In the event of an emergency not requiring 9-1-1, LMC facility personnel should be contacted in the order presented on Table 2-1.

TABLE 2-1

EMERGENCY CONTACTS LMC MARTIN STATE AIRPORT MIDDLE RIVER, MARYLAND

AGENCY	TELEPHONE
EMERGENCY (Police, Fire, and Ambulance)	911
LMC Project Lead, Paul Calligan	(240) 676-5392
Airport Operations Manager Charles M. Baublitz	(410) 682-8831
Airport Director Al Pollard, A.A.E	(410) 682-8800
Mike Musheno	(410) 682-1315 (Office) (610) 656-4012 (Cell)
Maryland Air National Guard Lt Col Peter Loebach	(410) 918-6486
Franklin Square Hospital	(443) 777-7000
John Hopkins Bayview Hospital (Chemical Exposure Decontamination)	(410)-550-0350
Chemtrec	(800) 424-9300
National Response Center	(800) 424-8802
Project Health Physicist (PHP), Lawson Bailey	(803) 641-6326 (Office) (706) 830-7530 (Cell)
Poison Control Center	(800) 222-1222
WorkCare	(888) 449-7787
Regional Manager, Michael Martin	(301) 528-3022
Tetra Tech Health and Safety Manager (HSM), Jim Laffey	(412) 921-8678
Tetra Tech Project Health and Safety Officer (PHSO), Clyde Snyder	(412) 921-8904 (Office) (724) 516-0907 (Cell)
Tetra Tech Radiation Site Officer (RSO), Lawson Bailey or Amy Stanford	(706) 830-7530 or (706) 832-7394
Miss Utility Maryland/DC	1-800-257-7777

2.8 EMERGENCY ROUTE TO HOSPITAL

FIGURE 2-1
ROUTE TO FRANKLIN SQUARE HOSPITAL CENTER



From: 701 Wilson Point Road, Middle River, Maryland, United States

To: MedStar Franklin Square Medical Center, Franklin Square Drive, Rosedale, MD, United States

Total Distance: 6.0 miles (9.7km)
Total Estimated Time: 0 hr., 11 mins.

Directions

701 Wilson Point Road, Middle River, Maryland, United States to MedStar Franklin Square Medical Center, Franklin Square Drive, Rosedale, MD, United States

Distance: 6.0 miles (9.7km) Time: 0 hrs., 11mins.

- Head northwest on Strawberry Point Rd toward Dogwood Dr-Drive for 0.4 miles.
- 2. Slight right onto Wilson Point Rd Drive for 1.1 miles.
- 3. Turn left onto Eastern Blvd Drive for 0.4 miles.
- 4. Take the ramp to US 40 Drive for 0.2 miles.
- Merge onto Martin Blvd Drive for 1.7 miles.
- Keep left at the fork, follow signs for US 40 W and merge onto US-40 W - Drive for 1.0 miles.
- 7. Turn right onto Rossville Blvd Drive for 1.1 miles.
- 8. Turn right onto Franklin Square Dr Drive for a short distance.



FIGURE 2-2
ROUTE TO JOHNS HOPKINS BAYVIEW HOSPITAL

From: 701 Wilson Point Road, Middle River, MD, United States To: 4940 Eastern Avenue, Baltimore, MD 21224, USA

Total Distance: 9.4 miles (15.1km)
Total Estimated Time: 0 hr., 18 mins.

Directions

701 Wilson Point Road, Middle River, MD, United States to 4940 Eastern Avenue, Baltimore, MD 21224, USA

Distance: 9.4 miles (15.1km) Time: 0 hrs., 18mins.

- Head northwest on Strawberry Point Rd toward Dogwood Dr-Drive for 0.4 miles.
- 2. Slight right onto Wilson Point Rd Drive for 1.1 miles.
- Turn left onto MD-150 W/Eastern Blvd Continue to follow MD-150 W - Drive for 5.5 miles.
- Merge onto MD-151 N/North Point Blvd via the ramp to Erdman Ave - Drive for 0.8 miles.
- 5. Turn left onto Kane St Drive for 0.2 miles.
- 6. Slight right onto E Lombard St Drive for 1.0 miles.
- 7. Turn left onto Bioscience Dr Drive for 0.3 miles.
- 8. Turn left onto Nathan Shock Dr Drive for a short distance.

2.9 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

Tetra Tech personnel will be working in close proximity to each other at Lockheed Martin MSA. As a result, hand signals, voice commands, and line of site communication will be sufficient to alert site personnel of an emergency.

If an emergency warranting evacuation occurs, the following procedures are to be initiated:

- Initiate the evacuation via hand signals, voice commands, or line of site communication
- Report to the designated refuge point where the FOL will account for all personnel
- Once non-essential personnel are evacuated, appropriate response procedures will be enacted to control the situation.
- Notify Lockheed Martin
- Locate a hospital that has decontamination capabilities and can provide care to chemical-exposed
 personnel. If employees are injured due to chemical contamination the nearest medical facility with the
 capability to decontaminate exposed individuals is John Hopkins Bayview Hospital at 4940 Eastern
 Ave. Baltimore Maryland (See Figure 2-2 for directions).
- Describe to the FOL (FOL will serve as the Incident Coordinator) pertinent incident details.
- If possible, have a smartphone app such as iTriage downloaded on field phones and ensure field crews understand how the app works. Available at: iTriage (https://www.itriagehealth.com)
- iTriage can provide routes to the selected medical facility. A Hospital Map is also provided in Figure 2-1



In the event that site personnel cannot mitigate the hazardous situation, the FOL and SSO will enact emergency notification procedures to secure additional assistance in the following manner:

Dial 911 and call other pertinent emergency contacts listed in Table 2-1 and report the incident. Give the emergency operator the location of the emergency, the type of emergency, the number of injured, and a brief description of the incident. Stay on the phone and follow the instructions given by the operator. The operator will then notify and dispatch the proper emergency response agencies.

2.10 PERSONAL PROTECTIVE EQUIPMENT (PPE) AND EMERGENCY EQUIPMENT

A first-aid kit, eye wash units (or bottles of disposable eyewash solution) and fire extinguishers (strategically placed) will be maintained onsite and shall be immediately available for use in the event of an emergency. This equipment will be located in the field office as well as in each site vehicle. At least one first aid kit supplied with equipment to protect against bloodborne pathogens will also be available on site. Personnel identified within the field crew with bloodborne pathogen and first-aid training will be the only personnel permitted to offer first-aid assistance.

Safety eyewear meeting American National Standards Institute (ANSI) Z87.1 is required in areas designated as "Eye Protection Required" and is also required on all jobs where a potential injury to the eye is possible whether or not the area is posted.

Safety shoes and boots which meet the new ASTM International standards, F 2412, Test Methods for Foot Protection, and F 2413, Specification for Performance Requirements for Protective Footwear, have replaced the former ANSI Z41 standard, Standard for Personal Protection-Protective Footwear, which has now been withdrawn. Both of the new ASTM standards are under the jurisdiction of ASTM Committee F13 on Pedestrian/Walkway Safety and Footwear. The American National Standards Institute's Z41 Committee on Personal Protection-Protective Footwear has merged into ASTM International's Committee F13. The new ASTM standards contain minimal changes from the withdrawn ANSI Z41 1999 standard with regard to test methodology. The new standards F 2412 and F 2413 will permit the continued use of safety and performance standards previously provided in the ANSI document, which has been an important part of worker safety since 1967. The new standards continue the long-standing effort to help protect against toe, metatarsal and foot bottom injuries. The new ASTM protective footwear standards are enhanced with expanded information on upper class 50 and class 75 toe protection performance requirements.

Appropriate NIOSH-approved respiratory protective devices must be worn when applicable state and/or federal action levels or OSHA permissible exposure levels are exceeded. Appropriate air monitoring and respiratory protection equipment will be supplied and maintained if inhalation hazards are anticipated and a respiratory protection adhering to all state and federal regulations implemented.

Hearing protection must be worn in all areas posted to indicate high noise level or where employees are exposed to noise levels in excess of the OSHA action level (85 dBA over an 8-hour time-weighted average or a dose of fifty percent).

Protective clothing such as suits, aprons, boots or gloves shall be worn where there is a hazard to the body through dermal contact with chemicals, dusts, heat or other harmful agents or conditions.

Hard hats meeting the ANSI Z89.1 Standard will be worn in all areas where there is danger of impact to the head or hazard from falling or moving objects.

All personal protective clothing and equipment will be used and approved as detailed in Section 3.1 of the LM Handbook (Attachment I).

2.11 HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

Tetra Tech and subcontractor personnel conducting work at Lockheed Martin will adhere to Title 29, Code of Federal Regulations, Section 1910.120 – Hazardous Waste Operations and Emergency Response or the applicable state OSHA standards.

Tetra Tech and/or subcontractor personnel will to perform periodic work area inspections to determine the effectiveness of the site safety and health plan and to identify and correct unsafe conditions in the work area. These inspections shall be documented and available to Lockheed Martin upon request for review.

The requirements and regulations described in Section 3.20 of the LM Handbook (Attachment I) will be adhered to.

2.12 DECONTAMINATION PROCEDURES / EMERGENCY MEDICAL TREATMENT

During any site evacuation, decontamination procedures will be performed only if doing so does not further jeopardize the welfare of site workers. Decontamination will be postponed if the incident warrants immediate evacuation. However, it is unlikely that an evacuation would occur which would require workers to evacuate the site without first performing the necessary decontamination procedures.

Tetra Tech personnel will perform rescue operations from emergency situations and may provide initial medical support for injury/illnesses requiring only "Basic First-Aid" level support, and only within the limits of training obtained by site personnel. Basic First-Aid is considered treatment that can be rendered by a trained first aid provider at the injury location and not requiring follow-up treatment or examination by a physician (for example; minor cuts, bruises, stings, scrapes, and burns). Personnel providing medical

assistance are required to be trained in First-Aid and in the requirements of OSHA's Bloodborne Pathogen Standard (29 CFR 1910.1030). Medical attention above First-Aid level support will require assistance from the designated emergency response agencies. Attachment II provides the procedure to follow when reporting an injury/illness, and the form to be used for this purpose.

2.13 WORKCARE INCIDENT INTERVENTION PROGRAM

The WorkCare Incident Intervention program is an injury and illness management tool that provides 24/7 immediate telephone access for Tetra Tech employees to access a WorkCare occupational medical provider. Their clinical staff of nurses and doctors will intervene on behalf of the Tetra Tech employee after a workplace injury and illness. The goal of the program is to help make sure the employee receives proper care with effective outcomes.

When this service is used within the first hour of an incident, known as the "golden hour," the clinical team has the ability to guide the proper course of action so that medical evaluation and treatment are rendered appropriately. This early intervention service provides the right care, at the right time, in the proper setting.

At the time of a workplace injury or illness, the FOL/SSO calls the WorkCare toll free telephone number – (888) 449-7787. The FOL/SSO then provides information on the type of incident, possible cause, and the scope of the situation.

The WorkCare clinician will provide:

- An evaluation of the incident
- Direction on the appropriate course of action
- Consults with the employees treating physician to design a quality care treatment plan

2.14 INJURY/ILLNESS REPORTING

If any Tetra Tech personnel are injured or develop an illness as a result of working on site, the Tetra Tech "Incident Report Procedure" (Attachment II) must be followed. Following this procedure is necessary for documenting of the information obtained at the time of the incident.

Any pertinent information regarding allergies to medications or other special conditions will be provided to medical services personnel. This information is listed on Medical Data Sheets filed onsite. If an exposure to hazardous materials has occurred, provide information on the chemical, physical, and toxicological properties of the subject chemical(s) to medical service personnel.

Tetra Tech personnel will contact the LMC personnel in the order presented in Table 2-1 in the event of a fatality injury, environmental release (spill), near-miss incident, or an ESH incident that is likely to generate significant publicity. A written report of the incident/injury/spill and corrective action(s) must be submitted to LMC personnel within one (1) day of the incident.

Section 8.1 of the LM Handbook (Attachment I) describing the requirements of accident, injury, illness and incident reporting will be addressed.

2.14.1 TOTAL Incident Reporting System

TOTAL is Tetra Tech's online incident reporting system. Use TOTAL to directly report health and safety incidents, notify key personnel, and initiate the process for properly investigating and addressing the causes of incidents, including near-miss events. An incident is considered any unplanned event. It may include several types of near misses, events where no loss was incurred, or incidents that resulted in injuries or illness, property or equipment damage, chemical spills, fires, or damage to motor vehicles.

A copy of the TOTAL incident reporting form is included in Attachment II. TOTAL is an intuitive system that will guide you through the necessary steps to report an incident within 24 hours of its occurrence. TOTAL is a tool helps Tetra Tech to better track incidents, analyze root causes, implement corrective action plans, and share lessons learned.

TOTAL is maintained on the Tetra Tech Intranet site at https://my.tetratech.com/

Once on the "My Tetratech" site, TOTAL can be found under the Health and Safety tab, Incident Reporting section, select "Report an Incident (TOTAL)." This will connect you directly to TOTAL. TOTAL can also be accessed directly from the internet using the following web address: http://totalhs.tetratech.com/

Note: When using the system outside the Tetra Tech intranet system or when operating in a wireless mode, a VPN connection will be required. The speed of the application may be affected dependent upon outside factors such as connection, signal strength, etc. Enter the system using your network user name and password. The user name should be in the following format - TT\nickname.lastname.

2.15 DRILL/INCIDENT AFTER ACTION CRITIQUE

The FOL may conduct a drill or exercise to test the Emergency Action Plan. A critique with the site personnel after each drill or incident will be conducted. This critique provides a mechanism to review the incidents and exercises or drills to determine where improvements can be made. For incidents recorded in TOTAL, the FOL will utilize the Lessons Learned component for the critique.

3.0 SITE BACKGROUND

3.1 SITE HISTORY

The LMC MSA is located at 2323 Eastern Boulevard in Middle River, Maryland. The site consists of approximately 180 acres of land and twelve main buildings. The subject property also includes perimeter parking lots, an athletic field, Lot D (presently a vacant lot with a concrete foundation for former Building D), a trailer and parts storage lot, and a vacant waterfront lot. The site is bounded by Eastern Boulevard (Route 150) to the north, Dark Head Creek to the south, Cow Pen Creek to the west, and Martin State Airport to the east.

The Martin State Airport (MSA) is located at 701 Wilson Point Road in Middle River, Maryland, and is bounded by Frog Mortar Creek to the east and Stansbury Creek to the west. Both creeks join into Chesapeake Bay to the south of the airport. With surface water bodies surrounding most of MSA, the site can be considered a small peninsula.

Historically, MSA was owned and operated by the Glenn L. Martin Company from approximately 1929 to 1975. Glenn L. Martin Company is the predecessor to Martin Marietta; Lockheed and Martin Marietta merged in 1996 to form Lockheed Martin Corporation. Since the 1950's the Maryland Air National Guard has leased land at the northeastern portion of the airport just north of the MSA site being investigated by LMC. In 1975, the airport was sold to the Maryland Aviation Administration (MAA), an agency within the Maryland Department of Transportation.

Currently, LMC is completing voluntary investigations conducted under the Maryland Department of the Environment (MDE) Environmental Restoration and Redevelopment program on a 50 acre portion of the MSA. This study is in support of the characterization of the 50 acre area.

Martin State Airport is an active airport, operated by the Maryland Aviation Administration. It is comprised of 747 acres, and is described by the MAA as a General Aviation Reliever Airport.

3.2 STRAWBERRY POINT AND GREATER STRAWBERRY POINT FACILITY

Strawberry Point (SP) is located within the confines of the MSA at the southern tip of the peninsula between the confluence of Stansbury Creek and Frog Mortar Creek. SP can be accessed from Eastern Avenue by traveling on Wilson Point Road and entering through a secured unmanned gate. The previously investigated, SP wooded area is located at the southwest termi of the peninsula and covers approximately 25 acres. The wooded area is bounded by earthen berms near the water line with thick brush and trees covering the entire area. Much of the SP wooded area was filled during the 1940's reportedly from

deposition of dredge spoils from Stansbury Creek and Frog Mortar Creek. A locked gate controls the entrance to the wooded area. The remainder of the area is currently being investigated, referred to as GSP, is a cleared and partially developed 75-acre area that houses a seaplane ramp, hangar, tank farm, police building and other maintenance buildings extending from the southern end of peninsula to the northern end bordering Taxiway J and eastward from Stansbury Creek to the Taxiway F. The airport runway is located northeast of the GSP.

Greater Strawberry Point was leased from the Glenn L. Martin Company by the Department of Navy on December 23, 1943. At that time, the Navy used the facility and the supporting structures, including a large hangar, for seaplane maintenance, launching, and recovery operations. During Navy occupancy, the former hangar and surrounding GSP area was known as the Naval Weapons Industrial Reserve Plant No. 148. Beginning on December 16, 1963, the Air Force occupied the facility (Permit No.1-N-MD-714) for a brief period. During the Department of Defense (DOD) usage (Navy and Air Force operations), the southern portion of the GSP near the wooded portion of the site contained more than 10 buildings. These included the Beach House (Building No. 3), the Pumping Station (Building No. 4), the Chlorination Station (Building No. 5), two Power Fence Service Houses (Building No. 6 and No. 9), Solvent Storage (Building No. 7), Equipment Storage Building (Building No. 8), Power Fence Switch House (Building No. 10), Delivery Hangar (Building ND/No. 11), and a general Storage Building (Building No. 12). A tank farm containing aboveground storage tanks (ASTs), used for the storage of aircraft fuels, was located adjacent to the wooded area near the southernmost tip of the developed area.

During the same time period (1940s to 1960s), the northern portion of greater GSP was developed with several improvements related to the Naval weapons research. These structures included the Induction Test Building (Building No. 13), Control House (Building No. 14), Noise Suppression Building (Building No. 15), Jet Test Shed (Building No. 16), Storage Building (Building No. 17), Propulsion Test Building (Building No. 22), Compressor Shed (Building No. 23), Engine Test Building (Building No. 24), and Vibration Slosh Test Building (near location of current ground surface mounding). A missile testing area was located along a straight road northwest of the Propulsion Test Building that included the Hyper-therm Test Facility (Building No. 25), Propellant Storage Shed (Building No. 18), Furnace Building (Building No. 19), Acetylene Storage Shed (Building No. 20), Vanguard Tower (Building No. 21), Block House (Building No. 26), and three Coupon Test Sheds (Building No. 27, No. 28, and No. 29).

Further to the northwest, along a former dirt road connecting Strawberry Point Road to the historic airfield maintenance storage building (Building No. 37), several buildings dedicated to nuclear research and testing were constructed. Two main research buildings were designated as the Critical Test Building (Building No. 36/Building. KC) and the Radioisotope Lab (Building No. 35/Building KJ). These research labs operated under Nuclear Regulatory Commission (NRC) permits. These buildings were decontaminated in the late 1980s and NRC terminated the licenses in 1995. A third building was located just south of the labs and

was known as the Liquid Metal Test Facility (Building No. 34). Additional buildings near the nuclear labs included several sheds that were removed by Martin-Marietta Corporation to construct Taxiway J, including an organic material storage shed.

Available records indicate that two underground storage tanks (USTs) were installed during DOD's usage of the southern GSP facilities. A 10,000-gallon, heating oil UST was located adjacent to the hangar (Building ND) to provide fuel to the hangar's heating system. This UST was closed-in-place in 1987 (post-DOD period) as the hangar's heating system was converted from fuel oil to natural gas. Both the lease and permit expired on November 30, 1967.

Just prior to that date, the Glenn L. Martin Company merged with Marietta Corporation to form Martin-Marietta Corporation. On June 30, 1975, MSA was conveyed to the MDOT. The State of Maryland currently uses MSA to house and maintain Medivac Units and Helicopters. The southern portion of GSP is occupied by the Baltimore County Marine Police. Eleven USTs have been removed from MSA since 1983 and no evidence of leakage was reported. The large hangar (designated as Building ND) was demolished in 1989, and another hangar that currently houses the Maryland State Police was constructed in 1989 and 1990. GSP currently contains a tank farm consisting of 12 ASTs containing jet fuel, fuel oil, and gasoline along with a pump house and other ancillary buildings currently used by the airport. In addition, as many as six ASTs present at the tank farm are in use by other tenants. An oil spill was reported during the construction of the new hangar in 1989 and 1990, when a fuel oil return and receiving line to two 12,000-gallon ASTs located in the tank farm was severed.

3.3 DUMP ROAD SITE

Environmental investigations of the Martin State Airport (MSA) Dump Road Area (DRA) began in 1989 when the Maryland Department of the Environment (MDE) conducted a preliminary assessment of MSA. During the 1930s and 1950s, the Glenn L. Martin Aircraft Company reportedly used a sand pit under the current Taxiway Tango to dump spent battery acid, acid type strippers and other acidic solutions, dredge spoils, and construction debris. The United States Environmental Protection Agency (USEPA) concluded, after a review of the preliminary assessment of the area, that no signs of waste disposal were apparent, and the site was classified as "No Further Remedial ActionPlanned.

In July 1991, four drums containing dried zinc-chromate paint were uncovered during installation of underground electric cables adjacent to Taxiway Tango west of Taxiway Tango. The discovery of these four drums prompted MDE to order the Maryland Aviation Administration (MAA) [the owners of MSA at that time] to perform additional studies (MDE, 1992 and 1997). The MAA conducted additional studies from 1991-1998, which included geophysical surveys to locate and identify buried materials, and sampling and chemical analyses of soil, groundwater, surface water, and sediment. These early investigations identified four areas of concern: (1) the Taxiway Tango Median Anomaly Area, (2) the Drum Area, (3) two ponds

(Pond 1 and Pond 2), and (4) the Petroleum Hydrocarbon Area. These four areas became the focus of subsequent studies when chemical constituent impacts to soil, pond sediment, and groundwater became apparent. Trichloroethene (TCE) and TCE-degradation daughter products were detected throughout the investigation area, with the highest concentrations appearing in the upper and intermediate surficial aquifer. Previously detected groundwater concentrations of TCE at MSA range from 0.5 micrograms per liter (µg/L) to more than 100,000 µg/L. 1,4-Dioxane, typically co-located in groundwater with chlorinated solvents, is also considered a chemical of concern. TCE-degradation daughter products (e.g., dichloroethenes and vinyl chloride) are typically co-located with TCE at MSA. Lockheed Martin Corporation (Lockheed Martin), the successor firm of the Glenn L. Martin Aircraft Company, conducted a remedial investigation (RI) [Tetra Tech, 2012a] from 1999–2009 and supplemental work at the DRA from 2010 through the present to further delineate the extent of soil, groundwater, and pond sediment chemical impacts indicated by earlier studies.

4.0 SCOPE OF WORK

This section summarizes the specific tasks that are to be conducted as part of this scope of work and covered by this HASP. Any modifications (additions or substantive changes) to these specified tasks will be a change in scope, which will require a review and appropriate modification of this HASP. In such an event, the PM is responsible for communicating the nature of the change to the HSM prior to the initiation of any onsite activity associated with the scope of work change. The HSM is then responsible for assuring that appropriate changes to this HASP are made.

The planned tasks covered by this HASP include the following:

- Mobilization/demobilization activities
- Soil lithology and groundwater assessment using Cone Penetrometer Testing (CPT) equipped with a Membrane Interface Probe (MIP)
- Confirmatory Direct Push Technology (DPT) soil and groundwater assessment
- Installation and development of groundwater monitoring wells and well points via Direct Push Technology
- Surveying new monitoring wells
- Multi-media Sampling
 - Groundwater Samples
 - Groundwater Levels
 - Aquifer Samples
 - Soil Samples
 - Sediment Samples
 - Storm Water Samples
 - Surface Water Samples
- Wetland Survey
- Dump Road Site
 - Pre-excavation soil/waste profile sampling
 - In situ DPT soil sampling
 - Excavation of soils
 - Soil disposal
 - Post-characterization confirmatory sampling
 - Excavation backfilling
 - Passive Flux Meter Grid Deployment and Retrieval
- Concrete Coring
- Passive Soil Gas survey
- Gamma Walk-over survey

- Monitor Gamma Radiation
- Aquifer pump testing
- Geophysical Surveying
- · Test pit excavation and soil sampling
- Surface and Landscaping Repair
- · Decontamination of heavy equipment and sampling equipment
- IDW Management

For more detailed description of the planned tasks associated with LMC MSA, refer to the Work Plan (WP). Any tasks to be conducted outside of the elements listed here will be considered a change in scope requiring modification of this document. All requested modifications to this document will be submitted to the HSM by the PM or a designated representative.

No other activities are anticipated to be necessary. If it becomes apparent that additional or modified tasks must be performed beyond those listed above, the work is not to proceed until the FOL or SSO notifies the Project Manager and the HSM, so that any appropriate modifications to this HASP can first be developed and communicated to the intended task participants.

5.0 IDENTIFYING AND COMMUNICATING TASK-SPECIFIC HAZARDS AND SAFE WORK PRACTICES

The purpose of this section is to identify the anticipated hazards and appropriate hazard prevention/hazard control measures that are to be observed for each planned task or operation. These topics have been summarized for each planned task through the use of task-specific Activity Hazard Analysis (AHAs), which are to be reviewed in the field by the SSO with all task participants prior to initiating any task. Additionally, potential hazard and hazard control matters that are relevant but are not necessarily task-specific are addressed it the following portions of this section.

Section 6.0 presents additional information on hazard anticipation, recognition, and control relevant to the planned field activities.

In the event of an emergency, not requiring 911, LMC/MSA facility personnel should be contacted in the order presented on Table 2-1.

5.1 GENERAL SAFE WORK PRACTICES

In addition to the task-specific work practices and restrictions identified in the AHA's (Attachment IV) the following general safe work practices are to be followed when conducting work on-site.

- Eating, drinking, chewing gum or tobacco, taking medication, or smoking in contaminated or potentially contaminated areas or where the possibility for the transfer of contamination exists is prohibited.
- Wash hands and face thoroughly upon leaving a contaminated or suspected contaminated area. If a
 source of potable water is not available at the work site that can be used for hands-washing, the use of
 waterless hands cleaning products will be used, followed by actual hands-washing as soon as
 practicable upon exiting the site.
- Avoid contact with potentially contaminated substances including puddles, pools, mud, or other such areas.
- Avoid, kneeling on the ground or leaning or sitting on equipment.
- Keep monitoring equipment away from potentially contaminated surfaces.
- Plan and mark entrance, exit, and emergency evacuation routes.
- Rehearse unfamiliar operations prior to implementation.

- Buddies should maintain visual contact with each other and with other on-site team members by remaining in close proximity to assist each other in case of emergency.
- Establish appropriate safety zones including support, contamination reduction, and exclusion zones.
- Minimize the number of personnel and equipment in contaminated areas (such as the exclusion zone).
 Non-essential vehicles and equipment should remain within the support zone.
- Establish appropriate decontamination procedures for leaving the site.
- Immediately report all injuries, illnesses, and unsafe conditions, practices, and equipment to the SSO.
- Observe co-workers for signs of toxic exposure and heat or cold stress.
- Inform co-workers of potential symptoms of illness, such as headaches, dizziness, nausea, or blurred vision.
- Prior to any onsite activities, a tailgate meeting will be conducted to discuss the activities and health and safety issues that are relevant to the activities.

5.2 DRILLING (HSA/DPT/LITTLE BADGER UNIT/ROTOSONIC) SAFE WORK PRACTICES

The following Safe Work Practices are to be followed when working near operating drilling equipment.

5.2.1 Before Drilling

- Identify underground utilities, buried structures, and aboveground utility lines before drilling. Tetra
 Tech, Inc. personnel will use the TtSOP Utility Locating and Excavation Clearance Standard Operating
 Procedure (Attachment VIII).
- Drill rigs will be inspected by the SSO or designee, prior to the acceptance of the equipment at the site
 and prior to the use of the equipment. Needed repairs or identified deficiencies will be corrected prior
 to use. The inspection will be accomplished using the Equipment Inspection Checklist provided in
 Attachment V. Additional inspections will be performed at least once every 10-day shift or following
 repairs.
- Check operation of the Emergency Stop/Kill Switch and/or the "Dead Man's" operational controls.
 These operational checks are required initially as part of the equipment pre-use inspection, and then

<u>periodically</u> thereafter. Periodic checks are required at least weekly, or more frequently if recommended by the rig manufacturer.

- Ensure that machine guarding is in place and properly adjusted.
- Block drill rig and use out riggers/levelers to prevent movement of the rig during operations.
- The work area around the point of operation will be graded to the extent possible to remove any trip hazards near or surrounding operating equipment.
- The driller's helper will establish an equipment staging and lay down plan. The purpose of this is to keep the work area clear of clutter and slips, trips, and fall hazards. Mechanisms to secure heavy objects such as drill flights will be provided to avoid the collapse of stacked equipment.
- Potentially contaminated tooling will be wrapped in polyethylene sheeting for storage and transport to the centrally located equipment decontamination unit.
- Prior to each instance of engaging the HSA drill rig, the Driller will look to ensure that the drilling area
 is clear of personnel and obstructions, and verbally alert everyone in the area that the rig is about to be
 engaged.
- Prior to the start of boring operations, one individual will be designated at the person responsible for immediate activation of the emergency stop device (if applicable) in the event of an emergency. This individual will be made known to the field crew and will be responsible for visually checking the work area and verbally alerting everyone of boring operations prior to engaging the equipment.

5.2.2 <u>During Drilling</u>

- The Driller will ensure that an individual is constantly stationed at a location were the drill rig emergency stop switch can be immediately engaged.
- Minimize contact to the extent possible with contaminated tooling and environmental media.
- Support functions (sampling and screening stations) will be maintained a minimum distance from the
 drill rig of the height of the mast plus five feet or 35-feet for Rotosonic/HSA, 25-feet for DPT operations
 whichever is greater to remove these activities from within physical hazard boundaries.
- Only qualified operators and knowledgeable ground crew personnel will participate in the operation of the drill rig.

- During maintenance, use only manufacturer provided/approved equipment (i.e. auger flight connectors, etc.)
- In order to minimize contact with potentially contaminated tooling and media and to minimize lifting hazards, multiple personnel should move auger flights and other heavy tooling.
- Only personnel absolutely essential to the work activity will be allowed in the exclusion zone.

5.2.3 After Drilling

- Equipment used within the exclusion zone will undergo a complete decontamination and evaluation by the SSO to determine cleanliness prior to moving to the next location, exiting the site, or prior to down time for maintenance.
- Motorized equipment will be fueled prior to the commencement of the day's activities. During fueling operations equipment will be shutdown and bonded to the fuel source.
- When not in use drill rigs will be shutdown, and emergency brakes set and wheels will be chocked to prevent movement.
- The mast will be completely lowered and outrigger completely retracted during movement to decontamination or the next location.
- Areas subjected to subsurface investigative methods will be restored to equal or better than original
 condition. Any contamination that was brought to the surface by drilling or DPT operations will be
 removed and containerized. Physical hazards (debris, uneven surfaces, ruts, etc.) will be removed,
 repaired or otherwise corrected. In situations where these hazards cannot be removed these areas will
 be barricaded to minimize the impact on field crews working in the area.

5.2.4 Concrete Coring Operations

The following safe work practices will be employed during concrete coring operations:

- Identify underground utilities before commencing any concrete operations.
- Use wetting techniques to minimize dust and friction.
- When applying water to the core bit the operator should apply water until the slurry begins to look like heavily creamed coffee.
- Wear the well-fitting nitrile gloves (rather than cotton or leather gloves) when in coring.

- Wash and dry hands before putting on gloves and every time that you remove your gloves.
- Replace grossly contaminated or worn-out gloves.
- Make sure the coring machine is properly anchored.
- Standing on the machine may cause the bit to bind up in the hole
- Use the manufacturers recommended speed (revolutions per minute) for the diameter of the bit used.
- The coring machine will be inspected to insure housings; plugs; guards are intact, and the coring machine is in good operating order.
- If the power source to be employed is not through a Ground Fault Circuit Interrupter (GFCI) then a temporary GFCI plug extension shall be put in place.
- A shop vac or similar device also connected to the GFCI will be used to collect the water employed during the coring process. All water in the coring area will be cleaned to reduce the potential for slip, trip and falls. Place floor wet signs as necessary from all approach venues.
- The preferred method is to bolt the coring machine to the floor during coring operations. It is however
 acceptable to utilize sand bags or similar weighted devices to control movement during this activity.
- No open core holes will be permitted after the termination of the shift. All cores will be placed back in the holes or the holes will be fitted for their permanent casings for the sub-slab soil gas vapor monitoring points.
- All core holes finished with protective casings or finished using concrete will be finished to grade again to prevent slip, trips, and/or falls.

5.3 EXCAVATION – SAFE WORK PRACTICES

See Section 16.0 of this HASP.

5.4 PERMANENT SOIL GAS VAPOR MONITORING POINTS WITHIN BUILDINGS

If installation of permanent soil gas vapor monitoring points is conducted within buildings on site, soil gas monitoring points may need to be installed at various locations using a diesel powered DPT rig. If necessary, a gasoline or electric powered concrete coring machine may used if the DPT rig cannot push through the concrete floor.

Operation of diesel/gasoline powered equipment within enclosed areas such as buildings presents unique hazards particularly the inhalation of exhaust gasses, fumes, and dusts generated during concrete coring or soil boring. Additional hazards that may be present during these operations include, increased noise levels, contact with utilities, electrocution hazards (particularly if water is present), and the movement of heavy equipment.

The major gaseous products of both diesel and gasoline fueled engines are carbon monoxide and water, but lower percentages of carbon monoxide, sulfur dioxide, and nitrogen dioxides as well as low molecular

weight hydrocarbons and their derivatives are also formed. Submicron-size particles are present in the exhaust emissions of internal combustion engines. The particles present in diesel engine exhaust are composed mainly of elemental carbon, absorbed organic material, and traces of metallic compounds. The particles emitted from gasoline engines are composed primarily of metallic compounds, elemental carbon and adsorbed organic material. However, the composition and quantity of the emissions from an engine depend mainly on the type and condition of the engine, fuel composition and additives, operating conditions, and emission control devices.

Short-term (acute) effects of workers exposed to high concentrations of exhaust gasses/fumes may include irritation of the eyes, nose, and throat; lightheadedness; heartburn; headache; weakness, numbness and tingling in the extremities; chest tightness; wheezing; and vomiting. Although there have been relatively few studies on the long-term health effects of exhaust gasses/fumes, the available studies indicate that they can be harmful to your health. According to the National Institute for Occupational Safety and Health (NIOSH), human and animal studies show that diesel/gasoline exhaust should be treated as a human carcinogen. Exposure to diesel/gasoline exhaust in combination with other cancer causing substances may increase your risk of developing lung or other forms of cancer. Some studies have suggested that workers exposed to diesel/gasoline exhaust are more likely to have chronic respiratory symptoms such as persistent cough and mucous, bronchitis, and reduced lung capacity than unexposed workers.

The follow controls may be used to minimize potential exposures to exhaust gases/fumes:

- Use flexible tailpipe or stack exhaust hoses to vent equipment exhaust gases/fumes to the outside.
- Use of general ventilation (roof vents, open doors and windows, roof fans, rollup doors, floor fans, etc.)
 to move air through the work area to facilitate dilution of airborne exhaust gases/fumes. If exhaust gas/fume concentrations cannot be diluted with existing general ventilation methods, use local exhaust ventilation devices (portable axial blowers, coppus blowers) to vent exhaust gases/fumes to the outside.
- If feasible, use grade 1K diesel fuels which burns more clearly than Diesel 1 fuels.
- All equipment must have regular maintenance and frequent tune ups including checks of the exhaust system to determine if leaks exist. All equipment will be inspected using the Equipment Inspection Checklist provided in Attachment V.
- Prolonged idling of machinery should be avoided.
- Minimize the number of personnel in the area where internal combustion engines are operating.
 Observe workers for signs and symptoms of exposure.
- Monitor the work area for airborne concentrations of carbon monoxide which will be used to control
 exposures to carbon monoxide and other exhaust gases follow established action levels.
- Use wetting methods to suppress airborne dusts generated during concrete coring or soil boring within the building.

5.5 HAND AND POWER TOOL SAFE WORK PRACTICES

The following safe work practices will be employed during hand and power tool usage:

- All hand and power tools will be maintained in a safe condition.
- Electrical power tools shall be grounded or double insulated with proper assured equipment grounding inspections or Ground Fault Interrupter (GFI) circuit protection provided.
- Pneumatic power tools shall be secured to the hose or whip by some positive means.
- Only properly trained Contractor employees shall operate power-actuated tools.
- All grinding machines shall conform to OSHA and ANSI requirements.

Hand and power tool use procedures are detailed in Section 3.16 of the LM handbook and will be followed.

5.6 HOUSEKEEPING / CLEANUP

Housekeeping procedures described in Section 5 of the LM Handbook (Attachment I) will be addressed and the following housekeeping practices will be employed during this field effort:

- Ensure discharge permits and/or Stormwater Pollution Prevention Plans (if applicable) are available at the project job site.
- Tetra Tech and/or subcontractor personnel will clean up its respective work area(s) and maintain work areas free from all slip, trip, and fall hazards at all times.
- Debris shall be kept cleared from work areas, passageways, stairs, and in and around buildings or other structures. The work area must be left free from accumulation of waste and rubbish at the end of each work shift.
- Combustible scrap and debris shall be removed at regular intervals during the course of work. Safe means shall be provided to facilitate such removal.
- At the end of each working day and/or the conclusion of work being performed, the work area will be restored to the same degree of neatness as when work commenced.
- Tetra Tech and/or subcontractor will furnish necessary equipment and/or receptacles to remove waste and rubbish from the job site unless otherwise specified by Lockheed Martin.

5.7 SAFE BOATING PRACTICES (i.e., WORKING FROM WATER VESSELS/BARGES)

Offshore Passive Soil Gas survey activities will require site personnel to work from pontoon boats in tidal bodies of water. The Diving Company HASP for this operation is attached to this HASP in Attachment XIV. To avoid potential hazards associated with working on water (drowning), the field team shall employ lifelines (tie-off procedure), safety harnesses, when on the barge. U.S. Coast Guard (USCG) approved personal flotation devices (PFD) will be on hand for all participants and will be used. Due to the obvious hazards associated with working on water during inclement weather, field activities may be temporarily suspended or terminated at the discretion and direction of the FOL or SSO. Tetra Tech personnel will also follow the Tetra Tech procedures for working over water outlined in Standard Operating Procedure SWP 5-6.

Refer to the Diver's HASP in Attachment XIV of this HASP.

5.7.1 <u>U.S.C.G. Flotation Device Types</u>

Use the following information to determine the proper type of U.S.C.G. PFD.

Off Shore Life Jacket (Type I, 22lbs buoyancy)

Type I life jacket is the best choice for rough or open waters. This type will float you the best and is favorable if rescue may be long in coming. This type will turn an unconscious person upright in the water. Though is bulky it does have a highly visible color for easier detection.

Near Shore Buoyant Vest (Type II, 15.5lbs buoyancy)

Type II is a good choice for calmer waters. It will turn most unconscious persons face-up in the water. Though it is less bulky than Type I, it is not intended for long hours in calm or rough water.

Flotation Aid (Type III, 15.5lbs buoyancy)

Type III is probably the most comfortable device offering more freedom of movement, such as water skiing or fishing, but is not intended for rough water. Also, an unconscious person may end up face-down in the water.

Throwable Devices (Type IV)

Throwable devices are intended for calm waters with heavy boat traffic where help is always close. It is not intended for unconscious persons or non-swimmers or long hours in the water. They are good backups for the other devices.

Site personnel shall wear Type III personal flotation devices in the event someone falls overboard, boats sinks or capsizes. Type IIIs were selected as they offer the most flexibility for working while still meeting minimum requirements for buoyancy. In situations where personal flotation devices cannot be worn due to the task to be conducted, the flotation devices shall be immediately available/accessible. It is recommended that personal flotation devices be continually worn during colder months due to the potential for hypothermia to restrict muscle movement and therefore, self-rescue and maintaining buoyancy. In addition, a single Type IV Throwable Flotation Device shall be maintained on board the boat with at least 90 feet of 3/8 polypropylene line.

When work activities take personnel within four feet of navigable waters edge personnel will have immediately accessible a lifeline with a throwing bag or Type IV flotation device facilitate extraction from the water. Personnel working on water's edge will do so using the buddy system to assist in rescue efforts, if needed.

Device	Туре	Description	
Off Shore Life Jacket	Type I	Best in rough or open waters. Floats best	
	22lbs buoyancy	especially in long time rescue. Will turn unconscious upright. Bulky but highly visible.	
Near Shore Buoyant Vest	Type II,	Good in calmer waters. Will turn most	
	15.5lbs buoyancy	unconscious face-up. Less bulky. Not for long time rescue.	
Flotation Aid	Type III	Most comfortable device offering more	
	15.5lbs buoyancy	freedom of movement. Not intended for rough water. Unconscious may end up face-down	
Throwable Devices	Type IV	Throwable devices for calm waters with	
		heavy boat traffic where help is always	
		close. Not for unconscious, non-swimmers	
		or long hours. Good backups for the other	
		devices.	

5.7.2 U.S.C.G Boat Regulations

No person born on or after March 1, 1986 shall operate a vessel that is fitted with propulsion machinery of more than ten (10) horsepower on waterways unless the person has successfully completed a boating safety education program as approved by the USCG. Certain bodies of water in some states may also have local restrictions as to type and size of watercraft or motor horsepower, restricted use areas, boat speed, and times for use. The FOL is responsible for checking with appropriate local authorities to identify and address any additional requirements/restrictions.

The U.S.C.G. requires boats to have the following equipment on board:

- One personal flotation device per person
- A sound producing device such as an air horn or whistle which can be heard one half mile.

Speed Limits

Any motorboat or vessel operated within a harbor or inlet or any pond of other confined body of water shall not exceed 45 mph from sunrise to sunset and 25 mph during periods of darkness or restricted visibility. Lower speed limits may be regulated in certain areas.

Reckless and Negligent Operation

Negligent or grossly negligent operation of a vessel which endangers lives and/or property is prohibited by law. A civil penalty may be imposed by the Coast Guard for this offense under federal laws. An operator may be subjected to a fine of up to \$5,000 and or imprisonment for up to one year, or both. The Maryland penalty is a fine of up to \$500 for the first offense.

Some examples of actions that may constitute negligent or grossly negligent operation include but are not limited to:

- Operating in a swimming area
- Operating under the influence of alcohol or drugs.
- Excessive speed in the vicinity of other boats or in dangerous waters.
- · Hazardous water skiing practices
- Bow riding, also riding on seatback, gunwale or transom.

Termination of Use

A Maryland Natural Resources Police Officer who observes a boat being operated in an unsafe condition and who determines that an especially hazardous condition exists may direct the operator to take immediate steps to correct the condition, including returning to port. Termination for unsafe use may be imposed for, but is not limited to:

- Insufficient number of USCG approved Personal Flotation Devices.
- Insufficient fire extinguishers.
- Overloading beyond manufacturer's recommended safe loading capacity.
- Improper navigation light display.
- Ventilation requirements for tank and engine spaces not met.

- · Fuel leakage.
- Fuel in bilges.
- Improper backfire flame control.

Boating Accident Reports

The operator of any boat involved in an accident must stop, render assistance, and offer identification. An accident report must be made to the Department within 48 hours if:

- A person dies within 24 hours;
- A person loses consciousness or receives medical treatment beyond first aid or is disabled more than 24 hours;
- A person disappears from the vessel under circumstances that indicate death or injury.

Accidents must be reported within 10 days if damage to all vessels and other property totals more than \$500.00 or an earlier report is not required. Running aground or hitting a fixed or floating object is considered a boating accident. Boating accident report forms (DNR-149) are obtainable from the Natural Resources Police. They must be submitted to the Natural Resources Police by the operator of the vessel or vessels involved. Accident reports are required by federal law and furnish information for use in accident prevention. Information from individual reports will not be publicly disclosed nor may the information be used in court.

Rendering Assistance

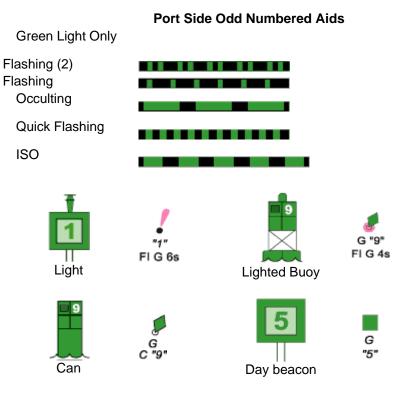
Federal law requires the operator of a vessel to provide assistance that can be safely provided to any individual in danger on the water. Persons who fail to provide assistance may be subject to fine or imprisonment.

Vessels required to be Registered in Maryland

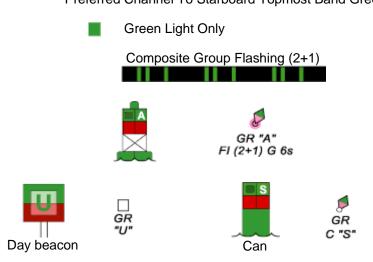
All vessels, whether commercial or recreational, must be registered in Maryland if it is equipped with any kind of primary or auxiliary mechanical propulsion; if it is not currently documented with the U. S. Coast Guard; and if it is being used principally in Maryland. An owner of a federally documented vessel, though exempt from state numbering requirements, shall apply to the Maryland Department of Natural Resources for documented use decals, and is subject to the state excise tax requirements.

5.7.3 Uniform State Waterway Marking System (USWMS)

Lateral System (As Seen Entering From Seaward)



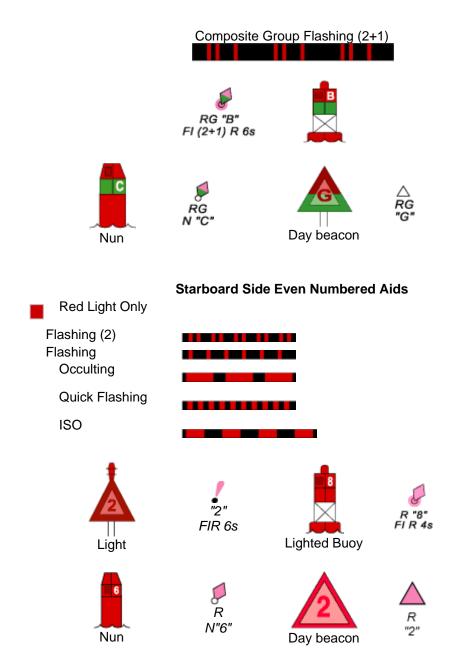
Preferred Channel No Numbers-May Be LetteredPreferred Channel To Starboard Topmost Band Green



Preferred Channel No Numbers-May Be Lettered

Preferred Channel To Port Topmost Band Red

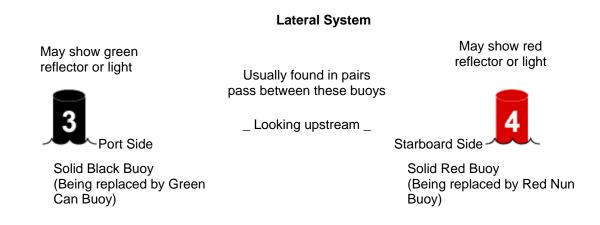
Red Light Only



Lateral Aids to Navigation generally indicates which side of an aid to navigation a vessel should pass when channels are entered from seaward. In the absence of a route leading from seaward, the conventional direction of buoyage generally follows a clockwise direction around landmasses. The most important characteristic of an aid is its color. The "3R" rule "Red Right Returning" is the essential rule of thumb for using the lateral system. This means that when entering one body of water from a larger body of water (i.e. returning to a harbor from a bay or sound); keep the red aids to starboard (right) side and green aids to port (left) side. In addition, each aid is numbered, and these numbers increase as entering from seaward.

Preferred Channel Marks are found at junctions of navigable channels and often mark wrecks or obstructions. A vessel may normally pass this aid on either side, but the top color band indicates the preferred channel. If the top band of the aid is red, it is treated as a red mark and kept to starboard as the

vessel passes it while returning from sea. Caution: It may not always be possible to pass on either side of preferred channel aids to navigation. The appropriate nautical chart should always be consulted.



Cardinal System

May show white reflector or light



Red striped white buoy

Do not pass between buoy and nearest shore



Black topped white buoy

Pass to north or east of buoy



Red topped white buoy

Pass to south or west of buoy

Safe Boating Practices:

The following are recommended safe boating practices to be employed prior to the commencement of sediment sampling. Ensure that:

- Fuel tanks are full
- The fuel line and gas tanks are not leaking
- Battery is charged
- If it is an enclosed engine compartment make sure it is free of fumes
- Motor in good operating condition
- Lights and horn are in working order
- Boat is checked for leaks
- Weather and water conditions suitable for the planned activity
- All gear and supplies properly stowed and secure

- Propeller in good condition, lower unit free of weeds and debris
- Passengers are briefed on emergency procedures--their PFDs should be checked for fit
- Operator alert, sober and ready
- Someone else knows how to operate the boat
- Be observant for other boats and/or subsurface obstacles.
- Do not moor to a navigation aid or regulatory marker.
- You understand the rules that describe who has the "right of way" for specific situations. When in doubt,
 "give way."

5.7.3.1 Boating Safety Precautions

The Captain has the authority to suspend field operations if it is determined conditions in the field are unsafe. Furthermore, the Captain is responsible for:

- Ensuring the Boat is in safe operating condition meeting the minimum safe USCG Vessel Certification.
- Providing the necessary safety equipment on the boat including:
 - A sufficient number of Personal Floatation Devices.
 - Emergency rescue devices to extract persons from the water.
 - Emergency alerting/alarm devices to signal when in distress.
 - Fire Extinguishers/First Aid Kit/Back up Bilge pumps as appropriate for the vessel type.

The Captain will operate the boat in a safe manner within the guidelines for operations in and around Cow Pen Creek.

5.7.3.2 Man Overboard (MOB) Procedures

When working on the boat or support vessels or when working on shore near water's edge, the possibility exists that a person could fall into the water. This can be a serious and even potentially-fatal event, especially if it were to occur when the ambient conditions and water temperatures are cold, which are expected conditions during the course of the dredging activities and possibly other tasks as well

Since no work on water is to be conducted by one person alone, there will always be at least one other person present if such an event should occur who initiate a rescue response effort (i.e., the "buddy system" will be observed, at a minimum for all site operations). Also, members of the field crew will be assigned with the responsibility as "MOB Spotter" or "MOB Lookout" with the duty to monitor for any persons who may fall into the water. If a person does go overboard from a vessel or otherwise falls into the water, then the following MOB procedures will be observed.

Basically, in an MOB event, there are three basic primary actions that should occur:

- 1. SHOUT "Man Overboard on the _____ side" (Port, Starboard, Stern/Aft, Bow)
- 2. THROW a tethered, lifesaving flotation device (i.e., a life saver ring) or a portable PFD if a lifesaver is not readily available
- 3. POINT the individual who first observed the person overboard and shouted the initial alarm should remain in place and point at the person in the water to assure that others who come to assist can quickly locate him/her

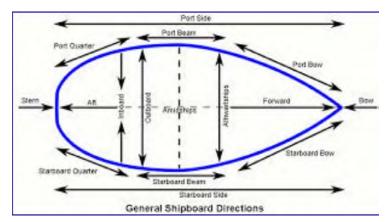
Specific MOB actions and procedures can vary depending if the incident involves a large or small watercraft, or is near land. Therefore, these different scenarios are addressed individually in the following paragraphs.

Small Watercraft (on boats, skiffs, etc.)

If a person goes overboard, the first person to discover this is to alert all others within the area by loudly yelling "Man Overboard". This person should also shout out what side the person fell off (Port, Starboard, Aft or Bow). See the illustrations in Figure 5-1 for a quick reference to Port and Starboard. "Bow" means the front of the vessel, and "Aft" means the stern, or rear of the vessel.

FIGURE 5-1
GENERAL SHIPBOARD DIRECTIONS





After hearing the "Man Overboard" alert, the following actions will immediately be taken:

- If the person is directly beside or near the boat, stop the motor
- If the boat has traveled too far from the person, maneuver the boat closer before throwing the ring. Motor must be in neutral when person in the water is alongside the boat.
- Throw the life ring (Type IV PFD) to the person.
- Extend the MOB pike pole to the individual, if necessary
- Give four blasts of the onboard emergency air horn to alert the rest of the project team.

• Instruct the person to tightly hold onto the ring, and then slowly bring the person to the side of the boat.

Depending on the boat size and configuration, the person may be able to climb back into the boat with assistance. For smaller boats like johnboats, attempting to bring someone on board can be difficult and could risk capsizing the boat. In this case, the rescuers should tell the person to hang onto boat and carefully maneuver boat to nearest shore. Rescuers can assist the person by holding on to his arms, but must exercise great care that they do not themselves fall or be pulled into the water.

Notify other site vessels and emergency responders and await assistance.

5.7.4 Strain/Muscle Pulls from Heavy Lifting

During execution of planned activities there is some potential for strains, sprains, and/or muscle pulls
due to the physical demands and nature of this site work. To avoid injury during lifting tasks personnel
are to lift with the force of the load carried by their legs and not their backs. When lifting or handling
heavy material or equipment use an appropriate number of personnel. Keep the work area (e.g., inside
of boat) free from clutter to avoid unnecessary twisting or sudden movements while handling loads.

5.8 WETLAND SAFE WORK PROCEDURES

This investigation entails a wetland survey to conduct work safely field crews will know the wetland where the survey is being conducted:

- Depth of water in area where survey is being conducted
- Species (both plant and animal) that could be encountered relevant to the body of water where the survey is being conducted.
- Protective equipment required for a survey including:
 - Ranging pole to check water depths and bottom surface configuration in murky waters
 - Life jacket as specified in Section 5.7
 - Chest waders
 - Binoculars
 - Workers will work in groups of no less than two people for safety
 - Notify the guard station or site contact when working in or near water. In the event of an emergency site personnel are required to have a contact and or control point.

This wetland survey may possibly be performed from a water craft. In order to avoid potential hazards associated with working on water (drowning), the field team will follow the safety procedures outlined in Section 5.7 of this HASP.

5.9 RADIOLOGICAL HEALTH AND SAFETY PROCEDURES FOR SOIL INVESTIGATIONS

Purpose: This section provides guidance for the methods that will be used for radiological screening of surfaces and soils during field investigations at the Martin State Airport in Middle River, Maryland. The primary isotopes of concern include uranium 235 (U-235), thorium 232 (Th-232) and americium 241 (Am-241). These screening activities are being performed to insure personnel safety. No regulatory determinations will be made from the screening data.

Scope: Surface and subsurface soil and groundwater investigations will be conducted in accordance with the Greater Strawberry Point Supplemental Soil and Groundwater Characterization Work Plan. These investigations will include (1) gamma walk-over surveys, (2) soil sampling, (3) monitoring well measurements and groundwater sampling, (4) direct push technology (DPT) groundwater investigation, and (5) active soil gas sampling.

Screening Methods

- A reference background area adjacent to the investigation area(s) will be identified. Static measurements will be obtained at each location to determine ambient background radiation levels. Surveys will be performed in accordance with (IAW) Attachment VI, Radiation and Contamination Surveys. The surveys will be performed in areas adjacent to the areas of concern that are not expected to be impacted and are of similar geological characteristics. Ten (10) static measurements will be performed using a Ludlum Model 2241 coupled with a Ludlum Model 44-10 sodium iodide (NaI) gamma scintillation detector (or equivalent). The mean and standard deviation will be calculated and used for comparison in the areas of concern.
- The expected field conditions indicate that Level D PPE is appropriate. However, if field conditions change, SOP 022, Radiological Protective Clothing Selection, Monitoring, and Decontamination (Attachment VII) provides instruction for selection of PPE.
- A gamma walk-over survey of the investigation area will performed IAW SOP 006 (Attachment VI),
 Radiation and Contamination Surveys. The survey will be performed by traversing the survey area
 using a 1-meter grid spacing, holding the detector approximately 6-inches above the surface and
 moving it in a serpentine manner. Survey results will be documented IAW SOP 006 (Attachment VI).
- Soil sampling activities will be screened in the following manner:
 - All sample locations will be surface scanned prior to commencing sampling operations.

- DPT cores will be scanned with the NaI detector to determine potential areas of elevated activity.
- Equipment used for intrusive activities will be periodically monitored for removable and fixed contamination IAW SOP 006 (Attachment VI).
- Work surfaces will be periodically monitored for removable and fixed contamination IAW SOP 006 (Attachment VI).
- It is not expected that particulate airborne activity will be present during the planned field activities such that airborne concentrations would exceed 10 percent of the derived air concentration (DAC) for Ra-226 (3.0 x 10⁻¹⁰ microcurie per milliliter), as established by the Nuclear Regulatory Commission (NRC). Therefore, occupational exposure monitoring is not required in accordance with Title 10 Code of Federal Regulations (CFR) 20.1502. If elevated dose rates or contamination levels are encountered, the need for air sampling will be re-evaluated and MD DEP will be notified.
- Soil samples will be taken IAW the applicable Work Plans.

TABLE 5-1
RELEASE LIMITS FOR MATERIALS AND EQUIPMENT

Radiation Type	Release Limits ^{1/} (Fixed) (dpm per 100 cm ²)	Release Limits ^{1/} (Removable) (dpm per 100 cm²)
Alpha (α)	100	20
Beta-Gamma (β-γ)	1000	200
Beta-Gamma (β-γ)	1000	200

Notes:

AEC – Atomic Energy Commission

cm² – square centimeters

dpm - disintegrations per minute

5.10 PASSIVE DETECTION SURVEYS

5.10.1 Acoustic Surveys

Acoustic location methods are generally most applicable to waterlines or gas lines. A highly sensitive Acoustic Receiver listens for background sounds of water flowing (at joints, leaks, etc.) or to sounds introduced into the water main using a transducer. Acoustics may also be applicable to determine the location of plastic gas lines.

5.10.2 Thermal Imaging

Thermal (i.e., infrared) imaging is a passive method for detecting the heat emitted by an object. Electronics in the infrared camera convert subtle heat differentials into a visual image on the viewfinder or a monitor.

^{1/} These limits are based on AEC Regulatory Guide 1.86 (AEC 1974)

The operator does not look for an exact temperature; rather they look for heat anomalies (either elevated or suppressed temperatures) characteristic of a potential utility line.

The thermal fingerprint of underground utilities results from differences in temperature between the atmosphere and the fluid present in a pipe or the heat generated by electrical resistance. In addition, infrared scanners may be capable of detecting differences in the compaction, temperature and moisture content of underground utility trenches. High-performance thermal imagery can detect temperature differences to hundredths of a degree.

5.11 PORTABLE GENERATOR SAFE WORK PRACTICES

5.11.1 <u>Major Causes of Accidents</u>

- Shocks and electrocution from improper use of power or accidentally energizing other electrical systems.
- Carbon monoxide from a generator's exhaust.
- Fires from improperly refueling the generator or inappropriately storing fuel.

5.11.2 Generator Operation

- Inspect portable generators for damage or loose fuel lines that may have occurred during transportation and/or handling.
- Keep the generator dry.
- Maintain and operate portable generators in accordance with the manufacturer's use and safety instructions.
- Before refueling the generator, turn it off and let it cool down.
- Gasoline spilled on hot engine could ignite.
- Never store fuel indoors.

5.11.3 <u>Electrical Considerations</u>

- Never attach a generator directly to the electrical system of a structure (home, office or trailer) unless
 the generator has a properly installed transfer switch because this creates a risk of electrocution for
 utility workers.
- Always plug electrical appliances directly into the generator using the manufacturer's supplied cords.
 - Flexible cords (extension cords) will contain the number of conductors required for service, plus a ground wire. Cords will be rated for hard usage (S, SE, SEO, SO, SOO, ST, STO, STOO). Flexible cords are not allowed to pass through doors or windows, or to be placed on the ground where

they are subject to being run over by vehicles. If flexible cords must pass through walls, the cords will be protected by bushings or fittings.

- Flexible cords must be inspected on each day of use. No splices or fraying are allowed.
- Flexible cords will not be secured with staples, hung from nails, or suspended by bare wire. (Plastic tie straps, commonly used today, are acceptable.).
- Portable lamps must have bulbs protected by a substantial guard and attached to the lamp holder handle.
- The circuit breaker panels and electrical transformers and supply equipment must be labeled as to the voltage contained therein.
- The circuit breaker panels must be labeled as to what each breaker controls.
- The breaker panels and electrical panels must have a cover protecting any live exposed wires.
- At least a 30-inch clearance must be maintained on three sides of the circuit breaker boxes, transformers, and electrical supply equipment so as to provide ready access to the equipment in the event of an emergency. A 36-inch clearance is required for higher voltages.
- Circuit breaker boxes that are locked, or kept in locked rooms, must have a key readily available in the event of an emergency.
- Use undamaged heavy-duty extension cords that are grounded (3-pronged).
- Use ground-fault circuit interrupters (GFCIs) as per the manufacturer's instructions.
- Inspect extension cords for physical defects.
- Extension cords will be rated for outdoor use and will be of significant wire gage to carry intended amperage.
 - The longer the distance the heavier gauge of wire will be required.
 - When in doubt use a heavier gauge.
- Extension cords will be kept from standing water.
- Employees will not plug or unplug cords with wet gloves.
- Portable generators will be grounded, if required by manufacturer.

5.11.4 Carbon Monoxide Poisoning

- Never use a generator indoors.
- Never place a generator outdoors near doors, windows, or vents.
- If you or others show symptoms of CO poisoning dizziness, headaches, nausea, tiredness—get to fresh air immediately and seek medical attention.

6.0 HAZARD ASSESSMENT AND CONTROLS

This section provides information regarding the chemical, physical, and natural hazards associated with the sites to be investigated and the activities that are to be conducted as part of the scope of work. Section 6 provides information on potential chemical contaminants, symptoms of exposure, physical properties, and air monitoring and sampling data.

6.1 CHEMICAL HAZARDS

Previous investigations indicate that the contaminants of concern (COCs) at both GSP and the Overall site are volatile organic compunds (VOCs), semi-volatile organic compounds (SVOCs), PCB's, and metals in both soil and water. Table 6-1 shows the primary COCs, their maximum concentrations, the worst case air concentrations of each primary COC that could be encountered, and their current occupational exposure limits (OELs).

6.1.1 Volatile Organic Compounds (VOCs)

The majority of VOCs are often related to chlorinated solvents and associated degradation products, paint thinners, dry cleaning solvents, constituents of petroleum fuels (e.g. gasoline and natural gas), and crude oil tanking. Symptoms of exposure to VOCs can include abdominal pain, irritation of the skin, eyes, nose, and throat, dizziness, tremors, vomiting, GI bleeding, enlarged liver, pallor of the extremities, and frostbite like-symptoms.

Short-term exposure to VOCs, such as TCE and VC, can cause irritation of the nose and throat and central nervous system (CNS) depression, with symptoms such as drowsiness, dizziness, giddiness, headache, loss of coordination. High concentrations have caused numbness and facial pain, reduced eyesight, unconsciousness, irregular heartbeat and death. Very high concentrations have produced death due to CNS effects, and, in rare cases, irregular heart beat. Permanent nervous system damage and/or liver injury have resulted from severe overexposure.

TABLE 6-1
COMPARISON OF COPCs, AVAILABLE WORST-CASE AIR CONCENTRATIONS,
AND CURRENT OCCUPATIONAL EXPOSURE LIMITS

Overall Site Surface Water							
Contaminant of Concern	Maximum Concentration	Units	Worst-Case Air Concentration That Could Be Encountered	Current OSHA PEL or ACGIH TLV			
HEXAVALENT CHROMIUM	5.21	UG/L	NA	0.005 mg/m3 0.0025 mg/m3 action level OSHA PEL 8-hour TWA			
VINYL CHLORIDE	140	UG/L	62.27 ppm	OSHA: 1 ppm, TWA8 5 ppm Ceiling			
TOTAL PCBS	0.42	UG/L	NA	OSHA PEL for PAHs workplace - 0.2 mg/m3			
PERCHLORATE	0.79	UG/L	NA	NA			
Overall Site Groundwater							
BENZENE	860	UG/L	59.6 ppm	ACGIH: 0.5 ppm TWA8 1 ppm STEL			
CHLOROFORM	7200	UG/L	221.34 ppm	ACGIH TWA8 10ppm OSHA Ceiling 50ppm			
1,2-DICHLOROETHANE	600	UG/L	7.15 ppm	ACGIH TWA8 10ppm OSHA TWA8 50; Ceiling 100ppm			
1,1-DICHLOROETHENE	2200	UG/L	592.33 ppm	ACGIH: 5 ppm, TWA8			
ETHYL BENZENE	3700	UG/L	274.62 ppm				
TOLUENE	51000	UG/L	3675.28 ppm	OSHA: 200 ppm ACGIH: 20 ppm TWA8			
1,1,1-TRICHLOROETHANE	6000	UG/L	773.56 ppm	OSHA: 10 ppm ACGIH: 10 ppm TWA8			
TRICHLOROETHENE	490000	UG/L	36734.15 ppm	OSHA: 100 ppm ACGIH: 10 ppm, TWA8			
VINYL CHLORIDE	870000	UG/L	386976 ppm	OSHA: 1 ppm, TWA8 5 ppm Ceiling			
XYLENES	28500	UG/L	17	ACGIH: 350 ppm, TWA8 OSHA: 350 ppm TWA ₈			
HEXANE	19	UG/L	397 ppm	ACGIH: 50 ppm, TWA8 OSHA: 500 ppm TWA ₈			
METHANE	1100	UG/L	4510 ppm	NA TIMA			
1,2,4- TRIMETHYLBENZENE	590	UG/L	30.2 ppm	ACGIH: 25 ppm, TWA8			
GSP Soil							
1,1-DICHLOROETHENE	0.006	MG/KG	1.46 ppm	ACGIH: 5 ppm, TWA8			
TRICHLOROETHENE	3.9	MG/KG	135.56 ppm	OSHA: 100 ppm ACGIH: 10 ppm, TWA8			
VINYL CHLORIDE	0.004	MG/KG	5.2 ppm	OSHA: 1 ppm, TWA8 5 ppm Ceiling			
GSP Groundwater							
1,1-DICHLOROETHENE	330	UG/L	88.85 ppm	ACGIH: 5 ppm, TWA8			
TRICHLOROETHENE	2600	UG/L	194.92 ppm	OSHA: 100 ppm ACGIH: 10 ppm, TWA8			
VINYL CHLORIDE	4.7	UG/L	2.09 ppm	OSHA: 1 ppm, TWA8 5 ppm Ceiling			

6.1.2 <u>Semi-Volatile Organic Compounds (SVOCs)</u>

SVOCs are substances composed primarily of carbon and hydrogen atoms that have boiling points greater than 200 degrees C. Sites where halogenated SVOCs may be found include burn pits, chemical manufacturing plants and disposal areas, contaminated marine sediments, disposal wells and leach fields, electroplating/metal finishing shops, firefighting training areas, hangars/aircraft maintenance areas, landfills and burial pits, leaking collection and system sanitary lines, leaking storage tanks, radiologic/mixed waste disposal areas, oxidation ponds/lagoons, pesticide/herbicide mixing areas, solvent degreasing areas, surface impoundments, and vehicle maintenance areas and wood preserving sites. Potential health effects related to SVOC expose include organ system toxicity (non-reproductive), cancer, birth or developmental effects, brain and nervous system damage, and reproduction and fertility damage.

6.1.3 Metals

Specific toxicities and symptoms from metals vary between individual metal compounds and associated isomers. However, general toxicities exist that can be applied to the general category of metals. For example metals are considered kidney toxins. Other generalized effects have demonstrated impacts on the peripheral and central nervous systems, blood forming mechanisms, gastrointestinal disturbances, cardio and vascular toxicities and some are cancer causing agents. In a particulate form, metals will cause respiratory, dermal, and eye irritation. Acute symptoms associated with ingestion include stomach pain, cramps, headaches, possibly diarrhea and vomiting. These conditions are typically symptomatic of chronic exposure or acute exposure to high concentrations which are not anticipated at this site.

Overexposure to these substances as indicated above typically occurs through ingestion or inhalation of particulates and/or fumes found within some industrial settings. The majority of the available toxicological information has been derived from such settings. In this investigation, potential exposure to these compounds are greatly reduced if not eliminated based on the media in which the contaminants exist. The mobility of these substances are greatly reduced as they are commingled and bound with soil particulates, sediments, as well as underwater. This aspect greatly reduces the mobility of the metals and thereby has a direct impact on the exposure through inhalation. Ingestion possibilities still exist. Exposure via this route is generally facilitated through contaminated hand or glove to mouth contact or to some media which eventually contacts the mouth. This exposure route can also be controlled and thereby minimize exposure potential. Actions include the use of gloves, good work hygiene practices, and through the employment of a suitable decontamination procedure.

These compounds will not have a distinct look, odor, or other physical characteristic.

6.1.4 PCBs

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor. PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

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

6.1.5 Inhalation

From a worst-case scenario, it is possible that workers participating in the activities being conducted in this HASP could encounter airborne concentrations of COCs that would represent an occupational exposure concern. However, in regarding the results of this data evaluation, it is important to recognize that the planned work area is outdoors, with ample natural ventilation that will reduce any airborne COCs through dilution and dispersion. To monitor this route, real-time direct reading monitoring instruments will be used (as described in Section 7.0). This will be performed during intrusive tasks, as these tasks are the most likely to involve encountering/releasing any COCs into the air phase.

In addition, workers will monitor for visible dust, and in the event that visible dust is seen, area wetting techniques will be employed for dust suppression during active/intrusive activities.

6.1.6 <u>Ingestion and Skin Contact</u>

Potential exposure concerns to the COCs may also occur through ingestion, or coming into direct skin contact with contaminated groundwater. The likelihood of worker exposure concerns through these two routes are also considered very unlikely, provided that workers follow good personal hygiene and standard good sample collection/sample handling practices, and wear appropriate PPE as specified in this HASP.

Examples onsite practices that are to be observed that will protect workers from exposure via ingestion or skin contact include the following:

- No hand-to-mouth activities on site (eating, drinking, smoking, etc.)
- Washing hands upon leaving the work area and prior to performing any hand to mouth activities
- Wearing surgeon's-style gloves whenever handling potentially-contaminated media, including groundwater and any potential free product, sampling equipment, and sample containers.

6.2 PHYSICAL HAZARDS

The following is a list of physical hazards that may be encountered at the site or may be present during the performance of site activities.

- Slips, trips, and falls
- Cuts (or other injuries associated with hand tool use)
- Lifting (strain/muscle pulls)
- Ambient temperature extremes (heat stress)
- Pinches and compressions
- Vehicular and foot traffic
- Noise in excess of 85 dBA
- Flying projectiles
- Contact with underground or overhead utilities/electrical safety
- Heavy equipment hazards (rotating equipment, hydraulic lines, etc.)
- Compressed gas cylinders

Specific hazards are discussed further below, and are presented relative to each task in the task-specificAHA.

6.2.1 Slips, Trips, and Falls

During various site activities there is a potential for slip, trip, and fall hazards associated with wet, steep, or unstable work surfaces. To minimize hazards of this nature, personnel required to work in and along areas prone to these types of hazards will be required to exercise caution, and use appropriate precautions (restrict access, guardrails, life lines and/or safety harnesses) and other means suitable for the task at hand. Site activities will be performed using the buddy system.

6.2.2 Strain/Muscle Pulls from Heavy Lifting

During execution of planned activities there is some potential for strains, sprains, and/or muscle pulls due to the physical demands and nature of this site work. To avoid injury during lifting tasks personnel are to lift with the force of the load carried by their legs and not their backs. When lifting or handling heavy material or equipment use an appropriate number of personnel. Keep the work area free from ground clutter to avoid unnecessary twisting or sudden movements while handling loads.

6.2.3 Heat/Cold Stress

Heat Stress

Because of the geographical location of the planned work, the likely seasonal weather conditions that will exist during the planned schedule, and the physical exertion that can be anticipated with some of the planned tasks, it will be necessary for the field team to be aware of the signs and symptoms and the measures appropriate to prevent heat stress. At this time of year heat stress is unlikely but the possibility exists of warm weather in December. For this reason heat stress information is provided here. The SSO is responsible for reviewing and implementing controls as appropriate on this project.

In general, early signs of heat-related disorders include heat rash, cramps, heavy sweating which may be followed by the complete shutdown of a person's ability to sweat, pale/clammy skin, headaches, dizziness, incoordination, and other maladies. To prevent heat stress disorders, the following preventive measures are to be implemented by the SSO:

- When possible, schedule the most physically-demanding tasks so that they are performed during cooler periods of the day such as early morning or late afternoon
- Educate the field staff in heat stress signs and symptoms so that they can monitor themselves and their co-workers
- Schedule frequent breaks during the hottest parts of the day (such as a few minutes each hour). Breaks should be in shaded areas, and in a location where workers can remove PPE, wash their hands, and drink fluids
- Drinking fluids should be cool and non-caffeinated. Sports-drinks with electrolytes are acceptable provided that they do not contain alcohol. Water is also acceptable.

For more information on heat stress recognition and prevention, consult Tt Safe Work Practice SWP 05-15 available at https://intranet.tetratech.com/healthsafety/Manual/SWP%2005-15%20Heat%20Illness%20Prevention%20and%20Monitoring.pdf.

6.2.4 Cold Stress Related Disorders

Cold Stress is more likely to present problems on this site and present a problem for on-site personnel during all activities. Our focus is on recognizing conditions contributing to cold related disorders and selecting the most appropriate control measure.

Work performed when ambient air temperatures are below 50°F may result in varying levels of cold stress (frost nip, frost bite, and/or hypothermia) depending on environmental factors such as temperature, wind speed, and humidity; physiological factors such as metabolic rate and moisture content of the skin; and other factors such as work load and the protective clothing being worn.

Hypothermia

Fatal exposures to cold among workers have almost always resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body. Workers should be protected from exposure to cold so that the deep core temperature does not fall below 36°C (96.8°F); lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

The most significant potential for a member of the field team to suffer hypothermia would be in the event of a Man Overboard incident where the worker falls into the water, and becomes immersed under ambient and water temperature conditions that are low. In such an event, it is of great importance that the individual be rescued from the water as quickly as possible, taken to a sheltered/heated area out of the elements, and that saturated clothing be removed and warm dry clothing and/or blankets be applied immediately. The person should them be taken to (or be ambulated to) an emergency health care facility for treatment and evaluation.

Signs and Symptoms

- Pain in the extremities may be the first early warning of danger to cold stress.
- During exposure to cold, maximum severe shivering occurs when the body temperature has fallen
 to 35°C (95°F). This must be taken as a sign of danger and exposure to cold should be immediately
 terminated when severe shivering becomes evident. Useful physical or mental work is limited when
 severe shivering occurs.

Control Measures

Since prolonged exposure to cold air, or to immersion in cold water, at temperatures well above freezing can lead to dangerous hypothermia. Whole body protection must be provided.

Adequate insulating dry clothing to maintain core temperatures above 36°C (96.8°F) must be provided to workers if work is performed in air temperatures below 4°C (40°F). Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. People with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered. The precautionary actions to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

- Acclimatization With exposure the body does undergo changes that will permit it to adjust to the cold weather better.
- Dehydration Water and salt loss magnifies conditions associated with hypothermia. Warm, sweet nonalcoholic fluids should be employed for fluid replacement. Soup, non-caffeinated drinks including decaffeinated teas, coffees, etc. are suitable for this purpose.
- Diet A balanced diet can provide the body with the necessary nutrients to aid in combating cold stress.
 Restrictive diets avoiding salts, carbohydrates, etc. may rob you of certain elements that you need.
 Also, site personnel should avoid consuming caffeinated and alcoholic drinks as they can increase the effects of a cold environment on the body.
- Engineering Controls such as wind shields/barriers may be used to control the potential effects of cold stress.
- Administrative controls such as worker rotation; work/warm regimens; required fluid intake; scheduling
 the work for warmer weather; assigning more workers to the task to complete it quicker.
- Overall physical condition should always be considered when combating cold stress. Older persons, those on certain medications (blood pressure control) are vulnerable to cold environment and cold stress disorders.

Environmental monitoring results will tell you if the conditions are such that cold related disorders can
occur. Biological monitoring will provide real time information as to the progression of the cold related
disorders within your field crew.

Monitoring

- Core temperature Ensure that it does not drop below 96.8°F
- Weight Loss Monitoring weight loss may be indicative of water and salt loss through dehydration.
 >2% changes in body weight are indicative of water loss.
- Visual observation of signs and symptoms of overexposure.

The best way to avoid hypothermia and frostbite is to stay warm and dry indoors. Office trailers will be located on this site and will provide areas for warming of employees. When you must go outside, dress appropriately. Wear several layers of loose-fitting, lightweight, warm clothing. Trapped air between the layers will insulate you. Remove layers to avoid sweating and subsequent chill. Outer garments should be tightly woven, water repellent, and hooded. Wear a hat, because half of your body heat can be lost from your head. Cover your mouth to protect your lungs from extreme cold. Mittens, snug at the wrist, are better than gloves. Try to stay dry and out of the wind.

6.2.5 Pinch/Compression Points

Handling of tools, machinery, and other equipment on site may expose personnel to pinch/compression point hazards during normal work activities. Where applicable, equipment will have intact and functional guarding to prevent personnel contact with hazards. Personnel will exercise caution when working around pinch/compression points, using additional tools or devices (e.g., pinch bars) to assist in completing activities.

6.2.6 Natural Hazards

Natural hazards such as poisonous plants, bites from poisonous or disease carrying animals or insects (e.g., snakes, ticks, mosquitoes) are often prevalent at sites that are being investigated as part of hazardous waste site operations. To minimize the potential for site personnel to encounter these hazards, nesting areas in and about work areas will be avoided to the greatest extent possible. Work areas will be inspected to look for any evidence that dangerous animals may be present. Based on the planned location for the work covered by this HASP, encountering wild animals is not a likely probability.

During warm months (spring through early fall), tick-borne Lyme Disease may pose a potential health hazard. The longer a disease carrying tick remains attached to the body, the greater the potential for contracting the disease. Wearing long sleeved shirts and long pants (tucked into boots and taped) will

prevent initial tick attachment, while performing frequent body checks will help prevent long term attachment. Site first aid kits should be equipped with medical forceps and rubbing alcohol to assist in tick removal. For information regarding tick removal procedures and symptoms of exposure, consult Section 4.0 of the Health and Safety Guidance Manual.

Contact with poisonous plants and bites or stings from poisonous insects are other potential natural hazards. Long sleeved shirts and long pants (tucked into boots), and avoiding potential nesting areas, will minimize the potential for exposure. Additionally, insect repellents may be used by site personnel. Personnel who are allergic to stinging insects (such as bees, wasps and hornets) must be particularly careful since severe illness and death may result from allergic reactions. As with any medical condition or allergy, information regarding the condition must be listed on the Medical Data Sheet (see Attachment III of this HASP), and the FOL or SSO notified.

6.2.7 <u>Vehicular and Equipment Traffic</u>

If working in or near streets or roadways, hazards associated with vehicular and equipment traffic are likely to exist during various site activities and whenever site personnel performed work on or near roadways. Site personnel will be instructed to maintain awareness of traffic and moving equipment when performing site activities. When working near roadways, site personnel will wear high visibility vests.

6.2.8 Inclement Weather

Project tasks under this Scope of Work will be performed outdoors. As a result, inclement weather may be encountered. In the event that adverse weather (electrical storms, tornadoes, etc.) conditions arise, the FOL and/or the SSO will be responsible for temporarily suspending or terminating activities until hazardous conditions no longer exist.

6.2.9 Contact with Underground or Overhead Utilities/Electrical Safety

Contact with energized sources can result in severe injury and even death. There are two areas of concern with this potential hazard: contact with energized processing equipment and contact with energized utilities including underground utilities (i.e., electrical transmission lines, gas lines, water lines, etc.) and overhead utilities (i.e., power lines, etc.).

 Use and application of the Tetra Tech Standard Operating Procedure (SOP) for Utility Locating and Excavation Clearance found in the Tetra Tech Health and Safety Guidance Manual will be employed. This procedure provides step-by-step instructions for clearance of underground utilities, as well as avoidance techniques, and required documentation.

- Establishment of a suitable clearance distance (20-feet) from overhead utilities will be the primary method to control hazards conveyed through contact with these power sources.
- Identify underground utilities and buried structures before commencing any DPT operations. Follow the Tetra Tech Utility Locating and Excavation Clearance Standard Operating Procedure.

In addition, the electrical safety procedures stipulated in Section 3.9 of the LM Handbook and the overhead power line safety procedures in Section 3.14 of the LM Handbook will also be followed.

No hazardous energy work is being conducted as part of this field effort. However, should activities associated with lockout/tagout be required, the requirements stipulated in Section 3.5 of the LM Handbook (Attachment I) will also be adhered to.

6.2.10 Heavy Equipment/Excavation Hazards

Ensure that workers are thoroughly trained and competent to perform their assigned task with the equipment used in investigation. Ensure that back-up alarms are functional on equipment. Heavy equipment will be subjected to an equipment inspection, upon arrival on-site and prior to leaving. This inspection will be recorded on the Equipment Inspection Checklist provided in Attachment V of this HASP. The equipment operators and on-site Supervisors responsible for the equipment are to ensure that the Equipment Inspection Checklist has been reviewed and completed, and that all moving parts are guarded if such parts are exposed. Check/test all emergency stop controls. Use escort vehicles with flashing lights to ward and control local traffic when moving large equipment to support area. Only trained and authorized workers may operate heavy equipment, industrial vehicles and/or cranes. All manufacturer's specifications and limitations will be adhered to. Utility clearances should be in place prior to the beginning of excavation (in accordance with the Tetra Tech Utility Locating SOP.

An Excavation Competent Person must be specifically identified to handle this responsibility prior to work beginning in the specified space provided (Section 1.3) in this HASP. Detailed Tetra Tech Excavation Safety Procedures, the Excavation Competent Person Checklist, the Tetra Tech Confined Space Entry Program and Procedures, and the Heavy Equipment Inspection Checklist are included in Attachments VIII, IX, X, and XI, and must be completed prior to beginning work. The OSHA Health and Safety Construction-Related regulations P-650 to 699 – Subpart P – Excavations are included in Attachment XII and must be followed during all excavation work.

In addition, the heavy equipment, industrial vehicle, and crane operation safety procedures and excavation procedures stipulated in Section 3.13 and 3.8 of the LM Handbook and will be followed.

6.2.11 Compressed Gas Cylinders

Work utilizing compressed gas cylinders is not anticipated as part of this field effort. However, if work utilizing compressed gas cylinders is required, this HASP will be updated/amended as necessary and the procedures in Section 3.17 of the LM Handbook (Attachment I) will be followed.

6.3 SANITATION AND BREAK AREAS

This section will address the following items:

- Toilets
- Potable water
- Showers and change rooms
- Break Areas

6.3.1 Toilets

One portable toilet will be provided for every 20 people. All toilets will be unisex and will have locking doors. The toilet provided will either be a chemical toilet and service provider or the flush toilet readily accessible at a predetermined approved location at the site where work is being conducted. If necessary the FOL will arrange to have toilets moved or delivered and picked up when work is occurring at other sites.

6.3.2 Potable Water

Potable water as well as electrolyte balance sports drinks such as Gatorade will be provided to the field crews for fluid replacement, as it is necessary under conditions of ambient temperature extremes. Storage and dispensing will proceed as follows:

- All containers will be clean and replenished daily.
- All containers will clearly marked as to their contents (Potable Water Drinking Water Only; Gatorade, etc.).
- Dispensing locations will be placed in identified break areas within the support zone. The most likely
 location will be at a support vehicle staged near the work area. This will serve as an area for cooling
 or warming as well as an identified food and drink consumption area.
- If larger containers are used, dispensing cups will be provided.
- The coolers used for storage of potable drinks and single-use/disposable cups will be stored in plastic bags away from potentially contaminating materials when not in use.

6.3.3 Showers and Change Rooms

Based on this scope and duration of this project shower facilities and locker rooms will not be required.

6.3.4 Break Areas

Given the location and the time of the year structured suitable locations for work breaks and warming regimens will reflect the ambient conditions anticipated for that time of the year. Portable shelters such as an office trailer will provide shelter for protection from the weather as well as to provide a suitable area to permit warming if in a cold environment.

6.3.5 Flying Projectiles

- Restrict other personnel from decon pad during pressure washing operations.
- Pressure washer operator must exercise care when directing the wand so that it is not pointing at himself/herself or at any other worker.
- Pressure washer operator must wear full face shield over safety glasses with side shields and brow protection.
- At SSO discretion, additional PPE consisting of hardhat, rainsuit, apron, and or boot covers may be required during decon operations - depending on observations indicating that significant contact with decon overspray and/or windy conditions during washing activities.

6.3.6 Noise in Excess of 85 dBA

Worker exposure to noise that can approach hazardous levels is a common potential hazard on most project work sites. Workers who must work in areas or who must perform operations where noise levels can approach an 8-hour time weighted average of 85 decibels on the A-weighted scale (dBA) must have received hearing conservation training within the past 12 month period (this is normally provided as part of the 8-hour refresher training). If personnel have not had this training within the last 12 months they will be provided such training by the SSO at the project site prior to participating in high noise level activities. On this project, high noise levels may be encountered when working near the drill rig, and during decontamination operations when using a pressure washer,

As a general rule-of-thumb to prevent worker exposure to high noise levels, workers will be informed to observe the following:

• If ambient noise levels are loud enough that they have to raise their voice in order to communicate with another person who is less than two feet away, hearing protection will be required. Also, if any existing site operations are posted as high noise areas or that hearing protection is required in that area, then hearing protection will be used

7.0 AIR MONITORING

As a precaution, direct reading instrument will be used for onsite activities to screen source areas (i.e., monitoring wells) and worker breathing zones for the presence of volatile site contaminants. At least twice each day (e.g., at the beginning and end of each work day), the SSO will establish background levels by operating the instrument at locations that are at the perimeter of the site property, and that are upwind of planned or ongoing site activities, unlikely to be affected by any intrusive site activities performed as part of this investigation. These daily-established background levels will be the baseline for comparing all other direct reading instrument readings noted during the performance of intrusive activities. Any readings noted above 1 PPM for five minutes four times a day will be regarded as "elevated" and interpreted as possible indications of airborne releases from site activities, warranting specific action specified in this section.

If instrument readings indicate airborne levels (lasting five minutes or longer) in BZ areas that are higher than the daily established background levels, this will require site activities to be suspended and workers to retreat upwind to the pre-determined emergency congregation point. Work may not resume until and unless readings return to background levels. The use of personal protective equipment and the observance of the other control requirements presented in this HASP have been selected to minimize potential for personnel exposures to hazardous concentrations of the site contaminants of concern presented in Section 6.0.

7.1 INSTRUMENTS AND USE

Instruments will be used primarily as described above to monitor source points and worker breathing zone areas, observing instrument action levels. Action levels are discussed in Section 7.1.1 as they may apply to a specific task or location.

7.1.1 <u>Photoionization Detector</u>

Based on the properties of the identified contaminants of concern, a Photoionization Detector (PID) equipped with a lamp strength of at least 11.7eV lamp will be appropriate to screen source areas (sampling locations, monitoring wells, bore holes, etc.) during intrusive site activities at the two planned site work areas. This instrument will also be used to periodically (e.g., at least 3-4 times each day) to monitor the breathing zones of employees during site activities for elevated readings above the daily-established background level. The PID suitably equipped with the appropriate lamp strength has been selected because it is capable of detecting all of the identified contaminants of concern at the site.

As previously mentioned, daily background level readings will be taken away from any areas of potential contamination. These readings must be documented in the field operations logbook or other site documentation (e.g., sample log sheet).

<u>Instrument Action Levels</u>: The use of a PID will be acceptable, provided that the following action levels are observed:

- PID Action Level: any reading >1 ppm for more than 5 minutes above background in the breathing zone for 4 exposures of 5 minutes in one workday.
- Generation of dusts should be minimized. If airborne dusts are observed, area wetting methods will be
 used. If area wetting methods are not feasible, termination of activities may be used to minimize
 exposure to observed airborne dusts.

7.1.2 <u>Hazard Monitoring Frequency</u>

The frequency that hazard monitoring will be performed as well as the action levels will be determined by the PHSO who will also initiate the use of elevated levels of protection. The SSO may decide to increases these frequencies based on instrument responses and site observations. The frequency at which monitoring is performed will not be reduced without the prior consent of the PHSO or HSM.

7.2 INSTRUMENT MAINTENANCE AND CALIBRATION

Hazard monitoring instruments will be maintained and pre-field calibrated by the equipment provider (i.e., rental agency used). Operational checks and field calibration will be performed on site instruments each day prior to their use. Field calibration will be performed on instruments according to manufacturer's recommendations. These operational checks and calibration efforts will be performed in a manner that complies with the employees health and safety training, the manufacturer's recommendations, and with the applicable manufacturer standard operating procedure (which the SSO must assure are included with the instrument upon its receipt onsite). Field calibration efforts must be documented. Figure 7-1 is provided for documenting these calibration efforts. This information may instead be recorded in a field operations logbook, provided that the information specified in Figure 7-1 is recorded. This required information includes the following:

- Date calibration was performed
- Individual calibrating the instrument
- Instrument name, model, and serial number
- Any relevant instrument settings and resultant readings (before and after) calibration
- Identification of the calibration standard (lot no., source concentration, supplier)
- Any relevant comments or remarks

7.3 DOCUMENTING INSTRUMENT READINGS

The SSO is responsible for ensuring that air monitoring instruments are used in accordance with the specifications of this HASP and with manufacturer's specifications/recommendations. In addition, the SSO is also responsible for ensuring that all instrument use is documented. This requirement can be satisfied either by recording instrument readings on pre-printed sampling log sheets or in a field log book. This includes the requirement for documenting instrument readings that indicate no elevated readings above noted daily background levels (i.e., no-exposure readings). At a minimum, the SSO must document the following information for each use of an air monitoring device:

- Date, time, and duration of the reading
- · Site location where the reading was obtained
- Instrument used (e.g., PID, etc.)
- Personnel present at the area where the reading was noted
- Other conditions that are considered relevant to the SHSO (such as weather conditions, possible instrument interferences, etc.)

7.4 RADIOLOGICAL AIR AND SURFACE MONITORING

The instruments described in this section are suitable for the physical and environmental conditions at Greater Strawberry Point. The instruments and measurement methods will be able to detect the ROC or radiation types of interest, and are, in relation to the survey or analytical technique, capable of measuring levels sufficient to support the data quality objectives.

7.4.1 <u>Field Survey Instruments</u>

The surveys conducted will be composed of one or more of the following general techniques:

- Scanning with hand-held instruments
- Direct measurements with hand-held instruments for spot readings and marginally accessible surface areas
- Field counting of swipes with Radiation Scaler/Sample Counter

Hand-held instrumentation may be used to scan small areas or surfaces that are not readily accessible otherwise. The hand-held instrumentation will be based on best available technology applicable to the release limits. Instrumentation may include sodium-iodide (NaI), Geiger-Mueller (GM), or zinc sulfide detectors. Swipes taken to determine the presence of removable radioactivity will be analyzed on site using an alpha/beta scaler/sample counter. Portable survey instruments will be used to perform measurements in the field.

7.4.1.1 Daily Performance

Prior to use of the portable survey instruments, calibration verification, physical inspection, battery check if direct current (DC) powered, and source-response check will be performed. The portable survey instruments will have a current calibration label that will be verified daily prior to use of the instrument. Physical inspection of the portable survey instrument will include:

- General physical condition of the instrument and detector prior to each use
- Knobs, buttons, cables, connectors
- Meter movements/displays
- Instrument cases
- Probe/probe windows
- Other physical properties that may affect the proper operation of the instrument or detector
- Any portable survey instrument or detector having a questionable physical condition will not be used until the problems have been corrected.

For instruments that are battery powered, a battery check will be performed to ensure that sufficient voltage is being supplied to the detector and instrument circuitry for proper operation. This check will be performed in accordance with the instrument's operations manual. The instrument will be exposed to the appropriate (alpha and beta) check source to verify the instrument response is within acceptable range.

7.4.1.2 Instruments for Surface Scan Surveys for Alpha and Beta Activity

Scan surveys for alpha, beta and gamma radiation will be performed using hand-held systems with scintillation detectors. The hand held equipment will be either a Ludlum 2241 or Ludlum Model 2360 data logger (or equivalent) equipped with a Ludlum Model 43-93 alpha-beta scintillation probes (or equivalent) or a Ludlum Model 44-10 Nal scintillation detector (or equivalent).

7.4.1.3 Instruments for Direct Measurement Static Surveys for Alpha and Beta Activity

Static surveys for alpha and beta radiation will be performed using hand-held systems with scintillation detectors. The hand held equipment will be either a Ludlum 2241 or Ludlum Model 2360 data logger (or equivalent) equipped with a Ludlum Model 43-93 alpha-beta scintillation probes (or equivalent) or a Ludlum Model 44-10 Nal scintillation detector (or equivalent).

Model 2360 Alpha/Beta Data Logger



Radiation Detection for a Safer World

Features

- · Scaler/Ratemeter/Data Logger
- Simultaneous Alpha & Beta Measurements with Audio Discrimination
- · Logs 550 Data Points
- · Analog & Digital Display
- · Six Separate Alarms
- · Overload Protection
- RS-232 Port



Part Number 48-2872

Specifications

SUGGESTED DETECTOR: dual phosphor scintillation and gas proportional detectors LINEARITY: reading within 10% of true value

HIGH VOLTAGE: adjustable from 200-2000 volts (can be read on meter)

OVERLOAD: senses detector saturation, indicated by red lamp on meter and meter deflecting to full scale (internally adjustable) RESPONSE: will vary according to number of counts, typically 2–11 seconds from 10%-90% of final reading

SCALER: 6-digit LCD display with 0.64 cm (0.25 in.) digits, overflow arrow, colons to indicate when a count is in process, and backlight COUNT TIME RANGE: 0.1–60 minutes with capability to preset user-programmed value

DATA LOGGER: capable of storing up to 550 individual data points with the following identifiers for each point: (all data is stored in non-volatile memory allowing batteries to be removed without loss of data)

alpha and beta sample counts

sample number

date/time stamp

scaler count time

10-character location identifier (can be set by ASCII terminal or PC)

HEADER INFORMATION: 6 lines of user defined memory at the beginning of the stack for storing user name, survey name, serial numbers, etc. (information is dumped with logged data)

RS-232 PORT: located on the can, this allows the instrument to be connected to a PC for dumping of data, and setup of parameters LOGGING FUNCTION CONTROL: internal selection that enables the pushbutton to log a ratemeter reading, initiate a scaler count and log the resulting reading, log both the scaler and ratemeter reading, or disable the logging function

ALARM: has alarm capabilities on both the scaler and ratemeter, both circuits allow for independent alarm settings of the alpha channel, beta channel, and the alpha/beta channel, the scaler alarm setpoints can be set at any point from 0–999999 counts, the ratemeter alarms can be set at any point from 0–999999 cpm, alarm points can be set via the keypad, or PC CONTROLS:

RESET/READ HV: a two-position, momentary action switch to allow for the meter to be reset or a reading of the HV setting COUNT TYPE: toggle switch to select alpha+beta or "alpha", only, or "beta" only

AUDIO VOLUME: rotary knob volume control, greater than 60 dB at 61 cm (2 ft), full volume, selectable dual or individual clickper- event for alpha and beta counts and divisions of 1, 10, 100, or 1000 events per click (beta counts only) INSTRUMENT: 6-position rotary knob for instrument off, battery check, range multipliers: x1, x10, x100, x1000

COUNT TIME: switch selectable times of 0.1, 0.5, 1, 2, 5, 10, 60 minutes, or PC to allow for a specific count time to be set from a PC LOGGING PUSHBUTTON: located in handle; used to activate scaler and/or log a count

CALIBRATION DUE DATE: an internal date that disables the instrument if the required calibration interval has been missed METER DIAL: 0–500 cpm, 0–2 kV, BAT OK, OL (overload); others available

BATTERY LIFE: typically 250 hours with alkaline batteries (battery condition can be checked on meter)

TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F), may be certified for operation from -40 to 65 °C (-40 to 150 °F)

SIZE: 16.5 x 8.9 x 21.6 cm (6.5 x 3.5 x 8.5 in.) (H x W x L)

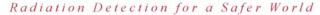
WEIGHT: 1.6 kg (3.5 lb), including batteries

Ludlum Measurements, Inc

1/24/2011

Model 43-93 Alpha/Beta Detector







Specifications

INDICATED USE: alpha beta survey

SUGGESTED INSTRUMENTS: Ludlum Model 2224-1, Model 2360, Model 2929, Model 3030E DETECTOR TYPE: ZnS(Ag) adhered to 0.254 cm (0.010 in.) thick plastic scintillation material

EFFICIENCY (4π): 20% of ²³⁹Pu; 15% of ⁹⁹Tc; 20% of ⁹⁰Sr/⁹⁰Y

WINDOW: 1.2 mg/cm² metalized polyester

REMOVABLE PROTECTIVE SCREEN: 0.79 mm (0.03 in.) thick, 6.5 mm (0.26 in.) square openings, 88% open SCREEN OUTER DIMENSIONS: 167.6 x 92.2 mm (6.6 x 3.6 in.) (L x W)

WINDOW AREA:

Open: 88 cm² (13.6 in²) open Active: 100 cm² (15.5 in²) active NON-UNIFORMITY: less than 10%

BACKGROUND: alpha: 3 cpm or less; beta: 300 cpm or less

CROSS TALK:

alpha to beta: < 10% beta to alpha: < 1%

PHOTOMULTIPLIER TUBE: 2.9 cm (1.12 in.) diameter OPERATING VOLTAGE: typically 500–1200 volts CONSTRUCTION: aluminum with beige powder coating TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F) CONNECTOR: series "C", unless specified otherwise

OVERALL SIZE: $6.4 \times 9.5 \times 31$ cm ($2.5 \times 3.8 \times 12.3$ in. (H x W x L), plus feet

WEIGHT: 0.5 kg (1.0 lb)

Optional Protective Screens

Model L-7393-209: 0.79 mm (0.031 in.) thick, 4 mm (0.16 in.) square openings, 81% open Model L-7393-208: 0.79 mm (0.031 in.) thick, 4.8 mm (0.19 in.) hex openings, 83.5% open Model L-7393-138: 0.51 mm (0.020 in.) thick, 6.5 mm (0.26 in.) square openings, 88% open

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Aug2012

Model 2929 Alpha/Beta Scaler



Radiation Detection for a Safer World

Features

- Dual-Channel Scaler with Independent Readouts
- 0.1 to 990 Minutes Scaler Range
- Independent Audio Volume Adjustments
- Independent RS-232 Outputs



Part Number: 48-1426

Introduction

The Model 2929 is a dual-channel scaler designed for use with a "phoswitch" and/or proportional type detectors that support discrimination between alphas and betas. A pulse height analyzer provides the separation and displays the counts for each on dedicated six-digit LED readouts. Each readout is accompanied by an audio volume rotary control. The high voltage is set via a fine 10-turn dial with the readout given on an analog meter.

The scaler count time is set by a combination of thumbwheel and multiplier controls that allow setting the time from 0.1 to 990 minutes. The front panel additionally provides a startcount button, halt-count button, and an on/off power switch. A red count lamp is illuminated anytime the instrument is performing a timed count, Independent RS-232 serial outputs are supplied for the alpha and beta channels on the back panel for supplying data to either a printer or PC.

Specifications

INDICATED USE: scaler for alpha beta sample counting

DETECTOR COMPATIBILITY: phoswich or proportional type detectors

HIGH VOLTAGE: adjustable from 200 to 2500 volts THRESHOLDS: beta: 4 mV; alpha: 175 mV

BETA WINDOW: 50 mV

SCALERS: 2 ea. 6-digit LED displays with a range of 0-999999 counts

SCALER LINEARITY: reading within 2% of true value

TIMER: thumbwheel adjustment from 0-99 minutes with selectable multipliers of x0.1, x1, x10, or EXT for manual timing

DATA-OUTPUT: two 15-pin connectors allowing for recorder and printers (one for alpha, one for beta)

AUDIO: built-in unimorph type speakers with volume controls to provide dual tone (1 per channel) click-per-event audio

AMP OUT: 'BNC" connector provides amplified detector pulse

METER DIAL: 0-2.5 kV

METER: 6.4 cm (2.5 in.) arc, 1 mA movement analog type POWER: 95 to 250 Vac, 50 to 60 Hz single phase

SIZE: 24.4 x 37.1 x 25.1 cm (9.6 x 14.6 x 9.9 in.) (H x W x D)

WEIGHT: 5.5 kg (12.1 lb), including detector

Available Options:

Model 43-10-1 Alpha/Beta Sample Counter Head: detector with counter head and sample tray (Part Number 47-1305) Model 264 Printer: can provide date/time stamp on each line, uses standard calculator paper (Part Number 48-1642).

Model CS12 Check Source: 230Th (Part Number 01-5860) Model CS13 Check Source: 98To (Part Number 01-5852)

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5/10/2011

Model 43-10-1 Alpha/Beta Sample Counter Head



Ludlum Measurements, Inc

Radiation Detection for a Safer World



Specifications

INDICATED USE: alpha/beta sample counting

SUGGESTED INSTRUMENTS: Model 2929, Model 2223, Model 2224, Model 3030E

DETECTOR TYPE: scintillator, ZnS (Ag)

DETECTOR OPERATING VOLTAGE: 500-1200 volts

CONNECTOR: series "C" (others available)

SAMPLE SIZE (maximum): 5.1 x 0.9 cm (2 x 0.4 in.) (Dia x L)

SAMPLE HOLDER: anodized aluminum tray with sample ring to allow for 2.5 cm (1 in.) or 5.1 cm (2 in.)

diameter x 0.32 cm (0.13 in.) deep samples PHOTOMULTIPLIER TUBE: 5.1 cm (2 in.)

WINDOW: 0.4 mg/cm²

EFFICIENCY (4π): 37% for ²³⁹Pu, 5% for ¹⁴C, 27% for ⁹⁹Tc, 32% for ²³⁰Th, 39% for ²³⁸U,

29% for 137Cs, 26% for 99Sr/90Y

BACKGROUND: 3 cpm or less alpha, 80 cpm or less for beta-gamma CONSTRUCTION: aluminum housing with beige powder coating

TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F), may be certified for operation from -40 to 65 °C (-40 to 150 °F)

SIZE: 23.6 x 11.4 x 23.6 cm (9.3 x 4.5 x 9.3 in.) (H x W x L)

WEIGHT: 1.9 kg (4.1 lb)

Optional Accessories

Sample Planchets

SIZE: 5.1 x 0.32 cm (2 x 0.125 in.) (Dia x Thickness)

Aluminum: Part Number 7525-371

Stainless Steel: Part Number 7525-371-01

(minimum order quantity 500)



6/13/2011

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Model 2241 General Purpose Ratemeter / Scaler



Radiation Detection for a Safer World

Features

- · Digital Ratemeter with Built-In Scaler
- Auto Ranging
- · Accommodates 6 Detector Setups
- · Adjustable Audible and Visual Alarms
- Wide Range HV
- · Overrange & Overload Protection
- · GM, Proportional & Scintillation Detectors

Introduction

The Model 2241 is a portable, rugged, microprocessor-based instrument designed for use with scintillation, Geiger-Mueller (GM), and proportional type detectors. It is constructed of cast-and-drawn aluminum with beige powder coating, which aids in the decontamination of surfaces and is suitable for indoor or outdoor use. Parameters may be programmed either manually, or by computer through the RS-232 port. Free PC Data Logging Software and a Data Logging Data Sheet are available online.



Part Number: 48-2444

Specifications

DETECTORS: Geiger-Mueller (GM), proportional, and scintillation ALERT/ALARM:

- · indicated by annunciation on display
- · built-in speaker for audible tone
- · set at any range
- speaker volume control available as an option

DISPLAY: 4-digit LCD display with 1.3 cm (0.5 in.) high digits, 2 additional 0.5 cm (0.2 in.) digits for overflow counter, separate annunciators for display units, ALERT, ALARM, Low Battery, detector OVERLOAD, counting OVERFLOW, and scaler COUNTING

BACKLIGHT: pushbutton activates LCD backlight for a pre-programmed time

RATEMETER: can display in R/hr, Sv/h, cpm, or cps when selector switch is in RATE position

DISPLAY RANGE: auto ranging from 0.0 µR/hr - 9999 R/hr, 0.000 µSv/h - 9999 Sv/h; 0 cpm - 999 kcpm, or 0 cps -100 kcps SCALER: adjustable from 1 - 9999 seconds (in 1-second intervals)

SCALER ALARM: adjustable from 1 - 999999 counts

DETECTOR DEAD TIME COMPENSATION (DTC): adjustable from 0 to 9999 microseconds LINEARITY: within 10%

ADJUSTABLE PARAMETERS (via Removable Switchboard): Backlight "ON" time, set minimum Display, RS-232 dump mode, Detector Setup mode, Baud rate, detector dead time compensation (DTC), Calibration Constant, display Units, display Range, Time Base (seconds or minutes), Auto Divide, Response Time (variable or fixed), Ratemeter Alert/Alarm, Scaler Alarm, Scaler Count Time

AUDIO: built-in unimorph speaker with AUD ON/OFF switch and volume control potentiometer

HIGH VOLTAGE: 400 to 2400 volts (regulated within 0.2 % at 1000 Vdc; maximum load of 50 μA)

DISCRIMINATOR: adjustable from 2–100 mV

POWER: 2 "D" cell batteries housed in externally accessible sealed compartment

BATTERY LIFE: typically 200 hours with alkaline batteries (Low Battery warning icon on LCD)

SIZE: 16.5 x 8.9 x 21.6 cm (6.5 x 3.5 x 8.5 in.) (H x W x L)

WEIGHT: 1.6 kg (3.5 lb), including batteries

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3/29/2011

Model 44-10 Gamma Detector



Radiation Detection for a Safer World



Part Number: 47-1540

Specifications

INDICATED USE: low-level, wide-energy gamma detection

ENERGY RESPONSE: energy dependent

SUGGESTED INSTRUMENTS: general purpose survey meters, ratemeters, and scalers

OPERATING VOLTAGE: 500-1200 volts

SCINTILLATOR: 5.1 x 5.1 cm (2 x 2 in.) (Dia x L) Nal SENSITIVITY: typically 900 cpm/µR/hr (137Cs gamma)

BACKGROUND: 9750 cpm

RECOMMENDED ENERGY RANGE: 50 KeV-3.0 MeV

PHOTOMULTIPLIER TUBE: 5.1 cm (2 in.) diameter, magnetically shielded

CONNECTOR: series "C" (others available)

TEMPERATURE RANGE: -20 to 50 °C (-4 to 122 °F), may be certified to operate from -40 to 65 °C (-40 to 150 °F)

CONSTRUCTION: aluminum housing with beige polyurethane paint

SIZE: 6.6 x 27.9 cm (2.6 x 11 in.) (Dia x L)

WEIGHT: 1.0 kg (2.3 lb)

Options: Model 180-7 and Model 180-9 Sample Holders provide repeatable geometry for counting wipes, filter paper, or slides at user-selectable spacings of 0.32, 0.64, 1.3, 2.5, and 5.1 cm (0.125, 0.25, 0.5, 1, and 2 in.) from the detector.

Model 180-7 anodized aluminum frame, sample tray, and colllimator (P/N 47-1675)

Model 180-9: has 3.81 cm (1.5 in.) thick lead housing with beige powder coat (P/N 47-1591)

Collimator: 7.9 x 6.6 cm (3.125 x 2.6 in.) (Dia x L), 0.56 cm (0.22 in.) thickness (P/N 4260-076) Collimator: 7.9 x 15.2 cm (3.125 x 6 in.) (Dia x L), 0.56 cm (0.22 in.) thickness (P/N 4260-079)

Planchets: 5.1 cm x 3.2 mm (2.0 x 0.125 in.) (Dia x thickness) in stainless steel or aluminum

Stainless Steel (P/N 7525-371-01); Aluminum (P/N 7525-371) Minimum order quantity of 500

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12/21/2011

7.4.2 Instrument Data Fact Sheets

The Ludlum Data Fact Sheets are included in this section to provide the technical information for the types of portable survey equipment and swipe analyzers expected to be used.

7.4.3 Instrument Action Level

The administrative control level for radiation workers for this project is 500 mrem/yr.

7.4.4 Instrument Maintenance and Calibration

The portable survey instrument calibration will be completed on an annual frequency; the instruments will be source checked daily when in use. Instrument calibration will also be conducted after repairs or modifications have been performed on the instrument. The instrument will be calibrated in accordance with the manufacturer's recommended method.

Figure 7-1 is provided for documenting Pre-operational and daily source checks. This information may instead be recorded in a field operations logbook or electronically, provided that the information specified in Figure 7-1 is recorded. This required information includes the following:

- Date calibration was performed and due date for next calibration
- Instrument name, model, and serial number
- Ambient background readings
- Source ReadingIdentification of the calibration standard (lot no., source concentration, supplier)
- Any relevant comments or remarks

Radiological survey instruments will be prepared for use in accordance with SOP 007, *Preparation of Portable Radiation and Contamination Survey Meters and Instruments for Field Use.*

7.4.5 <u>Documenting Instrument Readings</u>

The Project Health Physicist (PHP) is responsible for ensuring that radiation monitoring instruments are used in accordance with the specifications of this HASP and with manufacturer's specifications/recommendations. In addition, the PHP is also responsible for ensuring that the instrument use is documented. This requirement can be satisfied either by recording instrument readings on preprinted sampling log sheets, on survey sheets or in a field log book. This includes the requirement for

documenting instrument readings that indicate no elevated readings above noted daily background levels (i.e., no-exposure readings). At a minimum the following information should be included:

- Date, time, and duration of the reading
- · Site location where the reading was obtained
- Instrument used (e.g., 2241, 2360, etc.)
- Personnel present at the area where the reading was noted
- Radiological notifications will be performed by Lawson Bailey Project Health Physicist (PHP) thru
 Lockheed Martin contacts.
- Other conditions that are considered relevant to the SSO (such as weather conditions, possible instrument interferences, etc.)
- Radiological surveys will be documented in accordance with SOP 006, Radiation and Contamination Surveys.

Date:_____

Portable Instrument Pre-Operational Response Check Sheet

Instrument Model:			Serial Number:				
Probe Type:			Serial Number:				
Instrument Calibration Date:			Calibration Expiration Date:				
Check Source ID:			Background At Time Of Initial Response Check				
Reference Readin	g/Unit:	20%	+20%				
Date/Time	Bkgd.	Reading	Pass/Fail	Print/Sign	Comments		
		1					

Reviewed By:_____

FIGURE 7-1 DOCUMENTATION OF FIELD CALIBRATION

SITE NAME:	 PROJECT NO.:

Date of Calibration	Instrument Name and Model	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration	
				Pre- Calibration	Post- Calibration	Pre- Calibration	Post- Calibration	Standard (Lot Number)	Remarks/ Comments

8.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

8.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

This section is included to specify health and safety training and medical surveillance requirements for Tetra Tech personnel participating in on site activities. Tetra Tech personnel must complete 40 hours of introductory hazardous waste site training prior to performing work at the LMC MSA. Tetra Tech personnel who have had introductory training more than 12 months prior to site work must have completed 8 hours of refresher training within the past 12 months before being cleared for site work. In addition, 8-hour supervisory training in accordance with 29 CFR 1910.120(e)(4) will be required for site supervisory personnel. Tetra Tech and subcontractor personnel working on site who are potentially exposed to hazardous substances shall receive initial and annual refresher training in accordance with 29 CFR 1910.120(e) – Hazardous Waste Operations and Emergency Response or the applicable state OSHA standard. Lockheed Martin shall be provided with electronic copies of the training certificates. Site personnel must complete yearly LMC-MSA required H&S orientation as part of site specific training.

Documentation of Tetra Tech introductory, supervisory, and refresher training as well as site-specific training will be maintained at the site. Copies of certificates or other official documentation will be used to fulfill this requirement.

The requirements described in Section 3.20.3 of the LM Handbook (Attachment I) addressing training will be followed.

8.2 SITE-SPECIFIC TRAINING

Tetra Tech SSO will provide site-specific training to Tetra Tech employees who will perform work on this project. Figure 8-1 will be used to document the provision and content of the project-specific and associated training. Site personnel will be required to sign this form prior to commencement of site activities. This training documentation will be employed to identify personnel who through record review and attendance of the site-specific training are cleared for participation in site activities. This document shall be maintained at the site to identify and maintain an active list of trained and cleared site personnel.

The Tetra Tech SSO will also conduct a pre-activities training session prior to initiating site work. This will consist of a brief meeting at the beginning of each day to discuss operations planned for that day, and a review of the appropriate Activity Hazard Analysis (AHA) for the planned task participants. A short meeting may also be held at the end of the day to discuss the operations completed and any problems encountered.

In addition, site-specific health and safety training will be conducted by the onsite maintenance contractor (EMCOR). Each person on a yearly basis will be required to have this training prior to obtaining an unescorted security badge for the site.

8.3 MEDICAL SURVEILLANCE

Tetra Tech personnel participating in project field activities will have had a physical examination meeting the requirements of Tetra Tech's medical surveillance program. Documentation for medical clearances will be maintained in the Tetra Tech Pittsburgh office and made available, as necessary, and will be documented using Figure 8-1 for every employee participating in onsite work activities at this site. Tetra Tech shall provide evidence of employee enrollment in a medical surveillance program. Lockheed Martin does not provide medical surveillance examinations to contractor employees.

The medical surveillance requirements described in Section 3.20.4 of the LM Handbook (Attachment I) will be followed.

Each field team member, including visitors, entering the exclusion zone(s) shall be required to complete and submit a copy of the Medical Data Sheet (see Attachment III of this HASP). This shall be provided to the SSO, prior to participating in site activities. The purpose of this document is to provide site personnel and emergency responders with additional information that may be necessary in order to administer medical attention.

FIGURE 8-1

SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing field activities at LCM MSA and that I have received site-specific training which included the elements presented below:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- Emergency response procedures (evacuation and assembly points)
- Incipient response procedures
- Review of the contents of relevant Material Safety Data Sheets/Safwty Data Sheets/SDS
- Review of the use of Activity Hazard Analysis
- Stop Work Procedures

I have been given the opportunity to ask questions and all of my questions have been answered to my satisfaction. The dates of my training and medical surveillance requirements indicated below are accurate.

Name (Printed and Signature)	Site- Specific Training Date	40-Hour Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Medical Exam

9.0 SITE CONTROL

This section outlines the means by which Tetra Tech will delineate work zones and use these work zones in conjunction with decontamination procedures to prevent the spread of contaminants into previously unaffected areas of the site. It is anticipated that a three-zone approach will be used during work at this site. This approach will be comprised of an exclusion zone, a contamination reduction zone, and a support zone. It is also anticipated that this approach will control access to site work areas, restricting access by the general public, minimizing the potential for the spread of contaminants, and protecting individuals who are not cleared to enter work areas.

9.1 EXCLUSION ZONE

The exclusion zone will be considered the areas of the site of known or suspected contamination. It is anticipated that the areas around active/intrusive activates will have the potential for contaminants brought to the surface. These areas will be marked and personnel will maintain safe distances. Once active/intrusive activities have been completed and any surface contamination has been removed, the potential for exposure is again diminished and the area can then be reclassified as part of the contamination reduction zone. The exclusion zones for this project are those areas of the site where active work (DPT work areas, drilling, installation, and sample collection, etc.) is being performed plus a designated area of at least 25 feet surrounding the work area. Exclusion zones will be delineated as deemed appropriate by the FOL, through means such as erecting visibility fencing, barrier tape, cones, and/or postings to inform and direct personnel.

9.1.1 Exclusion Zone Clearance

An Exclusion Zone (EZ) will be established at each well installation/sampling location. The purpose of establishing and maintaining these localized exclusion zones is to define areas where more rigorous safety and health protection measures will be required and to designate areas restricted to non-essential and unauthorized personnel. The size and dimensions of these EZs will vary based on the nature of the planned activities, and may be subject to change at the SSO's discretion based on factors such as visual observations, nearby concurrent operations, and other factors. However, the following dimensions represent basic considerations for establishing EZs:

• <u>DPT and associated concurrent sampling activities</u>. The EZ for this activity will be set at the height of the mast, plus five feet surrounding the point of operation, with a minimum of 25-feet. This distance will also apply when surface and subsurface soil sampling from behind these type rigs.

- Monitoring well development, purging, piezometer construction and use, and collecting groundwater samples and water level readings. The EZ for these activities will be set to encompass an area of at least 10-feet surrounding the well head.
- <u>Decontamination operations</u>. The EZ for this activity will be set at 25 feet surrounding the gross contamination wash and rinse as well as 25-feet surrounding the heavy equipment decontamination area. Sample equipment decontamination boundaries will be set at 10-feet surrounding hand wash and rinse areas.
- Investigative Derived Waste (IDW) area will be constructed and barricaded. Only authorized personnel
 will be allowed access.

EZs will be marked using barrier tape, traffic cones and/or drive pole, or other readily-visible devices. Signs may also be posted at the SSO's discretion to inform and direct site personnel and site visitors. EZs shall remain marked until the SSO has evaluated the restoration effort and has authorized changing the zone status.

A pre-startup site visit will be conducted by members of the identified field team in an effort to identify proposed subsurface investigation locations, conduct utility clearances, and provide upfront notices concerning scheduled activities within the facility.

Subsurface activities will proceed only when utility clearance has been obtained. In the event that a utility is struck during a subsurface investigative activity, the emergency numbers provided in Section 2.0, Table 2-1, will be notified.

9.2 CONTAMINATION REDUCTION ZONE

Contamination Reduction Zones (CRZs) will be established to minimize the potential for the spread of contaminated media from being spread into previously-unaffected areas. The primary function of a CRZ is to provide an adequate area for decontamination activities. For personal and small item (e.g., sampling equipment) decontamination activities, a CRZ will be established at the perimeter of each EZ. For decontamination activities that will require specialized equipment, larger areas, and more significant containment, a heavy equipment decontamination pad CRZ will be established in one or more areas to support the two work areas.

In order to move from on EZ to another, the following activities will be performed in the localized CRZs:

- As samplers move from location to location, dedicated sampling devices and PPE will be washed to remove visible gross contamination, and then these items will be bagged and removed. Personnel will use hygienic wipes (such as "baby wipes") as necessary for interim personnel decontamination until they can access a facility equipped with hands washing and rinsing capabilities. At the first available opportunity personnel will wash their face and hands. This is critical prior to breaks and lunch when contamination may be transferred to the mouth through hand to mouth contact.
- Disposable PPE, sampling equipment, and other items are to be sequentially removed/deposited and double-bagged. Such waste is to be disposed of in accordance with the direction of the client. Reusable items that are grossly contaminated (such as muddy over-boots, hardhats, etc.) will be required to be removed, bagged, and taken to the established decontamination pad for washing and rinsing prior to being used at another EZ.
- Potentially contaminated tooling will be wrapped, as necessary, for transport to the decontamination area for cleaning.

9.3 SUPPORT ZONE

The support zone for this project will include a staging area where site vehicles will be parked, equipment will be unloaded, and where food and drink containers will be maintained. The support zones will be established at areas of the site where away from potential exposure to site contaminants during normal working conditions or foreseeable emergencies.

9.4 ACTIVITY HAZARD ANALYSIS

Exclusion Zone work conducted in support of this project will be performed using Activity Hazard Analysis (AHA's) to guide and direct field crews on a task by task basis. Partially completed AHA's for the work to be performed are attached (Attachment IV) to this HASP. These permits were completed to the extent possible as part of the development of this HASP. It is the SSO's responsibility to finalize and complete all blank portions of the AHA's based on current, existing conditions the day the task is to be performed, and then review that completed permit with all task participants as part of a pre-task tail gate briefing session. This will ensure that site-specific considerations and changing conditions are appropriately incorporated into the AHA, provide the SSO with a structured format for conducting the tail gate sessions, as well will also give personnel an opportunity to ask questions and make suggestions. All AHA's require the signature of the FOL or SSO.

9.5 SITE SECURITY

As this activity will take place at an active facility, the first line of security will be provided by the facility entrance/gate restricting the general public. The second line of security will take place at the work site referring interested parties to the FOL and LMC Contact.

Security at the work areas will be accomplished using field personnel. This is a multiple person operation, involving multiple operational zones. Tetra Tech personnel will retain complete control over active operational zones.

The site contact will serve as the focal point for facility personnel and interested parties and will serve as the primary enforcement contact.

9.6 SITE VISITORS

Site visitors for the purpose of this document are identified as representing the following groups of individuals:

- · Personnel invited to observe or participate in operations by Tetra Tech
- Regulatory personnel (i.e. EPA, MDEP, OSHA)
- Property Owners
- Authorized Personnel
- Other authorized visitors

Non Tetra Tech personnel working on this project are required to gain initial access to the facility by coordinating with the Tetra Tech FOL or designee and following established facility access procedures.

Once access to the facility is obtained, personnel who require site access into areas of ongoing operations will be required to obtain permission from the PM. In addition, site visitors wishing to observe operations in progress will be escorted by a Tetra Tech representative and shall be required to meet the minimum requirements discussed below:

- Site visitors will be directed to the FOL/SSO, who will sign them into the field logbook or daily sign-in sheet. Information to be recorded in the logbook or sign-in sheet will include the individual's name (proper identification required), the entity which they represent, and the purpose of the visit.
- Site visitors must be escorted and restricted from approaching any work areas where they could be exposed to hazards from Tetra Tech operations. If a visitor has authorization from the client and from

the Tetra Tech Project Manager to approach our work areas, the FOL must assure that the visitor first provides documentation indicating that he/she/they have successfully completed the necessary OSHA introductory training, receive site-specific training from the SSO, and that they have been physically cleared to work on hazardous waste sites. Site visitors wishing to enter the exclusion zone will be required to produce the necessary information supporting clearance to the site. This shall include information attesting to applicable training and medical surveillance as stipulated in Section 8.0 of this document. In addition, to enter the site operational zones during planned activities, visitors will be required to first go through site-specific training covering the topics stipulated in Section 8.2 of this HASP. All jobsite visitors must have a safety orientation prior to commencing work or touring the site. A visitor log will be kept to document the orientation.

Once the site visitors have completed the above items, they will be permitted to enter the operational zone. Visitors are required to observe the protective equipment and site restrictions in effect at the site at the time of their visit. Visitors entering the exclusion zones during ongoing operations will be accompanied by a Tetra Tech representative. Visitors not meeting the requirements, as stipulated in this plan, for site clearance will not be permitted to enter the site operational zones during planned activities. Any incidence of unauthorized site visitation will cause the termination of on site activities until the unauthorized visitor is removed from the premises. Removal of unauthorized visitors will be accomplished with support from local law enforcement personnel.

9.7 SITE MAP

Once the areas of contamination, access routes, topography, and dispersion routes are determined, a site map will be generated and adjusted as site conditions change. These maps will be posted to illustrate upto-date collection of contaminants and adjustment of zones and access points.

9.8 BUDDY SYSTEM

Personnel engaged in on site activities will practice the "buddy system" to ensure the safety of personnel involved in this operation.

9.9 COMMUNICATION

As personnel will be working in proximity to one another during field activities, a supported means of communication between field crew members will not be necessary.

External communication will be accomplished by using the cell phones/telephones at predetermined and approved locations. External communication will primarily be used for the purpose of resource and

emergency resource communications. Prior to the commencement of activities at the LCM MSA, the FOL will determine and arrange for telephone communications.

9.10 SELF-AUDITS

The procedures outlined in Section 7 of the LM Handbook (Attachment I) addressing self-audits will be adhered to.

Tetra Tech and/or subcontractor personnel will perform periodic work area/project field inspections to monitor compliance with project environmental, safety and health requirements. The name of Tetra Tech's jobsite health and safety (H&S) representative will be provided to Lockheed Martin prior to starting work at the jobsite.

For jobs that are ongoing, an annual H&S audit shall be conducted and for jobs with a duration of less than one year at least one audit shall occur. A competent H&S representative designated by the Tetra Tech shall perform the audit. Unsafe acts and/or non-compliance conditions noted during inspections shall be corrected immediately.

The documentation related to the audits and inspections shall be submitted electronically to the Lockheed Martin Project Lead.

10.0 SPILL CONTAINMENT PROGRAM AND WASTE MANAGEMENT PLAN

10.1 SCOPE AND APPLICATION

It is not anticipated that bulk hazardous materials (over 55-gallons) will be generated or handled at any given time as part of this scope of work. It is also not anticipated that such spillage would constitute a danger to human health or the environment.

This Spill Prevention and Containment Program applies to the potential release from one or more containers on the work site involving a single or aggregate accumulation of bulk storage materials (over 55-gallons). As the classification of certain materials such as IDW is unknown, these materials will be treated as hazardous, pending laboratory certification to the contrary.

However, as the job progresses, some potential may exist for accumulating Investigative Derived Wastes (IDW) such as decontamination fluids, soil cuttings, disposable sampling equipment and PPE.

The spill containment and control will be engaged any time there is a release of the above-identified materials from a containment system or vessel. This spill containment program will be engaged in order to minimize associated hazards.

10.2 POTENTIAL SPILL AREAS

Potential spill areas will be periodically monitored in an ongoing attempt to prevent and control further potential contamination of the environment. Currently, limited areas are vulnerable to this hazard including:

- Resource deployment
- Waste transfer
- Central staging

It is anticipated that the IDW generated as a result of this scope of work will be containerized, labeled, and staged to await further analyses. The results of these analyses will determine the method of disposal.

10.3 LEAK AND SPILL DETECTION

To establish an early detection of potential spills or leaks, a periodic walk-around by the personnel staging or disposing of drums area will be conducted during working hours to visually determine that storage vessels are not leaking. If a leak is detected, the contents will be transferred, using a hand pump, into a new vessel. The leak will be collected and contained using absorbents such as Oil-Dry, vermiculite, or

sand, which are stored at the vulnerable areas in a conspicuously marked drum. This used material, too, will be containerized for disposal pending analysis. Inspections will be documented in the project logbook.

In case of a spill or release of hazardous chemicals, Tetra Tech shall immediately notify the Lockheed Martin Project Lead, and/or if the severity of the spill warrants, the local fire department by calling 9-1-1. Tetra Tech shall take all necessary steps to control the spread of the release and to provide site control to prevent unauthorized personnel from entering the affected area.

Section 8.2 of the LM Handbook (Attachment I) pertaining to spill reporting will be addresses.

10.4 PERSONNEL TRAINING AND SPILL PREVENTION

Personnel will be instructed in the procedures for incipient spill prevention, containment, and collection of hazardous materials in the site-specific training. The FOL and the SSO will serve as the Spill Response Coordinators for this operation, should the need arise.

10.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the types of equipment that should be maintained at the staging areas for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other non combustible absorbent (Oil-dry)
- Drums (55-gallon U.S. DOT 1A1 or 1A2)
- Shovels, rakes, and brooms
- Container labels

Hazardous materials shall be stored in designated areas and all containers effectively closed. Spill equipment/supplied shall be readily available to contain and/or mitigate accidental spills of hazardous materials.

10.6 SPILL CONTROL PLAN

This section describes the procedures the Tetra Tech field crew members will employ upon the detection of a spill or leak.

Notify the SSO or FOL immediately upon detection of a leak or spill. Activate emergency alerting
procedures for that area to remove non-essential personnel.

- Employ the personal protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel. Spread the absorbent material in the area of the spill, covering it completely.
- Transfer the material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment and disposal options.
- Re-containerize spills, including 2-inch of top cover impacted by the spill. Await test results for treatment or disposal options.

It is not anticipated that a spill will occur that the field crew cannot handle. Should this occur, notification of the appropriate Emergency Response agencies will be carried out by the FOL or SSO in accordance with the procedures discussed in Section 2.0 of this HASP.

As mentioned above, in the event of a spill or release of hazardous chemicals, Tetra Tech will immediately notify the LMC personnel in the order presented in Table 2-1, and/or if the severity of the spill warrants, the local fire department by calling 9-1-1.

10.7 WASTE MANAGEMENT PLAN

Tetra Tech personnel will adhere to the decontamination and waste management procedures laid out the TtSOPs and the Tetra Tech Decontamination of Field Equipment and Waste Handling Standard Operating Procedure (Attachment XIII).

In addition, all requirements described in Sections 4.1 and 4.2 of the LM Handbook (Attachment I) will be addressed.

11.0 CONFINED-SPACE ENTRY

It is not anticipated, under the proposed scope of work, that confined space and permit-required confined space activities will be conducted. **Therefore, personnel under the provisions of this HASP are not allowed, under any circumstances, to enter confined spaces**. A confined space is defined as an area which has one or more of the following characteristics:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, manholes, sewers, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry).
- Is not designed for continuous employee occupancy.

Additionally, a Permit-Required Confined Space must also have one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly caving
 walls or by a floor that slopes downward and tapers to a smaller cross-section.
- Contains any other recognized, serious, safety or health hazard.

For further information on confined space, consult the Health and Safety Guidance Manual or call the PHSO. If confined space operations are to be performed as part of the scope of work, detailed procedures and training requirements will have to be addressed and this HASP will be updated/amended as necessary to address the confined space entry requirements detailed in Section 3.3 of the LM Handbook (Attachment I). If subcontractors are performing confined space entry, the subcontractor will work under their own HASP approved by a Tetra Tech health and safety official along with complying with any site specific permit requirements.

12.0 HOT WORK

No hot work activities are being conducted as part of this field effort. Should hot work be required, this HASP will be amended/updated as necessary to include the requirements stipulated in Section 3.4 of the LM Handbook (Attachment I).

13.0 USE OF LOCKHEED MARTIN MATERIALS AND EQUIPMENT

No Lockheed Martin materials, tools, equipment, PPE shall be used until authorized by Lockheed Martin.

No Tetra Tech personnel will start, stop, relocate, or adjust any Lockheed Martin process or production equipment without approval of the Lockheed Martin Project Lead. Details of these requirements are described in Section 3.6 of the LM Handbook.

14.0 ELEVATED LOCATIONS / LADDERS / SCAFFOLDS

No elevated location work, ladder work, or scaffolding activities are being conducted as part of this field effort. Should any of these activities be required, this HASP will be amended/updated as necessary to include the requirements stipulated in Sections 3.10, 3.11, and 3.12 of the LM Handbook (Attachment I).

15.0 DANGEROUS OPERATIONS

Tetra Tech and subcontractor personnel will isolate their work areas from Lockheed Martin operations, employees, and the public. Barricades, signs, and signals will be employed as necessary and will be visible at all times where hazards exist.

Tetra Tech and subcontractors will effectively barricade excavations, floor openings, etc. as required by OSHA regulations.

Prior to beginning work, Tetra Tech and subcontractors must inform the Lockheed Martin Project Lead of any potentially dangerous operations.

All requirements addressing dangerous operations are detailed in Section 3.7 of the LM Handbook and will be adhered to.

16.0 EXCAVATIONS, TRENCHES, AND EARTHWORK

This field effort includes the excavation of test pits, therefore the following excavation procedures will apply to the excavation work.

16.1 EXCAVATION SAFE WORK PRACTICES

- Utility clearances should be in place prior to the beginning of excavation (in accordance with the Tetra
 Tech Utility Locating SOP in the Health and Safety Guidance Manual Section 7.0).
- Excavation boundaries should be demarcated with appropriate warning signs (e.g., construction activities in progress).
- Traffic patterns for equipment and the loading of trucks should be established. This pattern should form a loop to minimize backing, an activity which causes many accidents.
- Traffic patterns for foot and small vehicular traffic should keep workers away from heavy equipment.
- Traffic patterns for heavy equipment should be constructed to maintain traffic flow a minimum of 10 feet from unsupported walls or excavation boundaries.
- Excavation along thoroughfares will require the use of warning signs, barricades and flag-persons for alteration of traffic patterns, as necessary.
- Ground personnel should be provided with reflective vests to increase visibility and air horns to signal loud trucks and heavy equipment.
- Ground activities with heavy equipment should be supported with a ground spotter. The operators
 should be instructed that they are to follow the instructions provided by the ground spotter unless
 another party is otherwise authorized.
- Surface encumbrances within the intended work area of the excavation will be removed or supported, as necessary, in accordance with OSHA 1926.651(a).
- Prior to being put into service at the site, the excavator will be inspected by the SSO, and this inspection
 will be documented using the applicable forms in Attachment V.

- Heavy equipment will be positioned and operated so that it never approaches closer than 4 feet from the edge of an open excavation (other than the boom and bucket portion of the excavator).
- A decontamination station should be established at the loading and off-loading areas to flush mud and dirt from the wheels and tires as well as any areas of the vehicle impacted during the loading operation.

Note: Tetra Tech personnel WILL NOT enter a trench past 4 feet deep

16.2 EMPLOYER DESIGNATED "COMPETENT PERSON"

The Employer Designated "Competent Person" is responsible for all aspects of excavation safety. This includes:

16.2.1 <u>Pre-Excavation Activities</u>

- Utility Clearance identification and marking
- Establishment of site control measures (temporary utilities, temporary traffic patterns, barricades, signs, etc.)
- Removal and/or control of Surface and Subsurface Encumbrances
- Traffic (Foot/Vehicular) Impact and routing
- Surface drainage patterns and impact

16.2.2 <u>During Excavation Activities</u>

- Utility sweeps
- Review and evaluation of entry/egress systems
- Installing support systems for surface and subsurface encumbrances as necessary (i.e. supporting building foundations, sidewalks, utility runs, etc.)
- Soil classification Visual and Manual Analysis
- Hazardous atmosphere evaluation (initial and periodic monitoring)
- Recommendation/Installation/Evaluation of protective system (in and out of the excavation)

16.2.3 <u>Post Excavation Activities</u>

- Evaluation of the protective systems installed (sloping, benching, shielding, etc.)
- Soil conditions (Moisture content, fissures developing, horizontal cracks, etc.)
- Loading the excavation walls (Spoils piles, resource/fill materials stock piling, traffic, etc.)
- Atmospheric monitoring
- Backfill

16.2.4 Competent Persons Qualifications

- The employer designates Competent Person(s) based on knowledge and training.
- Capable of identifying existing or predictable hazards associated with excavated cuts or cavities in the earth.
- Has the authority to take prompt action to abate these hazards.
- Working knowledge of Soil Analysis/Soil Classification.
- Knowledgeable in the area of Protective Systems.
- Working knowledge of the requirements of 29 CFR 1926 Subpart P.

This position will typically be filled by Site Safety Officer (SSO), Field Operations Leader (FOL), or a Registered Professional Engineer (PE). The Excavation Competent Person must be specifically identified to handle this responsibility prior to work beginning in the specified space provided (Section 1.3) in this HASP.

Detailed Tetra Tech Excavation Safety Procedures, the Excavation Competent Person Checklist, the Tetra Tech Confined Space Entry Program and Procedures, and the Heavy Equipment Inspection Checklist are included in Attachments VIII, IX, X and XI, and must be completed prior to beginning work. The OSHA Health and Safety Construction-Related regulations P-650 to 699 – Subpart P – Excavations are included in Attachment XII and must be followed during all excavation work.

16.3 LM EXCAVATION REQUIREMENTS

In addition, the requirements stipulated in Section 3.8 of the LM Handbook (Attachment I) will be reviewed and adhered to during the excavation work and a trained, competent person will be designated to oversee the activities. These requirements include:

- Review the Lockheed Martin intrusive fieldwork requirements in Appendix A of the LM Handbook.
- If workers are to enter excavations, a competent person must be designated and trained in soil classification and the recognition of trenching and excavation hazards.
- Excavations and trenches shall be inspected by a competent person daily and after every rainstorm, earthquake, or other hazard-increasing occurrence.
- Inspect the face, banks, and top daily when workers are exposed to falling or rolling materials.

- Shore, bench, slope, or use equivalent methods to protect workers in excavations four feet deep or more.
- Locate soil at least two feet from the edge of the excavation, or one foot from the edge when the excavation is less than five feet deep.
- Ladders or steps shall be provided and secured in all trenches four feet or more in depth. Ladders shall
 be located to require no more than twenty-five feet of lateral travel before having access or egress and
 shall extend three feet above the top of the trench bank.
- Install crossings with standard guardrails and toeboards when the excavation is more than 7½ feet deep.
- All open trenches and other excavations shall be provided with suitable barriers, signs, and lights to the extent that adequate protection is provided to the public.
- Do not excavate beneath the level of adjacent foundations, retaining walls, or other structures until a qualified person has determined that the work will not be hazardous. Support undermined sidewalks.

17.0 ASBESTOS

No asbestos abatement work is being conducted as part of this field effort. Should it be required, this HASP will be amended/updated as necessary to include the requirements stipulated in Section 3.19 of the LM Handbook (Attachment I).

It is not anticipated during this field effort, but should asbestos containing material (ACM) or presumed asbestos containing material (PACM) be disrupted, Tetra Tech and/or subcontractor personnel shall <u>immediately</u> report to the Lockheed Martin Project Lead and to other employers of employees working at the job site any discovery, disturbance, and/or spill of ACM and/or PACM. All operations will cease in the immediate area of the suspect ACM and/or PACM and demarcate the area. The approval of the Lockheed Martin Project Lead is required before resuming operations.

Tetra Tech and/or subcontractor personnel shall not disturb any pipe insulation, boiler insulation, or any other material reasonably suspected of containing asbestos until the Lockheed Martin is notified and approval is obtained.

Abatement of asbestos can be performed only by persons properly trained and licensed to perform such activities.

All requirements addressed in Section 3.18 of the LM Handbook pertaining to incidental asbestos exposure will be followed.

18.0 NANOTECHNOLOGY

No nanotechnology work is being conducted as part of this field effort. Should it be required, this HASP will be amended/updated as necessary to include the requirements stipulated in Section 3.21 of the LM Handbook (Attachment I).

19.0 WORK INVOLVING AIR EMISSIONS

No work involving air emissions is being conducted as part of this field effort. Should it be required, this HASP will be amended/updated as necessary to include the requirements stipulated in Section 4.3 of the LM Handbook (Attachment I).

20.0 WORK INVOLVING WATER DISCHARGES

Work involving water discharges has been conducted at the site during sediment removal actions and groundwater remediation. Treated water is stored in a holding tank, purged through carbon filtration or a similar specified appropriate media and the water is transported by tanker truck to an approved local sanitary discharge manhole onsite.

21.0 MATERIALS AND DOCUMENTATION

The Tetra Tech Field Operations Leader (FOL) shall ensure the following materials/documents are taken to the project site and used when required.

- · A complete copy of this HASP
- TtSOPs
- Incident Reports
- Medical Data Sheets
- Material Safety Data Sheets/Safety Data Sheets for chemicals brought on site, including decontamination solutions, fuels, sample preservatives, calibration gases, etc.
- A full-size OSHA Job Safety and Health Poster (posted in the site trailer)
- Training/Medical Surveillance Documentation Form (Blank)
- First-Aid Supply Usage Form
- Emergency Reference Form (Section 2.0, extra copy for posting)
- Directions to the Hospital

21.1 MATERIALS TO BE POSTED AT THE SITE

The following documentation is to be posted or maintained at the site for quick reference purposes. In situations where posting these documents is not feasible (such as no office trailer), these documents should be separated and immediately accessible.

- Chemical Inventory Listing (posted) This list represents all chemicals brought on-site, including decontamination solutions, sample preservations, fuel, etc. This list should be posted in a central area.
- SDS (maintained) The SDS should also be in a central area accessible to all site personnel. These documents should match all the listings on the chemical inventory list for all substances employed onsite. It is acceptable to have these documents within a central folder and the chemical inventory as the table of contents.
- The OSHA Job Safety & Health Protection Poster (posted Attachment XV) This poster should be conspicuously posted in places where notices to employees are normally posted, as directed by 29 CFR 1903.2 (a)(1). Each FOL shall ensure that this poster is not defaced, altered, or covered by other material. The law also states that reproductions or facsimiles of the poster shall be at least 8 1/2 by 14 inches with 10 point type.

- **Site Clearance (maintained)** This list is found within the training section of the HASP (Figure 8-1). This list identifies all site personnel, dates of training (including site-specific training), and medical surveillance. The list indicates not only clearance, but also status. If personnel do not meet these requirements, they do not enter the site while site personnel are engaged in activities.
- Emergency Phone Numbers and Directions to the Hospital(s) (posted) This list of numbers and directions will be maintained at all phone communications points and in each site vehicle.
- Medical Data Sheets/Cards (maintained) Medical Data Sheets will be filled out by on-site personnel
 and filed in a central location. The Medical Data Sheet will accompany any injury or illness requiring
 medical attention to the medical facility. A copy of this sheet or a wallet card will be given to all
 personnel to be carried on their person.
- **Personnel Monitoring (maintained)** All results generated through personnel sampling (levels of airborne toxins, noise levels, etc.) will be posted to inform individuals of the results of that effort.
- Placards and Labels (maintained) Where chemical inventories have been separated because of
 quantities and incompatibilities, these areas will be conspicuously marked using DOT placards and
 acceptable [Hazard Communication 29 CFR 1910.1200(f)] labels.

The purpose of maintaining or posting this information, as stated above, is to allow site personnel quick access. Variations concerning location and methods of presentation are acceptable providing the objective is accomplished.

21.2 HAZARD COMMUNICATION – USE OF HAZARDOUS MATERIALS

All hazardous substance (as defined by OSHA) brought onto Lockheed Martin remediation sites must be accompanied by a MSDS/SDS and the containers labeled in accordance with the Red OSHA Hazard Communication Standard, 29 CFR 1910.1200 or applicable state OSHA standard. Tetra Tech and subcontractor personnel will provide MSDS/SDSs for chemicals brought on site. The contents of these documents will be reviewed by the SSO with the user(s) of the chemical substances prior to any actual use or application of the substances on site. A chemical inventory of the chemicals used on site will be developed using the TtSOP. The MSDS/SDSs will then be maintained in a central location (i.e., temporary office) and will be available for anyone to review upon request.

The Lockheed Martin Project Lead shall be notified prior to bringing any quantity of hazardous materials onto Lockheed Martin remediation sites. Hazardous materials shall be stored in designated areas and all

containers effectively closed. Spill equipment/supplied shall be readily available to contain and/or mitigate accidental spills of hazardous materials.

All other hazard communication requirements are detailed in Section 3.2 and Section 4.1 of the LM Handbook (Attachment I) and will be adhered to.

22.0 ACRONYMS / ABBREVIATIONS

CFR Code of Federal Regulations
CIH Certified Industrial Hygienist

CPT Cone Penetrometer

CSP Certified Safety Professional
DPT Direct Push Technology

DRA Dump Road Area

DRI Direct Reading Instrument
FID Flame Ionization Detector
FOL Field Operations Leader
HASP Health and Safety Plan

HAZWOPER Hazardous Waste Operations and Emergency Response

HSM Health and Safety Manager
IDW Investigation Derived Waste

MDEP Maryland Department of Environmental Protection

MIP Membrane Interface Probe

MAA Maryland Aviation Administration

MSA Martin State Airport

N/A Not Available

NIOSH National Institute for Occupational Safety and Health

OSHA Occupational Safety and Health Administration (U.S. Department of Labor)

PHSO Project Health and Safety Officer

PID Photoionization Detector

PM Project Manager

PPE Personal Protective Equipment RCT Radiaition Control Technician

RI Remedial Investigation
RSO Radiation Site Officer
SSO Site Safety Officer
TBD To be determined
TCE Trichloroethene
Tetra Tech Tetra Tech, Inc.

µg/L microgram per liter

USEPA United States Environmental Protection Agency

VC Vinyl Chloride

VOCs Volatile Organic Compounds

ATTACHMENT I

LOCKHEED MARTIN'S REMEDIATION CONTRACTOR'S ESH HANDBOOK

LOCKHEED MARTIN

REMEDIATION CONTRACTOR'S ESH HANDBOOK

June 10, 2009

Revision 1

Lockheed Martin Corporation Energy, Environment, Safety & Health

A COPY OF THE JOB SPECIFIC HASP SHALL BE AVAILABE AT THE JOB SITE FOR THE DURATION OF THE PROJECT

REVISION STATUS

REVISION	DATE	COMMENTS
1	06/10/2009	

CONTRACTOR'S ESH HANDBOOK

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CONTRACTOR'S ESH HANDBOOK

GENERAL

Lockheed Martin Corporation management at all levels is committed to conducting operations and activities in a manner that provides and maintains safe and healthful working conditions, protects the environment, and conserves natural resources.

This *Contractor's ESH Handbook* has been prepared to assist each project jobsite employer/contractor in satisfying its' contractual and legal accident prevention responsibilities, in such a manner that a safe, efficient operation is assured. All applicable requirements outlined in this handbook shall be incorporated into the contractor's site specific Safety and Health Plan The site specific Safety and Health plan shall be submitted to the Lockheed Martin Project Lead at least two weeks prior to starting work on any Lockheed Martin remediation projects.

This material must not be considered to be all inclusive as to the hazards that might be encountered, safe practices that should be performed, or safe conditions that should be maintained during the course of any project. Moreover, this handbook does not replace the contractor's legal obligation to its employees under all relevant environmental, safety and health requirements and laws. All legal standards not specifically referenced in this handbook shall apply when applicable.

1 CONTRACT RESPONSIBILITIES

The Contractor agrees to comply with all rules and procedures contained in this document, known as the *Remediation Contractor's ESH Handbook*, unless Lockheed Martin specifically agrees, in writing, to a modification or exemption. In addition, the Contractor and subcontractors, at any tier, shall:

- 1.1 Lockheed Martin is a drug free-work workplace. This requirement extends to contractors working on Lockheed Martin remediation projects. Additionally, the use of tobacco is not permitted on Lockheed Martin owned property.
- 1.2 Take all prudent and proper environmental, safety and health (ESH) precautions to protect Lockheed Martin employees, all other workers, and the public from ESH hazards associated with contractor activities.
- 1.3 Comply with all applicable Federal, State, municipal, local, and any other applicable occupational safety and health statutes, rules, ordinances, regulations, and requirements issued or imposed by any governmental authority (including, but not limited to *Title 29*, *Code of Federal Regulations Parts 1903, 1904, 1910* and *1926*).
- 1.4 Comply with all applicable Federal, State, municipal, local, and any other applicable air pollution statutes, rules, ordinances, regulations, and requirements issued or imposed by any governmental authority.

- 1.5 Comply with all Federal, State, municipal, local and Lockheed Martin hazardous materials, hazardous waste, and non-hazardous waste statutes, rules, ordinances, regulations, and requirements (including, but not limited to *Title 40*, *Code of Federal Regulations*).
- 1.6 Obtain the applicable ESH permits to conduct the work in compliance with local, state, federal ESH regulations and site requirements (including, but not limiting to *Title 29*, *Code of Federal Regulations, 1910 and 1926*).
- 1.7 Ensure that all employees and subcontractors have received the appropriate level of ESH training in accordance with applicable ESH regulations necessary for the performance of the work requested by Lockheed Martin.
- 1.8 To instruct, prior to commencement of operations, all employees on the jobsite about relevant governmental laws and regulations, specific hazards expected to be encountered and proper safety precautions to be observed. In addition, jobsite employees shall read and certify that they have read and understand the job specific health and safety plan (HASP). The certification forms provided by the contractor within the HASP shall be electronically sent to the Lockheed Martin Project Lead.
- 1.9 Provide all jobsite visitors with a safety orientation prior to commencing work or touring the site. A visitor log shall be kept to document the orientation.
- 1.10 To ensure Contractor's job specific health and safety plan (HASP) encompasses Federal, State, municipal, local and the Lockheed Martin requirements found within this document the HASP should contain a section on crisis management / emergency response. A copy of the job specific HASP shall be maintained at the job site where jobsite employees have access to a copy. All Contractor Project Managers shall be provided a copy of the *Contractor's ESH Handbook* found within the Lockheed Martin Request for Proposal or as an appendix of the Key National Contractor Agreement. Contractors shall flow these requirements down to their subcontractors.
- 1.11 Contractor understands that Lockheed Martin may immediately stop Contractor's work if Contractor violates any applicable Federal, State, municipal, local, or any other rules, regulations, and requirements, *Remediation Contractor's ESH Handbook* provisions, or other contract terms and conditions regarding environmental, safety and health compliance. Lockheed Martin shall not incur work stoppage charges unless the contractor demonstrates that the work stoppage was unwarranted for any of the reasons stated above. Any dispute regarding work stoppage charges must be resolved through binding arbitration.
- 1.12 Contractor is advised that the Project may be inspected from time to time by Lockheed Martin or a representative of Lockheed Martin. Periodic Lockheed Martin inspections in no way relieve the Contractor of their obligation to maintain its own inspection program to identify unsafe conditions or acts. ESH violations will be considered in evaluation of Contractor's performance.

- 1.13 Lockheed Martin is not responsible for training or supervising Contractor employees or abating workplace hazards created by the Contractor or to which the Contractor's employees are exposed.
- 1.14 Contractor agrees to maintain copies of all pertinent ESH records at the job site. Pertinent records include, but is not limited to, personnel training documentation, evidence of enrollment in a medical surveillance program, accident/injury reporting, work area inspections, periodic safety meetings, MSDS's, air monitoring data, waste container inspections, etc. These records shall also be provided electronically to the Lockheed Martin Project Lead.
- 1.15 Contractor shall contact the Lockheed Martin Project Lead immediately in the event of a fatal or serious injury, an unpermitted environmental release, or any ESH incident that is likely to generate significant publicity or an adverse situation for Lockheed Martin (e.g., alleged releases of contaminants beyond property boundaries, purported fish or wildlife impacts, allegations of adverse community health or property impacts, etc.)

2 DEFINITION

- 2.1 <u>Contractor</u>: any agent/agency engaged by Lockheed Martin through written contract (or other written agreement) to perform work on Lockheed Martin Remediation Sites. For the purposes of this *Remediation Contractor's ESH Handbook*, "Contractor" shall also include Contractor's subcontractors at any tier.
- 2.2 <u>EPA</u>: the Environmental Protection Agency.
- 2.3 Fed/OSHA: the Federal Occupational Safety and Health Administration
- 2.4 <u>Hazard Communication Program</u>: a written program meeting the requirements of Title 29, Code of Federal Regulations, Section 1910.1200 Hazard Communication.
- 2.5 <u>Lockheed Martin</u>: Lockheed Martin Corporation, Corporate Energy, Environment, Safety & Health
- 2.6 <u>Lockheed Martin Project Lead</u>: the Lockheed Martin Corporate Environment, Safety & Health individual that has been designated to manage a specific project.
- 2.7 <u>Lockheed Martin Contract Representative</u>: the Lockheed Martin Corporate Environment, Safety & Health contract representative (Contract Administrator/Buyer) for the project.
- 2.8 <u>RCRA</u>: the Federal Resource Conservation and Recovery Act and all amendments or revisions.

3 SAFETY & HEALTH

Contractor shall comply with applicable provisions of Federal, State, municipal, local, and any other applicable occupational safety and health statutes, rules, ordinances, regulations and requirements. Contractor shall take all precautions for the protection of the safety and health of Contractor employees, subcontractor employees, and Lockheed Martin employees to prevent accidents or injury to them or to other persons on, about, or adjacent to site of work performance. Notwithstanding this handbook, Contractor will hold harmless Lockheed Martin for any incident, violation, regulatory agency inspection resulting in a finding, or any other ESH issue that occurs to a Contractor employee.

Within Section 3.0, Lockheed Martin is identifying specific requirements within the Federal regulations that need extra attention. These are not all encompassing and adherence to the all rules and regulations must be followed.

3.1 PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

1926 Subpart E or 1910 Subpart I 1910.139 / 1926.103 ANSI Z87.1 ANSI Z41 Standard ANSI Z89.1 Standard

- 3.1.1 Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.
 - <u>Eye Protection</u>. Safety eyewear meeting ANSI Z87.1 shall be worn in areas designated as "Eye Protection Required" and on all jobs where a potential injury to the eyes is possible whether or not the area is posted.
 - Foot Protection. Affected employee(s) shall wear protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and where such employee's feet are exposed to electrical hazards. Safety shoes and boots which meet the ANSI Z41 Standard shall be provided when impact and/or compression hazards exist. Soft-shoes, including but not limited to, tennis shoes, athletic shoes, moccasins, sandals, and open-toed or open-heeled shoes shall not be worn.
 - Respiratory Protection Devices. Appropriate, MSHA/NIOSH-approved respiratory protective devices must be worn when applicable state and/or federal action levels or OSHA permissible exposure levels (PELs) are exceeded. Contractor must have fully implemented a respiratory protection program meeting the requirements of *Title 29*, *Code of Federal Regulations*, Section 1910.139 / 1926.103 or applicable state OSHA regulations prior to issuing and using respiratory equipment. Contractor shall supply and maintain

- appropriate air monitoring and respiratory protection equipment if inhalation hazards are anticipated.
- <u>Protective Clothing</u> such as suits, aprons, boots, or gloves shall be worn where there is a hazard to the body through dermal contact with chemicals, dusts, heat or other harmful agents or conditions.
- <u>Hearing Protection</u> (muffs and/or plugs) must be worn in all areas posted to indicate high noise level or where Contractor employees are exposed to noise levels in excess of the OSHA action level (85 dBA over a 8-hour time-weighted average or a dose of fifty percent).
- <u>Hard Hats</u> will be worn in all areas where there is a danger of impact to the head or hazard from falling or moving objects. Hard hats must meet the ANSI Z89.1 Standard.
- 3.1.2 Contractor will issue or cause to be issued prior to commencing the job all necessary personal protective equipment and air monitoring equipment to all its agents and employees, together with full instructions and training on the use of said equipment.
- 3.1.3 Contractor will meet all applicable Federal, Sate, municipal, local, and Lockheed Martin requirements for protective clothing and equipment. Contractor will properly supervise all its agents and employees to ensure protective clothing and equipment are used in conformance with applicable rules and regulations.

3.2 <u>HAZARD COMMUNICATION - USE OF HAZARDOUS MATERIALS</u>

Title 29, Code of Federal Regulations, Section 1926.59 Hazard Communication Title 29, Code of Federal Regulations, Section 1910.1200 Hazard Communication

- 3.2.1 Contractor personnel shall not bring any hazardous substances (as defined by OSHA) onto Lockheed Martin remediation sites unless accompanied by a Material Safety Data Sheet (MSDS) and the containers are appropriately labeled. MSDS's must be maintained at the job site.
- 3.2.2 Contractor shall notify the Lockheed Martin Project Lead <u>prior</u> to bringing onto Lockheed Martin remediation sites any quantity of hazardous materials.
- 3.2.3 Contractor shall ensure all containers of hazardous materials are labeled in accordance with the Fed OSHA Hazard Communication Standard, 29 CFR 1910.1200 or applicable state OSHA standard.
- 3.2.4 Do not handle or use any hazardous material that does not have adequate safety warning labels.
- 3.2.5 Do not dump, drain or discharge any hazardous materials or wastes into any sink, drain or sewer.
- 3.2.6 The Lockheed Martin Project Lead shall inform the Contractor(s) of the identity of hazardous chemicals to which Contractor's employees may be exposed from

Lockheed Martin operations, if applicable. The Lockheed Martin Project Lead shall provide the following information:

- Where to obtain information concerning any hazardous substances used in Lockheed Martin operations that the Contractor's employees may come in contact with while performing their work;
- If Lockheed Martin owns or uses chemicals on a remediation site for any
 process where contractors could be exposed, Lockheed Martin shall make
 available to the Contractor Material Safety Data Sheets (MSDS) and sufficient
 information to permit the Contractor to train its employees on the hazards of the
 chemical Appropriate protective measure Contractor employees may take to
 protect themselves from exposure to known hazards from Lockheed Martin
 operations; and
- Appropriate work practice procedures (safety rules) for the location where work is to be performed.
- 3.2.7 Contractor shall ensure its employees are trained in the safe handling and use of hazardous materials in accordance with 29 CFR 1910.1200 Hazard Communication or the applicable state-OSHA hazard communication standard.
- 3.2.8 Contractor shall ensure that all applicable employees are medically qualified (as defined by OSHA) to perform the work assigned.
- 3.2.9 Hazardous materials shall be stored in designated areas and all containers effectively closed. Spill equipment/supplies shall be readily available to contain and/or mitigate accidental spills of hazardous materials.

3.3 <u>CONFINED SPACE ENTRY</u>

Title 29, Code of Federal Regulations, Section 1910.146 Permit-Required Confined Spaces

- 3.3.1 If Contractor or any other employee must enter a confined space (tank, vat, pit, sewer, etc.), the entry must be performed in accordance with the applicable state OSHA or federal OSHA regulations.
- 3.3.2 Before Contractor's employees are permitted entry into any confined space, the internal atmosphere shall be tested with a calibrated direct-reading instrument for the following conditions in the order given: 1) Oxygen content, 2) Flammable gases & vapors, and 3) Potential toxic air contaminants. Contractor shall furnish the air testing equipment and a person competent in the use of the testing equipment.
- 3.3.3 When possible, the Contractor shall notify the Lockheed Martin Project Lead prior to entering a permit required confined space. A permit shall be issued by the contractor prior to entry and electronically submit a copy to the Lockheed Martin Project Lead.

- 3.3.4 To ensure the safety of Contractor personnel during entry into confined spaces, the Contractor shall have a written confined space entry program.
- 3.4 HOT WORK REQUIREMENTS (i.e., welding, torch cutting, brazing, etc.)
 - Title 29, Code of Federal Regulations, Section 1910 Subpart Q Title 29, Code of Federal Regulations, Section 1926 Subpart J
 - 3.4.1 All hot work activities shall be conducted in accordance with the hot work permit requirements outlined in the site specific HASP (i.e., fire suppression equipment availability, removal of combustibles, fire watch, etc.).
 - 3.4.2 Contractor personnel must secure all oxygen and acetylene cylinders in a manner that will prevent them from falling or tipping over. Oxygen and acetylene cylinders must be stored separately. Oxygen cylinders in storage must be separated from fuel gas cylinders a distance of 20 feet or by a noncombustible barrier 5 feet high. Acetylene cylinders shall not be stored horizontally, lying on their side.
 - 3.4.3 When welding, Contractor personnel shall use welding curtains and/or suitable protective devices to protect persons from indirect exposure to welding flashes.
- 3.5 LOCKOUT / TAGOUT Control of Hazardous Energy
 - Title 29, Code of Federal Regulations, Section 1910.147
 - 3.5.1 Contractors are required to establish a written program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energization, start-up or release of stored energy in order to prevent injury to employee.
 - 3.5.2 Contractor shall not service and/or maintain machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees. Servicing and/or maintaining such equipment shall not be conducted until appropriate energy control methods have been initiated.
 - The Contractor shall provide training to ensure that the purpose and function of the energy control program are understood by their employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by the employees.
 - 3.5.3 If Contractor needs to service or maintain Lockheed Martin equipment, Contractor(s) shall notify the Lockheed Martin Project Lead and/or on-site facility operator (if applicable) of the intended equipment service for any unscheduled maintenance.
 - 3.5.4 Upon completion of the job, Contractor is to notify the Lockheed Martin Project

Lead and/or on-site facility operator (if applicable) so power can be resumed to the equipment after the lock-outs and tags have been removed.

3.6 <u>USE OF LOCKHEED MARTIN MATERIALS AND EQUIPMENT</u>

- 3.6.1 Contractor's employees shall not use Lockheed Martin tools, equipment, materials, or personal protective equipment unless otherwise authorized by Lockheed Martin.
- 3.6.2 Contractor shall not start or stop any production equipment without the approval of the Lockheed Martin Project Lead.
- 3.6.3 Contractor shall not adjust or relocate any Lockheed Martin process equipment without the approval of the Lockheed Martin Project Lead.

3.7 <u>DANGEROUS OPERATIONS - WARNINGS AND BARRICADES</u>

Title 29, Code of Federal Regulations, Section 1926, Subpart G-Signs, signals and barricades

- 3.7.1 Contractor shall isolate their work areas from Lockheed Martin operations, employees, and the public by using barricades or other effective means of isolation. Signs, signals and barricades shall be visible at all times where a hazard exists.
- 3.7.2 Contractor personnel shall erect and properly maintain, at all times, all necessary safeguards for the protection of Contractor personnel, Lockheed Martin employees and the public. This includes:
 - If doing any overhead work, Contractor must utilize warning signs and barricades, or station someone on the ground to prevent passers-by from entering the area below the overhead work;
 - Contractor must effectively barricade excavations, floor openings, etc., as required by OSHA regulations;
 - Contractor must construct and maintain all scaffolds and working platforms in accordance with OSHA regulations; and
 - If Contractor's equipment, barricades or other safeguards restrict fire lanes or fire equipment access, the Contractor shall notify the Lockheed Martin Project Lead about its notification to the local fire department.
- 3.7.3 Prior to commencing work, Contractor must inform Lockheed Martin Project Lead of any work posing a potential danger to personnel.

3.8 <u>EXCAVATIONS, TRENCHES, EARTHWORK</u>

Title 29, Code of Federal Regulations, Section 1926 Subpart P

3.8.1 Review the Lockheed Martin intrusive fieldwork requirements in Appendix A.

- 3.8.2 If workers are to enter excavations, a competent person must be designated and trained in soil classification and the recognition of trenching and excavation hazards.
- Excavations and trenches shall be inspected by a competent person daily and after every rainstorm, earthquake, or other hazard-increasing occurrence.
- 3.8.4 Inspect the face, banks, and top daily when workers are exposed to falling or rolling materials.
- 3.8.5 Shore, bench, slope, or use equivalent methods to protect workers in excavations four feet deep or more.
- 3.8.6 Locate soil at least two feet from the edge of the excavation, or one foot from the edge when the excavation is less than five feet deep.
- 3.8.7 Ladders or steps shall be provided and secured in all trenches four feet or more in depth. Ladders shall be located to require no more than twenty-five feet of lateral travel before having access or egress and shall extend three feet above the top of the trench bank.
- Install crossings with standard guardrails and toeboards when the excavation is more than $7\frac{1}{2}$ feet deep.
- 3.8.9 All open trenches and other excavations shall be provided with suitable barriers, signs, and lights to the extent that adequate protection is provided to the public.
- 3.8.10 Do not excavate beneath the level of adjacent foundations, retaining walls, or other structures until a qualified person has determined that the work will not be hazardous. Support undermined sidewalks.

3.9 ELECTRICAL SAFETY

Title 29, Code of Federal Regulations, Section 1926 Subpart K-Electrical Title 29, Code of Federal Regulations, Section 1910.269 Electrical Power Generation, Transmission and Distribution

- 3.9.1 Only qualified persons are permitted to work on electrical systems, as defined by *Title 29, Code of Federal Regulations Section 1910.269(a)(2)*. Qualified persons shall be trained and competent in:
 - The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment;
 - The skills and techniques necessary to determine the nominal voltage of exposed live parts;
 - The minimum approach distances specified by OSHA corresponding to the voltages to which the qualified employee will be exposed; and

- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment.
- 3.9.2 Contractor personnel shall properly ground all electrical tools, mechanical digging or concrete breaking equipment and all other electrical equipment while in use.
- 3.9.3 All electrical work, installation and wire capacities shall be in accordance with the pertinent provisions of the National Electrical Code, ANSI and OSHA.
- 3.9.4 Covers or barriers must be installed on boxes, fittings, and enclosures to prevent accidental contact with live parts.
- 3.9.5 Temporary wiring installations must be grounded.
- 3.9.6 Electrical systems shall be de-energized utilizing appropriate lockout/tagout procedures prior to conducting work.

3.10 <u>ELEVATED LOCATIONS / FALL PROTECT</u>

Cal/OSHA General Industry Safety Orders, 8 CCR 3210 Title 29, Code of Federal Regulations, Section 1926 Subpart M – Fall Protection

- 3.10.1 <u>California employers</u>: Guardrails shall be provided on all open sides of unenclosed room openings, open and glazed sides of landings, balconies or porches, platforms, runways, ramps, or working levels more than 30 inches above the floor, ground, or other working areas. The railing must be provided with a toeboard where the platform, runway, or ramp is 6 feet or more above places where employees normally work or pass and the lack of a toeboard could create a hazard from falling tools, material, or equipment.
- 3.10.2 Contractor must provide fall protection systems whenever a worker is exposed to a fall of four feet or more (in construction the threshold is six feet). Guardrails are the most common forms of fall protection systems. If guardrail systems are not feasible, safety nets, personal fall arrest systems, positioning device systems, warning line systems, or some other demonstrated, effective means of fall protection shall be used. Fall protection systems and devices shall be inspected prior to each use Title 29, Code of Federal Regulations, Section 1926 Subpart M.

3.11 LADDERS

Title 29, Code of Federal Regulations, Section 1910 Subpart D – Walking and Working Surfaces

Title 29, Code of Federal Regulations, Section 1926 Subpart X - Ladders

- 3.11.1 The use of ladders with broken or missing rungs or steps, broken or split rails or other defective construction is prohibited.
- 3.11.2 Ladders shall extend no less than 36 inches above landing and be secured to

prevent displacement.

- 3.11.3 Portable ladders must be equipped with safety shoes.
- 3.11.4 Wooden ladders shall not be painted.
- 3.11.5 Do not use metal ladders for electrical work or near live electrical parts.

3.12 SCAFFOLDS

Title 29, Code of Federal Regulations, Section 1910.28 – Safety Requirements for Scaffolding

Title 29, Code of Federal Regulations, Section 1926 Subpart L - Scaffolds

- 3.12.1 Scaffolds must be provided for all work that cannot be done safely by employees standing on solid construction at least 20 inches wide, except where such work can be safely done from ladders.
- 3.12.2 Erection and dismantling of scaffolds shall be performed in accordance with good engineering practice.
- Footings or anchorage for any scaffold shall be sound, rigid and capable of carrying the maximum intended load without settling or displacement.
- 3.12.4 No unstable objects such as concrete blocks shall be used to support scaffolds or planks.
- 3.12.5 Any part of a scaffold weakened or damaged shall be repaired or replaced immediately.
- 3.12.6 All scaffold planking shall be free of knots and cracks (Class A number) and shall completely cover the work platform.
- 3.12.7 Scaffold planks shall be laid tight, cleated at both ends or overlapped a minimum of 12 inches and nailed or bolted to prevent movement. Overlaps to occur directly above scaffold supports.
- 3.12.8 A safe and unobstructed means of access, such as a walkway, stair, or ladder shall be provided to all scaffold platforms.

3.13 HEAVY EQUIPMENT, INDUSTRIAL VEHICLES, AND CRANES

Title 29, Code of Federal Regulations, Section 1926 Subparts N, O and W

- 3.13.1 Only trained and authorized workers may operate heavy equipment, industrial vehicles, and/or cranes.
- 3.13.2 The Contractor shall designate a competent person who shall inspect all machinery and equipment prior to each use to make sure it is in safe operating condition.

- 3.13.3 The Contractor shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all heavy equipment, industrial vehicles, and cranes.
- 3.13.4 Seatbelts are required to be worn if the vehicle has Roll-Over Protection Structures (ROPS).
- 3.13.5 The swing radius of cranes shall be barricaded.
- 3.13.6 Equipment shall not be lubricated while in use.
- 3.13.7 Rated load capabilities, recommended operating speeds, special hazard warning, specific hand signal diagrams and special instructions shall be visible to the operator while he is at the control station.
- 3.13.8 Contractor's employees shall not be allowed to work under the load of cranes. Tag lines shall be used on all loads.

3.14 OVERHEAD POWER LINES

Title 29, Code of Federal Regulations, Section 1926.550 (a) (15)

- 3.14.1 If work is to be performed near overhead power lines, the lines must be deenergized and grounded by the owner or operator of the lines, or other protective measures must be provided before work is started. Protective measures (such as guarding or insulating the lines) must be designed to prevent employees from contacting the lines.
- 3.14.2 Unqualified employees and mechanical equipment must stay at least 10 feet away from overhead power lines. If the voltage is over 50,000 volts, the clearance should be increased by four inches for each additional 10,000 volts.
- 3.14.3 When mechanical equipment is being operated near overhead lines, employees standing on the ground may not contact the equipment unless it is located so that the required clearance cannot be violated even at the maximum reach of the equipment.
- 3.14.4 A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means.
- 3.14.5 Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicates that it is not energized.

3.15 FIRE PREVENTION / FLAMMABLE LIQUIDS

Title 29, Code of Federal Regulations, Section 1926 Subpart F or 1910 Subpart E

3.15.1 Contractor shall be responsible for fire protection in its work and operational areas,

including offices, tool rooms, and storage areas 24 hours per day, seven days per week through the duration of this Contract. Approved fire-fighting equipment, in adequate quantities, must be provided.

- 3.15.2 Contractor shall familiarize Contractor's employees with the locations of fire extinguishers in their respective work areas and ensure they are prepared to use them safely if necessary. In certain remote field locations or within abandoned (discontinued) facilities where fire extinguishers may not exist in the immediate work area, contractor shall provide and locate fire extinguisher(s) in close proximity to the active work area(s).
- 3.15.3 In case of fire, Contractor shall call 9-1-1. Contractor shall also inform all Contractor and Lockheed Martin employees in the area to evacuate to a safe place and direct arriving fire response personnel to the fire. Notify the Lockheed Martin Project Lead as soon as reasonably possible.
- 3.15.4 Contractor employees shall only attempt to put out a fire when such action can be performed safely.
- 3.15.5 If a Contractor employee uses a Lockheed Martin fire extinguisher, Contractor shall report its use to the Lockheed Martin Project Lead.
- 3.15.6 Contractor shall report all fires extinguished by the Contractor to the Lockheed Martin Project Lead.
- 3.15.7 Contractors are to store, dispense, and use flammable and combustible liquids in accordance with OSHA regulations and the Uniform Fire Code. Bonding and grounding of containers containing flammable liquids will be required.
- 3.15.8 Open flames and smoking shall not be permitted in flammable or combustible liquid storage areas.
- 3.15.9 Contractor shall provide sufficient fire extinguishers necessary for their work activities.

3.16 HAND AND POWER TOOLS

Title 29, Code of Federal Regulations, Section 1910 Subpart P – Hand and Portable Powered Tools and Other Hand-Held Equipment

Title 29, Code of Federal Regulations, section 1926 Subpart I – Tools Hand and Power

- 3.16.1 All hand and power tools, whether furnished by Contractor, or by Contractor's employee, shall be maintained in a safe condition.
- 3.16.2 Electrical power tools shall be grounded or double insulated with proper assured equipment grounding inspections or Ground Fault Interrupter (GFI) circuit protection provided.

- 3.16.3 Pneumatic power tools shall be secured to the hose or whip by some positive means.
- 3.16.4 Only properly trained Contractor employees shall operate power-actuated tools.
- 3.16.5 All grinding machines shall conform to OSHA and ANSI requirements.

3.17 COMPRESSED GAS CYLINDERS

Title 29, Code of Federal Regulations, Section 1910.101 – Compressed Gases Title 29, Code of Federal Regulations, Section 1926.350 – Gas Welding and Cutting

- 3.17.1 Compressed gas cylinders shall be secured in an upright position at all times.
- 3.17.2 When transporting, moving and storing cylinders, valve protection caps shall be in place and secured.
- 3.17.3 Compressed gas cylinders shall be kept away from excessive heat, shall not be stored where they might be damaged or knocked over by passing or falling objects, and shall be stored at least 20 feet away from highly combustible materials.
- 3.17.4 Cylinders shall be labeled as to the nature of their contents.
- 3.17.5 Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials a minimum of 20 feet or by a noncombustible barrier at least five feet high having a fire-resistant rating of at least one-half hour.
- 3.17.6 Acetylene cylinders shall be stored and used in a vertical, valve-end-up position only.
- 3.17.7 Anti-flashback arrestors shall be installed on all oxygen and acetylene cylinders.

3.18 <u>INCIDENTAL CONTACT WITH ASBESTOS</u>

- 3.18.1 This section applies to all contractors who incidentally disrupt the matrix of asbestos containing material (ACM) or presumed asbestos containing material (PACM); i.e., contractors who have <u>not</u> been specifically hired to perform ACM abatement.
- 3.18.2 Contractor shall <u>immediately</u> report to the Lockheed Martin Project Lead and to other employers of employees working at the job site any discovery, disturbance, and/or spill of ACM and/or PACM. Contractor(s) is to cease all operations in the immediate area of the suspect ACM and/or PACM and demarcate the area. The approval of the Lockheed Martin Project Lead is required before resuming operations.

- 3.18.3 Contractor shall not disturb any pipe insulation, boiler insulation, or any other material reasonably suspected of containing asbestos until the Contractor notifies the Lockheed Martin Project Lead. Lockheed Martin approval is required before operations may commence.
- 3.18.4 Abatement of asbestos can be performed only by persons properly trained and licensed to perform such activities

3.19 ASBESTOS ABATEMENT CONTRACTORS

- 3.19.1 This section applies to Contractors performing maintenance, construction, repair, renovation, demolition, salvage, or any other operation in which any material containing more than 1% asbestos is sanded, abrasive blasted, sawed, shoveled, removed, or otherwise handled in a manner that would generate airborne asbestos fibers. These requirements are in addition to any requirements contained in Contractor's scope of work.
- 3.19.2 All Contractors working with asbestos shall comply with applicable federal and state OSHA, EPA, local air district, and other applicable Federal, State, municipal, and local statutes, regulations, rules, and ordinances; and specific contract terms and conditions regarding the handling of, use of, and work involving asbestos.
- 3.19.3 The contractor shall ensure that a competent person, as defined by OSHA supervises all asbestos work performed within regulated areas.
- 3.19.4 Before commencing work, all asbestos abatement contractors shall supply to Lockheed Martin proof of:
 - Asbestos abatement contractor certification by the state Contractor's License Board
 - Liability insurance for Contractor employees engaged in asbestos work operations
 - Copies of asbestos work notification letters to state OSHA
 - Local air district Asbestos Demolition/Renovation Notification
- 3.19.5 Contractors shall minimize the creation and spread of airborne asbestos fibers by using appropriate work practices, engineering controls, and established procedures (i.e., wet methods, HEPA filter vacuums, negative pressure enclosure, local exhaust ventilation equipped with HEPA filter dust collection system, etc.).
- 3.19.6 All Class I, II and III asbestos work shall be conducted within regulated areas. The regulated area shall be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pressure enclosures are used, they may demarcate the regulated area. Signs shall be provided and displayed at each location where a regulated area is required to be established. Signs shall be posted at such a distance from such a location that an employee may read the signs

and take necessary protective steps before entering the area marked by the signs. Warning signs shall bear the following information:

DANGER ASBESTOS CANCER AND LUNG DISEASE HAZARD AUTHORIZED PERSONNEL ONLY

- 3.19.7 On multiple employer worksites requiring the establishment of a regulated area, the asbestos Contractor shall inform other employers on the site of the nature of the work with asbestos and/or PACM, of the existence of and requirements pertaining to regulated areas, and the measures taken to ensure that employees of such other employers are not exposed to asbestos.
- 3.19.8 Contractors shall package and label asbestos waste in accordance with federal and or applicable state OSHA requirements and federal or applicable state hazardous waste regulations. Labels shall be affixed to all products containing asbestos and to all containers containing such products, including waste containers. Labels shall be printed in large, bold letters on a contrasting background and shall contain the following information:

DANGER CONTAINS ASBESTOS FIBERS AVOID CREATING DUST CANCER AND LUNG DISEASE HAZARD

- 3.19.9 Contractors shall properly dispose of all asbestos waste. Proper disposal includes the use of hazardous waste manifests and Lockheed Martin approved and licensed waste haulers, and disposal facilities according to federal RCRA law and applicable state hazardous waste regulations. Contractor shall contact the Lockheed Martin Project Lead before transporting or disposing of any hazardous waste. Lockheed Martin must review all hazardous waste manifests prior to shipment.
- 3.19.10 Contractors shall ensure that employee exposure air monitoring is conducted as required by federal or applicable state OSHA regulations. All other air monitoring (i.e. clearance sampling) shall be conducted by a third-party contracted air monitoring firm not affiliated with the Contractor.
- 3.19.11 Contractor shall, at no cost to the employee, institute a training program for and ensure the participation of all employees engaged in asbestos-related work who may reasonably be expected to be exposed to asbestos fibers from asbestos containing construction materials.
- 3.19.12 Contractor shall institute a medical surveillance program for all employees who are or will be exposed to airborne concentrations of fibers of asbestos at or above the TWA and/or excursion limit.

3.20 <u>HAZARDOUS WASTE OPERATIONS and EMERGENCY RESPONSE</u>

(HAZWOPER)

Title 29, Code of Federal Regulations, Section 1910.120 - Hazardous Waste Operations and Emergency Response

Title 29, Code of Federal Regulations, Section 1926.65 – Hazardous Waste Operations and Emergency Response

This section applies to Contractors performing hazardous waste-type activities. This includes operations that pose a potential or reasonable possibility for employee exposure to hazardous waste/chemical contaminants during site investigations, clean-up operations, abatement, or hazardous substance removal work (remedial actions). These requirements are in addition to any requirements contained in Contractor's scope of work.

3.20.1 Contractor shall provide a **site-specific safety and health plan** at least two (2) weeks prior to field mobilization to the Lockheed Martin Project Lead (global statement – move to the beginning).

Contractor shall provide a **safety and health plan** in accordance with *Title 29*, *Code of Federal Regulations*, *Section 1910.120 - Hazardous Waste Operations and Emergency Response* or the applicable state OSHA standard and, at a minimum, shall contain the following elements:

- Safety and health risk or hazard analysis for each anticipated site task
- Employee training requirements
- Personal protective equipment to be used by employees for each of the site tasks and operations
- Medical surveillance requirements
- Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used
- Site control measures
- Decontamination requirements and procedures
- Emergency response plan
- Confined space procedures (if applicable)
- Emergency response plan
- Confined space procedures (if applicable)
- Spill containment program
- Periodic documented safety meetings
- Periodic documented work area safety inspections and corrective actions
- 3.20.2 Contractors performing hazardous waste-type operations shall adhere to the requirements specified in 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response or the applicable state OSHA standard.
- 3.20.3 <u>Training</u>: All Contractor and subcontractor employees working on site who are potentially exposed to hazardous substances shall receive initial and annual

refresher training in accordance with 29 CFR 1910.120(e) – Hazardous Waste Operations and Emergency Response or the applicable state OSHA standard. Lockheed Martin shall be provided with electronic copies of the training certificates.

- 3.20.4 <u>Medical Surveillance</u>: Contractor employees must be enrolled in a medical surveillance program prior to performing hazardous waste operations. Upon Lockheed Martin request, Contractor shall provide evidence of employee enrollment in a medical surveillance program. Lockheed Martin does not provide medical surveillance examinations to Contractor employees.
- 3.20.5 <u>Periodic work area inspections</u>: Contractor agrees to perform periodic work area inspections to determine the effectiveness of the site safety and health plan and to identify and correct unsafe conditions in contractor's responsible work area. These inspections shall be documented and available to Lockheed Martin upon request for review.

3.21 <u>MANAGEMENT OF NANOTECHNOLOGY</u>

- 3.21.1 The Lockheed Martin Project Lead shall work with the designated contractor responsible for nanotechnology to implement this procedure and ensure areas where nanomaterials (materials incorporating engineered nanoparticles or nanoscale features that exhibit unique physical and chemical properties as a result of the nanoparticles or nanoscale features) will be used meet engineering control requirements of this procedure.
- 3.21.2 The contractor shall ensure that the safety and environmental hazards of nanomaterials are managed as described in the requirements of this section.
- 3.21.3 A plan must be developed and executed that addresses the following requirements:
 - 3.21.3.1 **Hazard Analysis:** Identify potential adverse health effects and environmental impacts that could result from the chemical and physical properties exhibited by the nanomaterials and/or nanoparticles in use, to be used, under development, or to be developed at the site.
 - 3.21.3.2 **Exposure Assessment**: Evaluate all tasks involving nanomaterials and identify where exposures could occur. The evaluation must include at a minimum, an evaluation of materials; chemical intermediates; by-products; end-products; waste products; processes; process equipment; the amount of material used; material form; degree of containment; duration of use; and work space including laboratory and manufacturing space.

3.21.3.3 Exposure Control

• Implement appropriate controls to mitigate worker exposure and environmental emissions identified in sections 3.21.2.1 and 3.21.2.2 of this procedure.

• Implement Control Bands as indicated on the Control Band Matrix below.

Exposure	Bound	Potential	Free /
Duration	Materials	Release	Unbound
Hazard	Group A (K	nown to be i	nert)
Short	1	1	2
Medium	1	1	2
Long	1	2	2
Haz		3 (Understan	d
	reactivity/f	unction)	
Short	1	2	2
Medium	1	2	3
Long	1	3	3
Hazard (Group C (Un	known Prop	erties)
Short	2	2	3
Medium	2	3	4
Long	2	4	4

Duration Key:

Short - Less than 4 hrs/day; 2 days/week

Medium - Between 4 to 6 hrs/day; 3 to 5 days/week

Long - 6 to > 8 hrs/day; 3 to 5 days/week

Release Key:

Bound Materials: Nanoparticles in a solid matix e.g. polycarbonate

Potential Release: Nanoparticles in friable or solgel matrix Free / Unbound: Nanoparticles unbound, not aggregated

Control Band:

- 1. General Ventilation and PPE
- 2. Engineering Controls and/or Respirators and additional PPE
- 3. Containment e.g. glove box
- 4. Specialist Advise
- Establish designated areas for Control Banding. The designated area shall, at a minimum, include warning signs informing employees that they are entering a nanomaterial work area as well as signs specifying administrative controls and personal protective equipment (PPE) required for entry.
- Identify appropriate administrative controls (e.g. good housekeeping methods, HEPA vacuums, wet wipe methods, employee training, safe work practices), engineering controls (e.g. containment, exhaust ventilation) and Personal Protective Equipment (e.g. respiratory protection, protective coveralls, gloves, goggles) based on Control Band and best industry practices.
- Develop and execute procedures for housekeeping, including clean-asyou-go practices that do not re-suspend particles.
- Develop and execute procedures for management of nanomaterialassociated waste.

4 ENVIRONMENTAL

Contractors shall comply with all applicable provisions of Federal, State, municipal, local, and other environmental statutes, rules, and regulations. Contractor shall take all necessary precautions to protect the environment. Contractor shall also store, transport, dispose, or otherwise handle hazardous wastes and non-hazardous wastes to prevent discharges of materials into the environment except in accordance with applicable governmental regulations.

4.1 HAZARD COMMUNICATION - USE OF HAZARDOUS MATERIALS

4.1.1 Contractor shall develop a Waste Management Plan in accordance with the requirements outlined in the LMC Remediation Waste Management Procedure in

- Appendix B. Lockheed Martin shall approve the Waste Management Plan prior to work commencement.
- 4.1.2 Contractor must segregate hazardous from non-hazardous waste; all hazardous waste generated by its operations must be labeled in accordance with all governmental regulations.
- 4.1.3 Contractor shall dispose of all hazardous waste within the time frame stipulated by local, state, or federal regulations. Contractor shall not leave behind on Lockheed Martin remediation sites any containers of hazardous materials or waste (including drums, roll-offs, maintenance chemicals, etc.), empty or not, after the termination of operations.
- 4.1.4 In case of a spill or release of hazardous materials or waste, Contractor shall immediately notify the Lockheed Martin Project Lead and if the severity of the spill warrants, notify the local fire department (Call 9-1-1). The Contractor shall be liable for the costs of any spill resulting from Contractor's actions, including, but not limited to, costs of containment, cleanup, and disposal.

4.2 NON-HAZARDOUS WASTE DISPOSAL

4.2.1 Contractor shall develop a Waste Management Plan in accordance with the requirements outlined in the LMC Remediation Waste Management Procedure in Appendix B. This plan must be approved by the Lockheed Martin Project Lead.

4.3 WORK INVOLVING AIR EMISSIONS

- 4.3.1 Contractor shall work with the Lockheed Martin Project Lead to identify applicable Federal, state, and/or local permit application requirements for air emission sources (i.e., stationary point source, fugitive emissions, etc.) associated with the anticipated project.
- 4.3.2 Contractor shall submit permit applications and/or notifications to the Lockheed Martin Project Lead for review prior to submittal to the applicable regulatory agency.
- 4.3.3 Contractor shall abide by the requirements of the permit(s) and gather emissions data (as applicable) to document compliance. This data shall be electronically submitted to the Lockheed Martin Project Lead.
- 4.3.4 Contractor shall immediately contact the Lockheed Martin Project Lead in the event permit conditions are not met.
- 4.3.5 Ensure permits are posted on permitted equipment (or in close proximity) as required by the respective permit.

4.4 WORK INVOLVING WATER DISCHARGES

- 4.4.1 At no time is an unauthorized, unpermitted release allowed. Contractor shall notify the Lockheed Martin Project Lead in the event of a release and obtain the approval of Lockheed Martin before discharging any material into storm drains or sewers.
- 4.4.2 Contractor shall work with the Lockheed Martin Project Lead to identify applicable National Pollutant Discharge Elimination System (NPDES), Stormwater Pollution Prevention Plans (SWPPP), and POTW requirements associated with the anticipated project.
- 4.4.3 Contractor shall submit permit applications and/or Notice of Intent forms to the Lockheed Martin Project Lead for review prior to submittal to the applicable regulatory agency.
- 4.4.4 Contractor shall abide by the requirements of the discharge permit(s) and maintain discharge monitoring information and inspection data to document compliance. This documentation shall be electronically provided to the Lockheed Martin Project Lead.
- 4.4.5 Contractor shall immediately contact the Lockheed Martin Project Lead in the event permit conditions are not met.

5 HOUSEKEEPING / CLEANUP

- 5.1 Ensure discharge permits and/or SWPPP plans (as applicable) are available at the project job site.
- 5.2 Contractor shall continuously clean up its respective work area(s). Contractor shall maintain its work areas free from all slip, trip, and fall hazards at all times.
- 5.3 Debris shall be kept cleared from work areas, passageways, stairs, and in and around buildings or other structures. The work area must be left free from accumulation of waste and rubbish at the end of each work shift.
- 5.4 Combustible scrap and debris shall be removed at regular intervals during the course of work performed by Contractor. Safe means shall be provided to facilitate such removal.
- 5.5 At the end of each working day and/or the conclusion of work being performed, Contractor shall restore the work area to the same degree of neatness as when work commenced.
- 5.6 Contractor shall furnish necessary equipment and/or receptacles to remove waste and rubbish from the job site unless otherwise specified by the Lockheed Martin.

6 CHANGE MANAGEMENT

If deviations are encountered from the field work plan, the contractor shall A) notify to the Lockheed Martin Project Lead and B) suspend work to assess changes to the work plan(s) and the HASP. Changes to the work plan(s) and the HASP shall be reviewed by the PL.

7 REQUIREMENT TO PERFORM & DOCUMENT SELF-AUDITS

- 7.1 Contractor agrees to perform periodic work area/project field inspections to monitor compliance with project environmental, safety and health (ESH) requirements. The name of Contractor's jobsite ESH representative will be provided to Lockheed Martin prior to the Contractor starting work at the jobsite.
- 7.2 For jobs that are ongoing, an annual ESH audit shall be conducted and for jobs with a duration of less than one year at least one audit shall occur. A competent ESH representative designated by the Contractor shall perform the audit. Unsafe acts and/or non-compliance conditions noted during inspections shall be corrected immediately.
- 7.3 The documentation related to the audits and inspections shall be submitted electronically to the Lockheed Martin Project Lead.

8 ACCIDENT, INJURY, ILLNESS, INCIDENT and SPILL REPORTING

- 8.1 Contractor shall immediately contact the Lockheed Martin Project Lead and/or Lockheed Martin Safety & Health Manager in the event of a fatality, injury, environmental release (spill), near-miss incident, or any ESH incident that is likely to generate significant publicity. A written report of the incident/injury/spill and corrective action(s) taken shall be submitted to the Lockheed Martin Project Lead within one (1) day of the incident. Representatives from Lockheed Martin may conduct joint investigations with the contractor if deemed necessary.
- 8.2 In case of a spill or release of hazardous chemicals, Contractor shall immediately notify the Lockheed Martin Project Lead, and/or if the severity of the spill warrants, the local fire department by calling 9-1-1. Contractor shall take all necessary steps to control the spread of the release and to provide site control to prevent unauthorized personnel from entering the affected area. The Contractor shall be liable for the costs of any spill resulting from Contractor's actions, including, but not limited to, costs of containment, cleanup, and disposal.

9 FINES, PENALTIES AND COSTS

9.1 Contractor shall indemnify and hold Lockheed Martin harmless from any and all liability (including but not limited to fines and penalties), loss, cost, damage, or expense (including attorney's fees) suffered or incurred by Lockheed Martin by reason of Contractor's failure to comply with Federal, State, municipal, local or other laws, rules, regulations, ordinances and requirements, or failure to comply with generally accepted environmental safety and health practices.

10 <u>LOCKHEED MARTIN ESH MANAGER</u>

The Lockheed Martin ESH Manager is Jimmy Yeager. Contact Jimmy regarding any questions or concerns at (301) 873-1444 or via email at james.l.yeager@lmco.com.

Appendix A – LMC Requirements for Invasive Fieldwork



LMC Minimum Requirements for Inv

Appendix B – LMC Waste Management Procedure



LMC Waste Mgmt Procedure Rev 4



CONTRACTOR'S ESH HANDBOOK

COMPLIANCE AGREEMENT

The Key National Contractor Program Manager has read and understands the contents of the *Contractor's ESH Handbook*. Contractor agrees while performing work on Lockheed Martinowned or Lockheed Martin-controlled premises, that the Contractor shall require its employees and subcontractors at any tier to comply with the contents of this *Contractor's ESH Handbook* and the job specific HASP. A copy of the HASP shall be maintained at the job site and made readily available to contractor and subcontractor employees for their information. All contractor employees and subcontractors shall read and certify that they have read and understand the job specific health and safety plan (HASP). The certification forms shall be electronically sent to the Lockheed Martin Project Lead.

I further understand that this handbook and the rules and regulations it contains do not in any way relieve the Contractor (employer) of its responsibility to comply with the applicable environmental safety and health (ESH) regulations and its obligation to implement and enforce its own written ESH programs while working on this project.

Company:	
Name:	
Signature:	
Title:	
Date:	

COMPLETE, SIGN AND RETURN THIS CERTIFICATE TO THE LOCKHEED MARTIN ESH MANAGER.

ATTACHMENT II INCIDENT REPORT FORM



Report Date	Report Prepared By		Incident Report Number
persor	nnel) must be documen	ors under di ted on the IF	rect supervision of Tetra Tech R Form. r the type of incident selected.
TYPE OF INCIDENT (Check all that apply)		dditional Form	s) Required for this type of incident
Near Miss (No losses, but could have residamage)	ulted in injury, illness, or	Com	olete IR Form Only
Injury or Illness		Com	olete Form IR-A; Injury or Illness
Property or Equipment Damage, Fire, Spill or	Release	Comp	blete Form IR-B; Damage, Fire, Spill or Release
Motor Vehicle			blete Form IR-C; Motor Vehicle
ll en	NFORMATION ABOUT 1	HE INCIDEN	NT
Description of Incident			
Date of Incident	Time of Inc	ident	
		AM _	PM OR Cannot be determined
Weather conditions at the time of the incid	ent Was there a	idequate lightii	ng?
			Yes
Location of Incident			
	Was location of incident within		
Street Address	City	, State, Zip Cod	e and Country
Project Name / Project #	Clie	nt:	
Tt Supervisor or Project Manager	Was	supervisor on	the scene?
			Yes No
WITNESS INFO	ORMATION (attach add	tional sheet	s if necessary)
Name	Con	pany	
Street Address	City	State and Zip	Code
Telephone Number(s)			



CORRECTIVE ACTIONS						
Corrective action(s) immediately taken b	y unit reporting the incident:				
Corrective action(s	Corrective action(s) still to be taken (by whom and when):					
	,	,				
	D.	OOT CAUSE ANALYSIS I	EVEL REQUIRED			
Doot Course Arrabasis	s Level Required: Leve					
,	<u> </u>	el - 1 Level - 2 None				
Root Cause Analys	is Level Definitions					
Level - 1	Definition: A Level 1 RCA is conducted by an individual(s) with experience or training in root cause analysis techniques and will conduct or direct documentation reviews, site investigation, witness and affected employee interviews, and identify corrective actions. Activating a Level 1 RCA and identifying RCA team members will be at the discretion of the Corporate Administration office. The following events may trigger a Level 1 RCA: Work related fatality Hospitalization of one or more employee where injuries result in total or partial permanent disability Property damage in excess of \$75,000 When requested by senior management					
Level - 2	the operating unit tools provided. The following eve OSHA record Near miss in	rel 2 RCA is self performed within HSR. Level 2 RCA will utilize that will require a Level 2 RCA: dable lost time incident cident that could have triggered a sted by senior management	he 5 Why RCA methodology a			
Complete the Roo identified within ea		orksheet and Corrective Action	n form. Identify a corrective	action(s) for each	root cause	
		NOTIFICATION	ONS			
Title		Printed Name	Signature	Telephone Number	Date	
Project Manager or	Supervisor					
Site Safety Coordinator or Office H&S Representative						
Operating Unit H&S	Representative					
Other:						
The signatures pr	ovided above indic	cate that appropriate perso	nnel have been notified of	of the incident.		



INSTRUCTIONS:

	Do NOT leave rm to the IR FORI	any blanks.		5 5 .
Incident Report Number: (From the IR Form	1)			
	EMPLOYEE IN	FORMATION		
Company Affiliation				
Tetra Tech Employee?	Tech subcontractor emp	oloyee (directly supervi	sed by Tt personne	el)?
Full Name		Company (if not Tt	employee)	
Street Address, City, State and Zip Code		Address Type		
		Home address (for 1	Tt employees)	
		Business address (fo	or subcontractors)	
Telephone Numbers				
Work:	Home:		Cell:	_
Occupation (regular job title)		Department		
Was the individual performing regular job duties? Time individual began work				
Yes	☐ No ☐	AM	PM ☐ OR C	annot be determined
Safety equipment				
Provided? Yes No	Туре	(s) provided: Ha	ard hat	Protective clothing
Used? Yes No If no, expl	ain why	☐ Gle	oves	High visibility vest
130 - 130 - 130 - 1310, 000	an wily	_	re protection	Fall protection
		_	ifety shoes	Machine guarding
		∐ Re	espirator	Other (list)
	NOTIFICA	ATIONS		
Name of Tt employee to whom the injury reported	or illness was first	Was H&S notified w	ithin one hour of	injury or illness?
				Yes No
Date of report		H&S Personnel Noti	ified	
Time of sevent		Time of Deposit		
Time of report		Time of Report		
If subcontractor injury, did subcontractor's	firm perform their ow	n incident investigati	on?	
Yes No If yes, request a copy of t	•			r4



TETRA TECH, INC. INCIDENT FORM IR-A

	INJURY / II	LLNESS DETAILS			
What was the individual doing just before individual was using. Be specific. Examples: "Daily computer key-entry"	the incident occur "Climbing a ladder v	red? Describe the activity while carrying roofing mat	y as well as the tools, equerials"; "Spraying chloring	uipment, or material the e from a hand sprayer";	
-					
What Happened? Describe how the injury of sprayed with chlorine when gasket broke during the sprayed with chlorine when gasket broke during the sprayed with th	occurred. Examples: ng replacement"; Wo	"When ladder slipped on orker developed soreness	wet floor and worker fel in wrist over time"	l 20 feet"; "Worker was	
-					
Describe the object or substance that directly harmed the individual: Examples: "Concrete floor"; "Chlorine"; "Radial Arm Saw". If this question does not apply to the incident, write "Not Applicable".					
_	MEDICAL	CARE PROVIDED			
Was first aid provided at the site: Yes	No If yes, des	scribe the type of first aid a	administered and by whor	m?	
Was treatment provided away from the site:	Yes No	If yes, provide the inform	ation below.		
Name of physician or health care profession	onal	Facility Name			
Street Address, City State and Zip Code		Type of Care?			
		Was individual treated in	n emergency room?	Yes No N	
			zed overnight as an in-pa		
		Did the individual die?		yes, date:	
Telephone Number		Will a worker's compens		Yes No	
NOTE: Attach any police reports or related					
		NATURES			
I have reviewed this report and agree that all Affected individual	the supplied informa	tion is accurate			
(print)	Affected individ	ual (signature)	Telephone Number	Date	
				1	

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.



INSTRUCTIONS: Complete all sections below for incidents involving property/equipment damage, fire, spill or release. Do NOT leave any blanks. Attach this form to the IR FORM completed for this incident.						
Incident Report Number: (From the IR For	rm)					
T	YPE OF INCIDEN	NT (Check all t	hat apply)			
Property Damage	Equipment	Damage	Fire or Ex	plosion Spi	ill or Release	
	INCIDE	ENT DETAILS				
Results of Incident: Fully describe damage	s, losses, etc.					
	-					
					_	
Response Actions Taken:						
Responding Agency(s) (i.e. police, fire de	partment, etc.)		Agency(s) Co	ontact Name(s)		
DAMAGED ITEMS (List a	II damaged item	s, extent of da	mage and e	estimated repair	cost)	
Item:		Extent of damag	ge:	Estimated re	pair cost	
		1				
SPILLS / RELEASES (Provide information for spilled/released materials)						
			<u>-</u>	•		
SPILLS / RELEAS	SES (Provide info		<u>-</u>	sed materials) ortable Quantity (RQ)	
			<u>-</u>	•		
	Estimated quantit	y and duration	Specify Repo	ortable Quantity (RQ _Exceeded? Yes		
Substance	Estimated quantit	y and duration	Specify Repo	ortable Quantity (RQ _Exceeded? Yes		
Substance FIRES / EXPLOS	Estimated quantit	y and duration	Specify Repo	ortable Quantity (RQ _Exceeded? Yes		
Substance FIRES / EXPLOS	Estimated quantit	nformation related	Specify Repo	ortable Quantity (RQ _Exceeded? Yes		
Fire fighting equipment used? Yes No.	Estimated quantit	nformation related to the second seco	Specify Repo	ertable Quantity (RQ Exceeded? Yes	No NA	
Fire fighting equipment used? Yes No	Estimated quantit	nformation related to the second seco	Specify Repo	ertable Quantity (RQ Exceeded? Yes	No NA	
FIRES / EXPLOS Fire fighting equipment used? Yes No Required notifications Client: Yes No	Estimated quantit	nformation related to the second seco	Specify Repo	ertable Quantity (RQ Exceeded? Yes	No NA	
FIRES / EXPLOS Fire fighting equipment used? Yes No Required notifications Client: Yes No Agency: Yes No	Estimated quantit	nformation related to the second seco	Specify Repo	ertable Quantity (RQ Exceeded? Yes	No NA	



INSTRUCTIONS:

Complete all sec	Complete all sections below for incidents involving motor vehicle accidents. Do NOT leave any blanks. Attach this form to the IR FORM completed for this incident.				
Incident Report Numb	per: (From the IR Form	n)			
		INCIDENT	DETAILS		
Name of road, stre occurred	et, highway or loca	tion where accident	Name of intersecting	g road, street or highway if applicable	
		<u>-</u>			
County		City		State	
Did police respond to	the accident?		Did ambulance response	ond to the accident?	
	Yes	□ No □		Yes No No	
Name and location of	responding police de	epartment	Ambulance company	name and location	
Officer's name/badge	· #		•		
Did police complete an Request a copy of com	•	No If yes, poort and attach to this fo	olice report number: _ rm.		
			FORMATION		
How many vehicles we than 2 vehicles.)	re involved in the accid	lent?	(Attach additional sh	eets as applicable for accidents involving more	
Vehicle Number 1 – T	etra Tech Vehicle		Vehicle Number 2 – 0	Other Vehicle	
Vehicle Owner / Contact Information			Vehicle Owner / Contact Information		
Color			Color		
Make			Make		
Model			Model		
Year			Year		
License Plate #			License Plate #		
Identification #			Identification #		
Describe damage to v	vehicle number 1		Describe damage to	vehicle number 2	
Insurance Company I	Name and Address		Insurance Company	Name and Address	
Agent Name			Agent Name		
Agent Phone No.			Agent Phone No.		
Policy Number			Policy Number		

TETRA TECH, INC. INCIDENT FORM IR-C

	DRIVER INFORMATION								
Vehicle	Number 1 – T	etra Tech V	ehicle		Vehicle Number 2 -	- Other Vehicle			
Driver's	s Name				Driver's Name				
Driver's	s Address				Driver's Address				
Phone	Number				Phone Number				
Date of	Birth				Date of Birth				
Driver's	s License #				Driver's License #				
Licensi	ng State				Licensing State				
Gender		Male	Female		Gender	Male Female			
Was tra	ffic citation issu	tion issued to Tetra Tech driver? Yes No			Was traffic citation is	ssued to driver of other	vehicle? Yes No		
Citation	n #				Citation #				
Citation Descrip					Citation Description				
			PASSE	ENGERS IN VEH	IICLES (NON-INJ	URED)			
In	List all non-injured passengers (excluding driver) in each vehicle. Driver information is captured in the preceding section. Information related to persons injured in the accident (non-Tt employees) is captured in the section below on this form. Injured Tt employee information is captured on FORM IR-A								
Vehicle Number 1 – Tetra Tech Vehicle				Vehicle Number 2 -	Other Vehicle				
How ma	any passengers	(excluding o	driver) in the	vehicle?	How many passenge	How many passengers (excluding driver) in the vehicle?			
Non-Inj Passen and Ad	ger Name	(excluding diver) in the vehicle.			Non-Injured Passenger Name and Address				
Non-Inj Passen and Ad	ger Name				Non-Injured Passenger Name and Address				
Non-Inj Passen and Ad	ger Name				Non-Injured Passenger Name and Address				
			INJUR	IES TO NON-TE	TRATECH EMPLO	OYEES			
Name o	of injured perso	on 1			Address of injured p	erson 1			
Age	Gender		Car No.	Location in Car	Seat Belt Used?	Ejected from car?	Injury or Fatality?		
	Male Fe	emale			Yes No No	Yes No	Injured Died		
Name o	of injured perso	on 2			Address of injured person 2				
Age	Gender		Car No.	Location in Car	Seat Belt Used?	Ejected from car?	Injury or Fatality?		
	Male Fe	emale			Yes No No	Yes No No	Injured Died		
				OTHER PROP	ERTY DAMAGE				
Describ	oe damage to p	property oth	er than mot	or vehicles					
Propert	ty Owner's Nar	me			Property Owner's	Address			



COMPLETE AND SUBMIT DIAGRAM DEPICTING WHAT HAPPENED	

ATTACHMENT III MEDICAL DATA SHEET

MEDICAL DATA SHEET

This Medical Data Sheet must be completed by on-site personnel and kept in the command post during the conduct of site operations. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project			
Name		Hor	ne Telephone
Address			
Age	Height		Veight
Person to notify	y in the event of an emergency:	Name:	
		Phone:	
Drug or other A	Allergies:		
Particular Sens	sitivities :		
Do You Wear (Contacts?		
What medication	ons are you presently using?		
Name, Address	s, and Phone Number of personal	physician:	
Note: Health	Insurance Portability and Acc	ountability Act (HIP	AA) Requirements
Information (Phas that you ma also requires T Data Sheet to o So before you o location. It will	HI) by the entity collecting that info y report on this Medical Data Sho etra Tech to ensure the confiden contain and convey information yo complete the Medical Data Sheet	ormation. PHI is any interpretation. PHI is any interpretation of heat tallity of PHI. This Act would want a Doct understand that this fider accessible to other.	es the disclosure of Protected Health information about health status (such lth care, or other information. HIPAA it can affect the ability of the Medical for to know if you were incapacitated. Form will not be maintained in a secure her members of the field crew so that
	le information that you do not wisl situation or treatment.	n others to know, only	y information that may be pertinent in
Name (Print cle	early)	Signature	Date

ATTACHMENT IV ACTIVITY HAZARD ANALYSIS



ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: Site Mobilization/Demobilization and Site Preparation	emobilization Overall Risk Assessment Code (RAC) (Use highest code)					L
Project Location: LMC MSA	Ris	k Assessi	ment Cod	e (RAC) Mat	rix	
Date Prepared: January 2016		Frequent	Likely	Occasional	Seldom	Unlikely
Brangrad by C. Spyder	Catastrophic	ш	ш	H	Н	M
Prepared by: C. Snyder	Critical	ш	H	H	M	L
Paviawad by I Carathara PhD	Marginal	Н	M	M	L	П
Reviewed by: J. Carothers, PhD	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)					
	"Probability" is the likelihood t Identified as: Frequent, Likely, (,		RAC	Chart
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible E= Extremely High Risk H= High Risk					
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA. **L= Low Risk**					

JOB STEPS	HAZARDS	CONTROLS	RAC
Mobilization\Demobilization • Assembling equipment	Minor cuts, abrasions or contusions	Wear cut-resistant gloves when handling items with sharp or rough edges.	L
 Performing initial/exit inspections of the intended work areas Arranging for utilities, site 	Heavy lifting (muscle strains and pulls)	 Practice safe lifting techniques. Use mechanical lifting devices such as a dolly whenever possible Ensure clear path of travel. Have a good grasp on object. Perform "test lift" to gauge ability to safely make the lift. Lift with legs not back. Obtain help when needed to lift large, bulky, or heavy items). 	L
access, notifying appropriate client contacts	Vehicular traffic when moving large equipment to the support area	 Designate and mark vehicle and equipment staging areas. Inform the site personnel of heavy equipment areas and of their responsibility to stay clear of moving vehicles. In high traffic areas, wear a high-visibility vest, shirt or jacket. Construct Traffic Control Plan if existing traffic patterns enter. Free space of Travel (within 15-feet of existing established traffic patterns. 	L
	4. Slips, Trips, Falls	 Watch for tree branches, roots, weeds, limbs and other ground hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces. Practice good housekeeping. 	L
	5. Inclement weather	The FOL and/or the SSO will temporarily suspend outside activities in the event of electrical storms or high winds.	L

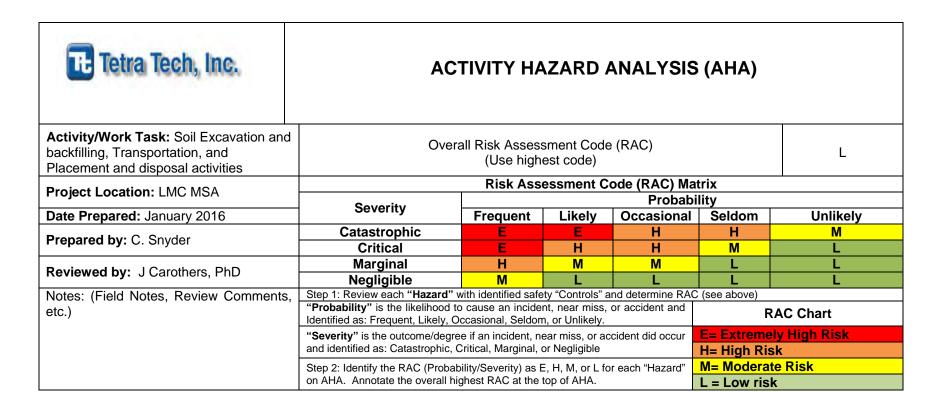
JOB STEPS	HAZARDS	CONTROLS	RAC
		 It is preferred that supported systems such as lightning detection devices or emergency weather broadcasts are employed. However, when this is not possible field personnel should use the 30/30 Rule: "If there is less than 30 seconds between thunder and lightning go inside and stay inside for at least 30 minutes after the last thunder." 	
	Implement Site Specific Hazard Communication Program	 Complete the chemical inventory for the project Procure Material Safety Data Sheets/Safety Data Sheets (SDS) for chemicals used on this site. Label containers used on site for hazardous materials Identification of any additional hazard communication training requirements 	L
PORTABLE POWER HAND TOOLS	Any portable power tools (e.g., electric demolition hammers, pneumatic tools, drills) used in the work area must have appropriate guarding, interlocks, or controls to ensure safe operation, in accordance with 29 CFR 1926.301 and 302. Machinery and equipment must be inspected for defects in the guarding, electrical safety, and operation before each use.	 The following specific precautions will be used to help prevent injuries and accidents: Never remove, make inoperative, or reduce the effectiveness of any equipment or machine guard. Never override any safety interlock or attempt to operate any piece of equipment or machinery without guards or other required safety devices in place and fully functional. Never operate any piece of equipment or machinery when it is functioning improperly or at any time when operation would constitute a hazard. Malfunctioning equipment must be repaired immediately or removed from the premises. Do not use electrically powered tools near flammable materials. At no time will electrical power equipment be operated without proper grounding. All electrical power tools will be marked to indicate that they have double insulation by a nationally recognized laboratory. Do not use electrical tools in wet or damp areas. Use tools only for their intended purpose Repair mushroomed punch, drift, and chisel heads or take the tool out of service and replace. Do not use conductive (i.e., metal) tools around energized electrical sources. Select the correct size and type of wrench for each job. Wrench handles will not be extended with a pipe or "cheater" bar. Wear eye protection at all times when using hand tools All hand tools and power tools will be inspected prior to use 	L

ACTIVITY HAZARD ANALYSIS Site Mobilization/Demobilization and Site Preparation Page 3 of 3

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	SITE TRAINING REQUIREMENTS
Hand tools (dollies, hand carts, hand knives, etc.)	Visual inspection prior to use by user.	Review of AHA during pre-task tailgate safety briefing with the intended task participants.
Personal Protective Equipment Minimum: Sleeved Shirts, Long Pants, Safety toe boots, safety glasses. Optional items: Hardhat, hearing protection when needed. HTRW: None anticipated for this task.	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in any onsite activities, and will be confirmed by visual observations of worker activities.

I have read and understand my responsibility as specified in this AHA:

Name (Printed)	Signature	Date	



ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS		
Excavation and Trenching	Struck by Heavy Equipment/Vehicles	 Operators/Drivers will submit a copy of their valid driver's license on initial arrival for each vehicle brought on site. Drivers will maintain workers on foot in sight, if you lose sight of someone, Stop! Design the site traffic controls to minimize backing operations. Personnel are not allowed to use a cellular phone while driving a vehicle on-site. Use spotters for traffic control whenever there is "blind spots", backing in congested areas, or where there are road hazards or unsafe road conditions. Be aware of heavy equipment operations. Keep out of the swing radius of heavy equipment. Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. 		

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 10. Ground personnel will not stand directly behind heavy equipment when it is in operation. 11. Do not approach heavy equipment unless eye contact with appropriate hand signals has been made with the operator to cease activity. Equipment operators will confirm that eye contact had been made by stopping operation and clearly showing their hands are off of the controls. 	
	Rollovers	 Equipment will have rollover protective structures and seat belts. Operators will wear seat belts when operating equipment. Equipment will not be operated on grades which exceed manufacturer's recommendations. Run articulated equipment (i.e., rollers, trucks) up and down slopes – not at an angle. 	L
	Unstable Soils	 During hauling operations, keep soft areas/ruts filled and graded. Do not allow off-road trucks to continually run over ruts. Off-road trucks should vary their path on the haul roads. Prior to beginning any grading activities in potentially unstable areas, an operator experienced with working on unstable material will run a LGP dozer over the entire area to evaluate for signs of unstable areas. 	L
	Underground Utilities	 Check all available information for location of possible underground obstruction, (e.g., buried pipe, conduit, cable, and telephone lines), especially at sites where plants or structures already exist. Contact local utility companies, landowners, and organizations such as 'dig safe' to assure identification of all buried utilities and obstacles. In planning size of work area at toe of slope, allow for accessibility and maneuverability of equipment planned for construction activities. Follow TtSOP for Utility Clearance 	L
	Slopes	 Earth slopes for trenches and other embankments must be in accordance with OSHA regulations. Locate borrow and waste areas to maximize downhill hauls. Consider use of "reinforced earth" retaining walls. Ensure erosion control materials comply with the E&S Plan. Consider use of geotextiles, erosion control blankets, hay bales or other means to maintain drainage areas and prevent wastage. 	L
	Noise	Where provided close the cab to reduce noise levels associated with the machinery operation. Wear hearing protection when operating noise levels exceed 85dBA.	L

ACTIVITY HAZARD ANALYSIS Excavation Trenching of Storm Sewers and Traffic Control Page 3 of 6

ACTIVITY / POTENTIAL PHASE HAZARDS		RECOMMENDED ACTIONS / CONTROLS	RAC
		SSO will be responsible for implementing the Site Specific Hearing Conservation Program.	
		 Provisions for initial monitoring; selection of types of hearing protection and performance requirements are provided there. 	
	Eye Injuries	Wear safety eye ware	1
	Struck By/Against	Personnel will understand and review hand signals.	L
	January, igamet	All machines will be equipped with backup alarms.	_
Excavation	Excavation Hazards	Prior to beginning work, the competent person shall complete a Checklist for any excavation 4 feet or greater.	L
		2. Do not leave excavations open overnight whenever possible fill them.	
		3. Install open trench warning devices/barricades.	
		4. Excavated and loose materials should be kept at least 4 feet from the edge of excavations. The spoils shall be properly slope at a safe angle.	
		5. If the excavated site is large enough for employees to bodily enter and perform work, and has limited means for entry or exit, and is not designed for continuous employee occupancy, it falls under OSHA confined space regulations.	
		6. If deemed necessary, use the benching and sloping methods to prevent cave-ins (29 CFR 1926.652, Appendix B).	
		7. If personnel entry is necessary, stairways, ladders, or ramps shall be provided as means of egress in all trenches 4 feet or more in depth.	
		8. Travel distance shall be no more than 25 feet between means of exit.	
		9. Protective systems are required on all excavations over 5 feet in depth or in	
		excavations less than 5 feet when examination of the ground by a competent person reveals conditions that may result in cave-ins (29 CFR 1926.652, Appendices C & D).	
		10. Excavations will be inspected by a competent person prior to personnel entering	
		the excavation. Continuous air monitoring will be performed in accordance with	
		Section 6.0 if personnel are required to enter the excavation. The competent person shall have completed an accredited excavation safety course.	
	Exposure to potential site contaminants	Monitoring with portable photoionization detector (PID) Calibrate monitoring equipment twice/day.	
	(VOC's, Metals,	In the morning prior to use to ensure the operational status	
	PCB's)	In the evening in order to compensate results for any instrument drift due to battery loss.	
	 Inhalation 	Establish background levels to be incorporated into the monitoring results.	
	Skin contact	3. Periodically screen the borehole and any samples collected with a PID equipped	
	Absorption	with an 11.7eV Ultra Violet (UV) lamp.	

ACTIVITY / POTENTIAL PHASE HAZARDS		RECOMMENDED ACTIONS / CONTROLS	RAC
	Ingestion	 4. If readings above daily-established background levels (BGLs) are noted in borehole, monitor worker breathing zone (BZ) areas. 5. If readings in worker BZ areas exceed: PID Action Level: >1 ppm above BG sustained for 1 minute in BZ areas for 4 	
		exposures of 5 minutes in one work day for VOC's. • Visible Dust - employ dust suppression area wetting	
		6. Monitoring will be conducted in the breathing zone to collect data for the worst case scenario in order to evaluate air emissions from this source point.	
	Heavy Equipment Operation	 Reference General Site Hazards. Only operators trained and experienced with the specific equipment will operate that equipment. Equipment will have guards, canopies or grills to protect from flying objects. Ground personnel will stay clear of all suspended loads. 	L
		 5. Eye contact with operators will be made before approaching equipment. Equipment will not be approached on blind sides. 6. Avoid equipment swing radius. This area will be delineated with cones. 7. Know hand signals. 	
		 8. All equipment will be equipped with backup alarms. 9. The use of headphones for entertainment purposes is prohibited. 10. A 15 foot minimum safe separation distance (boom fully extended) will be maintained between equipment and overhead utility lines. 11. Equipment will be shut down before and during fueling operations. 	
	Exposure to Contaminants	 Site personnel will wear PPE as required. Site personnel will make an effort to stay clean and use good hygiene practices during work activities. Minimize the amount of work that must be performed in excavations. 	L
Trenching	Confined Space Entry	 Personnel entry into the excavation or trench is not planned A permit is required for any confined space entry that has one or more of the following characteristics: Contains or has the potential to contain a hazardous atmosphere. Contains a material that has the potential for engulfing the Entrant. Has an internal configuration that can cause a person to be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller area. Contains any other recognized serious safety or health hazard. 	L
		Complete the Non-Permit Confined Space Pre-Entry Checklist Form prior to entry to assure that all conditions for a Non-PRCS are met.	

ACTIVITY HAZARD ANALYSIS Excavation Trenching of Storm Sewers and Traffic Control Page 5 of 6

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 All hazardous energy sources shall be isolated before entry is permitted. Provide safe access into the work area (e.g., ladders, scaffolding, or guarded platforms). Where possible, multiple openings for entry/exit shall be provided for access to confined spaces. Prior to entry, perform air monitoring in accordance with Section 6.0 and inspections to ensure no atmospheric hazards or other safety hazards exist. Perform on-going visual inspections of the Non-PRCS during entry to ensure all health and safety hazards are identified and mitigated. If performing hot work in a relative small/restricted confined space, an attendant will be stationed outside and be capable of executing pre-planned rescue operations. If any condition or hazard is detected that would cause the Non-PRCS to meet the definition of a PRCS, all entrants will evacuate the space and PRCS procedures will be employed prior to re-entry or until that condition/hazard is eliminated. All site personnel involved in confined space entry (i.e., Entry Supervisors, Entrants, Attendants, and Rescue Teams) will receive confined space entry training. 	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Excavators and transport trucks	SSO to inspect each vehicle prior to permitting site access using Heavy Equipment Inspection Checklist provided in Attachment XI.	Heavy equipment operators must demonstrate experience in proper vehicle/equipment operations. Over the road heavy motorized vehicle operators must possess appropriate DOT licenses.
Personal Protective Equipment: Minimum: Hard hats, steel toe boots, sleeved shirt, long pants, safety glasses, high visibility vests Optional items: Hearing protection when required and surgeons gloves when sampling HTRW: VOC's, Metals/dust, PCB's	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations.

ACTIVITY HAZARD ANALYSIS Excavation Trenching of Storm Sewers and Traffic Control Page 6 of 6

All persons working within the operation will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training



ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: Decontamination	Overall Risk Asses	sment Code	(RAC) (U	se highest co	de)	L
Project Location: LMC MSA	Risk Assessment Code (RAC) Matrix					
Date Prepared: January 2016	Severity			Probabi	lity	
Date I repared: January 2010	Severity	Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: C. Snyder	Catastrophic	E	Е	Н	H	M
	Critical	E	Н	Н	M	L
Paviewed by L Carathara DbD	Marginal	Н	M	M	L	L
Reviewed by: J. Carothers, PhD.	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Ha	zard" with ident	ified safety "C	ontrols" and deter	mine RAC (See	above)
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely. RAC Chart					RAC Chart
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible E= Extremely High H= High Risk					
					M= Mod	derate Risk
	"Hazard" on AHA. Annot	ate the overall h	ighest RAC at	the top of AHA.	L = Lov	v Riak

JOB STEPS	HAZARDS	CONTROLS	RAC
Personal Decontamination • Equipment drop • Segregated removal of PPE (wash and rinse reusable items, dispose of non-reusable items)	Slips, Trips, Falls Exposure to contaminated media	 Clear intended deacon area location of ground hazards. Practice good housekeeping to keep the site clear of obstructions, materials, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet surfaces. Follow good decontamination practices (work from top down and outside in). Nitrile gloves are to be the last item of PPE removed. Wash hands and face following personal decontamination and prior to performing any hand-to-mouth activity. 	L
Decontamination of boating equipment and large tooling (e.g., vehicles, etc.) using pressure washer	 Noise Flying projectiles 	 Pressure washer operator must wear hearing protection (muffs or plugs with NRR of at least 25 dB) Restrict other personnel from decon pad during pressure washing operations. Pressure washer operator must exercise care when directing the wand so that it is not pointing at himself/herself or at any other worker. Pressure washer operator must wear full face shield over safety glasses with side shields and brow protection. At SSO discretion, additional PPE consisting of hardhat, rain suit, apron, and or boot covers may be required during decon operations - 	L

JOB STEPS	HAZARDS	CONTROLS	RAC
		depending on observations indicating that significant contact with decon overspray and/or windy conditions during washing activities.	
	3. Falling objects	3. Place items to be decontaminated on ground or on washing/drying racks in a manner that they are secure and will not fall. Wear safety toe safety footwear.	
	Strains/sprains from heavy lifting	4. Practice safe lifting techniques (use mechanical lifting devices such as a dolly whenever possible, ensure clear path of travel, good grasp on object, perform "test lift" to gauge ability to safely make the lift, lift with legs not back, obtain help when needed to lift large, bulky, or heavy items).	
	5. Slips/trips/falls	5. Keep decon areas orderly, maintain good housekeeping, spread light coating of sand on decon pad liner to increase traction.	
	Exposure to contaminated media	6. Follow good decontamination practices (work from top down and outside in). Surgeon's gloves are to be the last item of PPE removed. Wash hands and face following personal decontamination and prior to performing any hand-to-mouth activity.	

EQUIPMENT	INSPECTION	TRAINING
Hand tools (hand brushes, garden sprayers, etc.)	Visual inspection prior to use by user. Check wooden handles for cracks or splinters.	None required.
Pressure washer	Inspect pressure washer prior to putting into service to ensure that it is in good working order, and ensure that fittings are secure.	Review manufacturer's instructions and safety guidelines prior to use.

ACTIVITY HAZARD ANALYSIS Decontamination Page 3 of 3

EQUIPMENT	INSPECTION	TRAINING
Personal Protective Equipment: Minimum: Safety toe boots, safety glasses Optional items: Hardhat, hearing protection. HTRW: Decontamination pad pressure washer operators are to wear full face shield over safety glasses with side shields and brow protection, hearing protection, and nitrile gloves. If contact with overspray cannot be avoided, rain suit or moisture- repellant disposable coveralls may be specified by the SSO.	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	OSHA 40 Hazardous Waste Operations and Emergency Response (HAZWOPER) training, plus appropriate 8-hour annual refresher training for all task participants. Supervisors must have completed additional 8 hours of HAZWOPER training. Also Review of AHA during tailgate safety briefing with the intended task participants. PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in site activities, and will be confirmed by visual observations of worker activities.

I have read and understand this AHA:

Name (Printed)	Signature	Date

Tetra Tech, Inc.		ACTIVITY HAZARD ANALYSIS (AHA)					
Activity/Work Task: HSA/DPT drilling, including soil sampling and monitoring well installation, development. This task includes soil lithology and groundwater assessment using Cone Penetrometer Testing (CPT) with an Membrane Interface Probe (MIP). Project Location: LMC MSA			Overall Risk Assessment Code (RAC) (Use highest code)				
Site: Martin State Air	port	Soverity			Probability	1	
Date Prepared: Janu	uary 2016	Severity	Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: Clyde	Snyder	Catastrophic	Е	Ε	Н	Н	M
1 Toparoa by. Olyac (Critical	E	H	Н	M	<u> </u>
Reviewed by: J. Card	others, PhD	Marginal	H M	M	M	L	L L
Notes: (Field Notes, Revi		Negligible Step 1: Review each "Haza		ed safety "Cont	rols" and determine	RAC (See above	ve)
Notes. (Field Notes, Neview Comments, etc.)		"Probability" is the likeliho and Identified as: Frequent	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above) "Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely. RAC Cha				
			"Severity" is the outcome/degree if an incident, near miss, or accident did				
		occur and identified as: Catastrophic, Critical, Marginal, or Negligible H= High Risk Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each M= Moderate Risk					
		"Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.					
JOB STEPS	HAZARDS	CONTROLS				RAC	
operation 2. Control work area (u and restrict all non-e				th visibility vests for all personnel in work area. (use flaggers, signage, barricades, and/or other means) n-essential personnel from the area. nsure that all equipment, augers, rods and tools will be during transport.			
	2. Tip Over	 Do not permit rig to attempt to traverse severely sloping terrain. Use a ground guide along with a functioning back-up alarm during equipment backing. Once rig is sited, deploy outriggers to properly block and level the rig and secure parking brake. 					L
	3. Slips, Trips, Falls	 Clear trees, roots, weeds, limbs and other ground hazards from the Drill/DPT location. Practice good housekeeping to keep the ground around the Drill/DPT site clear of obstructions, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces. 					

ACTIVITY HAZARD ANALYSIS Block D, E, and G HSA/DPT Drilling Page 2 of 7

JOB STEPS	HAZARDS	CONTROLS	RAC
	4. Minor cuts, or abrasions	When handling equipment and tools wear cut-resistant gloves when handling items with sharp or rough edges.	L
	5. Heavy lifting (muscle strains and pulls)	 Practice safe lifting techniques (use mechanical lifting devices such as a dolly whenever possible. Ensure clear path of travel, good grasp on object, perform "test lift" to gauge ability to safely make the lift Lift with legs, obtain help to lift large, bulky, or heavy items. 	L
	6. Insect bites	 Shake out boots before donning. Use insect repellants (products containing DEET should be applied to exposed skin, products containing Permethrin should be applied to clothing only. Follow manufacturer's recommendations for application). Tape up pants leg to work boot joints with duct tape. Wear light-colored clothing to better see and remove any insects. Perform close body inspections at least daily upon leaving the site. 	L
	7. Inclement weather	 The FOL and/or the SSO will temporarily suspend outside activities in the event of electrical storms or high winds. It is preferred that supported systems such as lightning detection devices or emergency weather broadcasts are employed. However, when this is not possible field personnel should use the 30/30 Rule: "If there is less than 30 seconds between thunder and lightning go inside and stay inside for at least 30 minutes after the last thunder." 	L
Drill Rig Operations	Intermittent high noise levels	 Operators/nearby personnel are to wear hearing protection if noise levels are such that they must raise their voice in order to communicate with someone who is within arm's reach (approx. 2') of them. SSO responsible for determining and designating when hearing protection is required. Hearing protection is to consist of either ear muffs or ear plugs that have an NRR of at least 25 dB. 	L
	Contact with equipment moving parts	 Ensure that workers are thoroughly trained and competent to perform their assigned task with the equipment used in investigation. Ensure that back-up alarms are functional on equipment. The equipment operators and Site Supervisors are responsible to ensure that the equipment is properly inspection prior to being permitted onsite. (see Equipment Inspection Checklist) 	М

ACTIVITY HAZARD ANALYSIS Block D, E, and G HSA/DPT Drilling Page 3 of 7

JOB STEPS	HAZARDS	CONTROLS	RAC
		Ensure that all moving parts are guarded if such parts are exposed. Check/test all emergency stop controls.	
	Contact/striking underground or overhead utilities	 Movement of rig with mast raised will be strictly prohibited. Inspect for buried and overhead utilities in the vicinity of the Drill/DPT location. Verify the location of utility lines in accordance with the Tetra Tech SOP Utility Location and Excavation Clearance (Attachmnet XV). Plan the move with the local utility companies if utility lines must be moved. Pre-survey the height of equipment and height of utility lines to determine which lines must be removed or raised. Equipment should not come within 20 feet of existing overhead utility lines. 	L
	Pressurized hydraulic lines could rupture, causing release of hot hydraulic fluid.	 Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. Immediately shut down equipment if lines rupture. If rupture occurs, as quickly as possible, berm the liquid to minimize the area over which the liquid spreads. Ensure that all pressurized lines have whip checks. 	L
	5. Workers could trip or fall by the borehole	Cap and flag open boreholes. If left unattended, protect all open boreholes as any open excavation.	L
Handling drill rods and augers and	Struck by/entanglement	 Be prepared for sudden shifting when removing rod sections. Restrict non-essential personnel from approaching working area. 	L
MIP Installation	2. Overhead hazards	1. All personnel within the radius of the Drill/DPT rig must wear ANSI approved hard hats.	L
	3. Slips, Trips, Falls	 Clear trees, roots, weeds, limbs and other ground hazards from the location. Practice good housekeeping to keep the ground around the site clear of obstructions, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces. Keep a wide base and assure secure footing while attempting to handler auger flights and tooling. 	L
	Contusions, cuts, or abrasions	When handling auger flights, MIPS and tools, wear cut-resistant heavy cotton or leather work gloves when handling items with sharp or rough edges.	L
	Heavy lifting (muscle strains and pulls).	 Practice safe lifting techniques by using mechanical lifting devices such as a dolly whenever possible. Ensure clear path of travel 	L

ACTIVITY HAZARD ANALYSIS Block D, E, and G HSA/DPT Drilling Page 4 of 7

JOB STEPS	HAZARDS	CONTROLS	RAC
		3. Have a good grasp on object. Perform "test lift" to gauge ability to safely make the lift.4. Lift with legs not back. Obtain help when needed to lift large, bulky, or heavy items	
HSA Operations	Auger start up and operation	 Auger will be engaged only when the hot zone is cleared and site personnel notified. Site personnel will not approach a rotating auger. Use a long handled flat head shovel when removing auger cuttings. Stay away from the augers when rotating. Prevent shovel from lodging into the augers and kicking out. Do not wear loose clothing when working with augers. 	L
	2. Cleaning augers	 Augers will be cleaned only when they are stopped and in neutral. They will not be restarted until the worker has given a verbal "all clear" to the operator, and the operator has visually determined that the worker is clear of the auger. Only long-handled shovels will be used to remove cuttings from the auger. 	L
Monitoring Well installation	1. Slips, Trips, Falls	 Clear trees, roots, weeds, limbs and other ground hazards from the location. Practice good housekeeping to keep the ground around the site clear of obstructions, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces. Keep a wide base and assure secure footing while attempting to handler auger flights and tooling. 	L
	Contusions, cuts, or abrasions	When handling auger flights and tools, wear cut-resistant heavy cotton or leather work gloves when handling items with sharp or rough edges.	L
	3. Heavy lifting (muscle strains and pulls).	 Practice safe lifting techniques by using mechanical lifting devices such as a dolly whenever possible. Ensure clear path of travel Have a good grasp on object. Perform "test lift" to gauge ability to safely make the lift. Lift with legs not back. Obtain help when needed to lift large, bulky, or heavy items 	L
	4. Exposure to potential site contaminants (VOC's, Metals, PCB's)	 7. Monitoring with portable photoionization detector (PID)Calibrate monitoring equipment twice/day. In the morning prior to use to ensure the operational status 	L

ACTIVITY HAZARD ANALYSIS Block D, E, and G HSA/DPT Drilling Page 5 of 7

JOB STEPS	HAZARDS	CONTROLS	RAC
	 Inhalation Skin contact Absorption Ingestion 	 In the evening in order to compensate results for any instrument drift due to battery loss. Establish background levels to be incorporated into the monitoring results. Periodically screen the borehole and any samples collected with a PID equipped with a 11.7eV Ultra Violet (UV) lamp. If readings above daily-established background levels (BGLs) are noted in borehole, monitor worker breathing zone (BZ) areas. If readings in worker BZ areas exceed: PID Action Level: >1 ppm above BG sustained for 1 minute in BZ areas for 4 exposures of 5 minutes in one work day for VOC's. Visible Dust employ dust suppression area wetting Monitoring will be conducted in the breathing zone of the Driller to collect data for the worst case scenario in order to evaluate air emissions from this source point. 	
Soil sampling	Cuts and lacerations – when cutting acetate liners without the proper material handling devices.	 Always cut away from yourself and others. Do not place items to be cut in your hand or on your knee. Change blades as necessary to maintain a sharp cutting edge as many accidents result dull cutting attachments. Wear cut-resistant gloves (leather or heavy cotton) at least on the non-knife/saw hand, where possible. When cutting acetate liners use the tubing retention tub to secure the tube. Use the knife intended for that purpose. Geoprobe® makes a kit for this purpose. 	L
	2. Chemical exposure	 Wear surgeons' gloves when handling potentially-contaminated media and samples. Avoid contact with potentially-contaminated media to the extent possible. Practice good personal hygiene (hands and face washing) when exiting work area. Hand-to-mouth activities in the work area are prohibited (eating, drinking, smoking, etc.). Exposure via dermal contact and ingestion represent some limited concern during this task. Periodically screen sample with monitoring equipment. If readings above daily-established background levels (BGLs) are noted in borehole, monitor worker breathing zone (BZ) areas. If readings in worker BZ areas exceed the action level: After at least 5 minutes, SSO will approach from upwind direction screening BZ areas. 	L

ACTIVITY HAZARD ANALYSIS Block D, E, and G HSA/DPT Drilling Page 6 of 7

JOB STEPS	HAZARDS	CONTROLS	RAC
		Work may resume when readings in the BZ return to BGLs.	
Decontamination	1. Chemical spread	 When handling soils and potentially contaminated equipment Wear surgeon's gloves when handling potentially-contaminated media and samples Avoid contact with potentially-contaminated media to the extent possible. These are disposable, change out as necessary to avoid break through. When exiting the exclusion zone, wash the outer gloves to remove any residual contamination. This will also permit disposal in the general refuse. Remove gloves, wash hands and face to minimize any potential introduction of contaminants into the body. Leave consumable materials such as cigarettes, snuff chewing tobacco, candies, medications, etc. in the break area to avoid potential contact. Practice good personal hygiene (hands and face washing) when exiting work area, avoiding any hand-to-mouth activities in the work (eating, drinking, smoking, etc.). Practice good housekeeping to avoid the spread of contamination. 	L

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
 DPT Rig, bore rods, auger flights, acetate cutting device and sharp knives, hand tools (dollies, hand carts, etc.) Safety Equipment: A 20-pound dry chemical ABC fire extinguisher readily available. Spill-control kit available at drilling location. First-aid kit, eyewash (meeting the ANSI Z358.1 criteria), and an emergency air horn nearby. Monitoring Instruments: None 	Visual inspection prior to use by user. PID must be calibrated as per the manufacturer's recommendations and documented on each use.	 Review of AHA during pre-task tailgate safety briefing with all intended task participants. Personnel must be trained in use of drilling equipment. The Drill/DPT operator must have current certifications to operate the equipment.
Personal Protective Equipment: Minimum: Safety toe boots, safety glasses, Hardhat, hearing protection Nitrile surgeon's style gloves. Optional items: Tyvek if there is a change to soil clothing. HTRW: VOC's, Metals/dust, PCB's	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in any onsite activities, and will be confirmed by visual observations of worker activities.

ACTIVITY HAZARD ANALYSIS Block D, E, and G HSA/DPT Drilling Page 7 of 7

I have read and understand this AHA:

Name (Printed)	Signature	Date



Activity/Work Task: Concrete Chipping and Coring activities	Overall Risk Assessment Code (RAC) (Use highest code)			М		
Project Location: Lockheed Martin	Ris	k Assessr	nent Cod	e (RAC) Mat	rix	
Site: Martin State Airport	Severity			Probability		
Date Prepared: January 2016	1	Frequent	Likely	Occasional	Seldom	Unlikely
Propored by C. Spyder	Catastrophic	Е	Е	Н	Н	M
Prepared by: C. Snyder	Critical	Е	Н	Н	M	L
Paviawad hyr. I. Carathara DhD	Marginal	Н	M	M	L	L
Reviewed by: J. Carothers, PhD	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard"	with identified	safety "Controls	and determine R	AC (See above)
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely. RAC Chart				C Chart	
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible E= Extremely High F H= High Risk					
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA. M = Moderate Risk L = Low Risk L = L					

JOB STEPS	HAZARDS	CONTROLS	RAC
Qualified and trained personnel shall utilize a powered coring/cutting machine to saw cut and remove concrete cores and chips. Hand tools and or drills may also be used for this activity.	Crushing, pinching, cutting, amputation and bruising hazards as well as caught-on and struck-by and flying debris hazards are associated with powered handheld equipment usage.	 Workers shall inspect, test, and determine safe operating condition of all power tools prior to use. Continued, periodic inspections shall be performed assure safe operating condition and proper maintenance. Utilize a coring machine in a well ventilated environment. Prior to use, the operator shall check the blade for damage and ensure that the blade arbor is the proper size and is seated securely on the hub. Use the proper blade for the material being cut. The operator shall use the correct size blade guard for the blade in use. Intentional forcing of the coring tool bit may cause the blade to shatter. 	M

JOB STEPS	HAZARDS	CONTROLS	RAC
		 8. The operator shall make shallow cuts with the blade to avoid overheating. 9. Overheating may cause the blade to fail resulting in serious injury. 10. The operator shall lift blade from cutting surface before stopping the machine. If hand tools (hammers, chisels etc.) are used to clear brush and small trees the following precautions should be followed: 	
	Hand Tool Use	 Inspect handles are they in good condition (no cracks, splinters, loose heads. Check tool edges all blades should be sharp without knicks or gouges in the blade. All hand tools should be controlled when not in use to prevent tripping. A 10-foot perimeter will be established around areas where concrete chipping is being conducted. 	
	Dust generation	 Visible Dust employ dust suppression area wetting When handling soils and potentially contaminated equipment Wear surgeon's gloves when handling potentially-contaminated media and samples Avoid contact with potentially-contaminated media to the extent possible. These are disposable, change out as necessary to avoid break through. When exiting the exclusion zone, wash the outer gloves to remove any residual contamination. This will also permit disposal in the general refuse. Remove gloves, wash hands and face to minimize any potential introduction of contaminants into the body. Leave consumable materials such as cigarettes, snuff chewing tobacco, candies, medications, etc. in the break area to avoid potential contact. Practice good personal hygiene (hands and face washing) when exiting work area, avoiding any hand-to- 	

ACTIVITY HAZARD ANALYSIS Concrete Chipping and Coring Page 3 of 3

JOB STEPS	HAZARDS	CONTROLS	RAC
		mouth activities in the work (eating, drinking, smoking, etc.). 11. Practice good housekeeping to avoid the spread of contamination.	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Coring tool, concrete coring bit, hand tools.	Visual inspection prior to use by user.	Review of AHA during pre-task tailgate safety briefing with all intended task participants.
Personal Protective Equipment: <u>Minimum</u> : Safety toe boots, safety glasses, face shield, and hearing protection, cotton or leather work gloves. <u>Optional items:</u> Hardhat, <u>HTRW</u> : possible dust	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in any onsite activities, and will be confirmed by visual observations of worker activities.

I have read and understand this AHA:

Name (Printed)	Signature	Date



Activity/Work Task: Excavation activities	Overa	Overall Risk Assessment Code (RAC) (Use highest code)					
Project Location: LMC/MSA		Risk Ass	essment C	ode (RAC) Mat Probabi			
Date Prepared: January 2016	Severity	Frequent	Likely	Occasional	Seldom	Unlikely	
Brangrad by C. Spyder	Catastrophic	Е	Е	Н	Н	M	
Prepared by: C. Snyder	Critical	Е	Н	Н	M	L	
Reviewed by: M. Soltis, CIH, CSP	Marginal	Н	M	M	L	L	
Reviewed by. W. Sollis, CIH, CSP	Negligible	M	L	L	L	L	
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above) "Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely. RAC Chart					AC Chart	
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible			_	E= Extremely High Risk H= High Risk		
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" M= Mod			M= Modera L = Low ris	derate Risk v risk	

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Excavation and Trenching	Struck by Heavy Equipment/Vehicles	 Operators/Drivers will submit a copy of their valid driver's license on initial arrival for each vehicle brought on site. Drivers will maintain workers on foot in sight, if you lose sight of someone, Stop! Design the site traffic controls to minimize backing operations. Personnel are not allowed to use a cellular phone while driving a vehicle on-site. Use spotters for traffic control whenever there is "blind spots", backing in congested areas, or where there are road hazards or unsafe road conditions. Be aware of heavy equipment operations. Keep out of the swing radius of heavy equipment. Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times. Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. Ground personnel will not stand directly behind heavy equipment when it is in operation. 	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		11. Do not approach heavy equipment unless eye contact with appropriate hand signals has been made with the operator to cease activity. Equipment operators will confirm that eye contact had been made by stopping operation and clearly showing their hands are off of the controls.	
	Rollovers	 Equipment will have rollover protective structures and seat belts. Operators will wear seat belts when operating equipment. Equipment will not be operated on grades which exceed manufacturer's recommendations. Run articulated equipment (i.e., rollers, trucks) up and down slopes – not at an angle. 	L
	Unstable Soils	 During hauling operations, keep soft areas/ruts filled and graded. Do not allow off-road trucks to continually run over ruts. Off-road trucks should vary their path on the haul roads. Prior to beginning any grading activities in potentially unstable areas, an operator experienced with working on unstable material will run a LGP dozer over the entire area to evaluate for signs of unstable areas. 	L
	Underground Utilities	 Check all available information for location of possible underground obstruction, (e.g., buried pipe, conduit, cable, and telephone lines), especially at sites where plants or structures already exist. Contact local utility companies, landowners, and organizations such as 'dig safe' to assure identification of all buried utilities and obstacles. In planning size of work area at toe of slope, allow for accessibility and maneuverability of equipment planned for construction activities. 	L
	Slopes	 Earth slopes for trenches and other embankments must be in accordance with OSHA regulations. Locate borrow and waste areas to maximize downhill hauls. Consider use of "reinforced earth" retaining walls. Ensure erosion control materials comply with the E&S Plan. Consider use of geotextiles, erosion control blankets, hay bales or other means to maintain drainage areas and prevent wastage. 	L
	Noise	 Where provided close the cab to reduce noise levels associated with the machinery operation. Wear hearing protection when operating noise levels exceed 85dBA. SSO will be responsible for implementing the Site Specific Hearing Conservation Program. Provisions for initial monitoring; selection of types of hearing protection and performance requirements are provided there. 	L

ACTIVITY HAZARD ANALYSIS Excavation Trenching of Storm Sewers and Traffic Control Page 3 of 7

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
	Eye Injuries	Wear safety eye ware	L
	Struck By/Against	Personnel will understand and review hand signals.	L
	, ,	All machines will be equipped with backup alarms.	
Excavation	Excavation Hazards	 Air machines will be equipped with backup alarms. Prior to beginning work, the competent person shall complete a Checklist for any excavation 4 feet or greater. Do not leave excavations open overnight whenever possible fill them. Install open trench warning devices/barricades. Excavated and loose materials should be kept at least 4 feet from the edge of excavations. The spoils shall be properly slope at a safe angle. If the excavated site is large enough for employees to bodily enter and perform work, and has limited means for entry or exit, and is not designed for continuous employee occupancy, it falls under OSHA confined space regulations. If deemed necessary, use the benching and sloping methods to prevent cave-ins (29 CFR 1926.652, Appendix B). If personnel entry is necessary, stairways, ladders, or ramps shall be provided as means of egress in all trenches 4 feet or more in depth. Travel distance shall be no more than 25 feet between means of exit. Protective systems are required on all excavations over 5 feet in depth or in excavations less than 5 feet when examination of the ground by a competent person reveals conditions that may result in cave-ins (29 CFR 1926.652, Appendices C & D). Excavations will be inspected by a competent person prior to personnel entering the excavation. Continuous air monitoring will be performed in accordance with Section 6.0 if personnel are required to enter the excavation. The competent 	L
		person shall have completed an accredited excavation safety course.	
	Slips, Trips, Falls	 Clear intended work areas and walking paths of roots, weeds, limbs and other ground hazards. Practice good housekeeping to keep the site clear of obstructions, materials, equipment and other tripping hazards. Ensure that work boots have adequately-aggressive sole design. Use caution when working on uneven and wet ground. 	М
	Insect bites, snake bites, and contact with poisonous plants.	 Shake out boots before donning. Use insect repellants (products containing DEET should be applied to exposed skin, products containing Permethrin should be applied to clothing only. Follow manufacturer's recommendations. 	

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 Tape up pants leg to work boot joints with duct tape. Wear light-colored clothing to better see and remove any insects. Perform close body inspections at least daily upon leaving the site. Avoid potential nesting areas (brush, deadfall, etc.) where insects or snakes may be present. Review Natural Hazards information in the TtSOP with field team as appropriate based on site observations and conditions. 	
	Chemical contaminants (VOC's, Metals, PCB's)	 Use the PID (11.7eV) to check for background levels in the breathing zone. If following action levels will be observed: PID Action Level: >1 ppm above BG sustained for 1 minute in BZ areas for 4 exposures of 5 minutes in one work day for VOC's. Visible Dust employ dust suppression area wetting 	
	Encumbrance	 Utility clearances must be in place prior to the beginning of excavation (in accordance with the Tetra Tech Utility Locating SOP. Excavation boundaries must be demarcated with appropriate warning signs (e.g., construction activities in progress). Traffic patterns for equipment and the loading of trucks must be established. This pattern should form a loop to minimize backing, an activity which causes many accidents. Traffic patterns for foot and small vehicular traffic must keep workers away from heavy equipment. Traffic patterns for heavy equipment must be constructed to maintain traffic flow a minimum of 10 feet from unsupported walls or excavation boundaries. Excavation along thoroughfares will require the use of warning signs, barricades and flag-persons for alteration of traffic patterns, as necessary. Ground personnel should be provided with reflective vests to increase visibility and air horns to signal loud trucks and heavy equipment. Ground activities with heavy equipment must be supported with a ground spotter. The operators should be instructed that they are to follow the instructions provided by the ground spotter unless another party is otherwise authorized. Surface encumbrances within the intended work area of the excavation will be removed or supported, as necessary, in accordance with OSHA 1926.651(a). Prior to being put into service at the site, the excavator will be inspected by the SSO, 	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 11. Heavy equipment will be positioned and operated so that it never approaches closer than 4 feet from the edge of an open excavation (other than the boom and bucket portion of the excavator). 12. A decontamination station should be established at the loading and off-loading areas to flush mud and dirt from the wheels and tires as well as any areas of the vehicle impacted during the loading operation. Tetra Tech personnel WILL NOT enter a trench past 4 feet deep 	
	Heavy Equipment Operation	 Reference General Site Hazards. Only operators trained and experienced with the specific equipment will operate that equipment. Equipment will have guards, canopies or grills to protect from flying objects. Ground personnel will stay clear of all suspended loads. Eye contact with operators will be made before approaching equipment. Equipment will not be approached on blind sides. Avoid equipment swing radius. This area will be delineated with cones. Know hand signals. All equipment will be equipped with backup alarms. The use of headphones for entertainment purposes is prohibited. A 15 foot minimum safe separation distance (boom fully extended) will be maintained between equipment and overhead utility lines. Equipment will be shut down before and during fueling operations. 	L
	Exposure to Contaminants	 Site personnel will wear PPE as required. Site personnel will make an effort to stay clean and use good hygiene practices during work activities. Minimize the amount of work that must be performed in excavations. 	L
Trenching	Confined Space Entry	 Personnel entry into the excavation or trench is not planned A permit is required for any confined space entry that has one or more of the following characteristics: Contains or has the potential to contain a hazardous atmosphere. Contains a material that has the potential for engulfing the Entrant. Has an internal configuration that can cause a person to be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller area. Contains any other recognized serious safety or health hazard. Complete the Non-Permit Confined Space Pre-Entry Checklist Form prior to entry to assure that all conditions for a Non-PRCS are met. All hazardous energy sources shall be isolated before entry is permitted. 	L

ACTIVITY HAZARD ANALYSIS Excavation Trenching of Storm Sewers and Traffic Control Page 6 of 7

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 Provide safe access into the work area (e.g., ladders, scaffolding, or guarded platforms). Where possible, multiple openings for entry/exit shall be provided for access to confined spaces. Prior to entry, perform air monitoring in accordance with Section 6.0 and inspections to ensure no atmospheric hazards or other safety hazards exist. Perform on-going visual inspections of the Non-PRCS during entry to ensure all health and safety hazards are identified and mitigated. If performing hot work in a relative small/restricted confined space, an attendant will be stationed outside and be capable of executing pre-planned rescue operations. If any condition or hazard is detected that would cause the Non-PRCS to meet the definition of a PRCS, all entrants will evacuate the space and PRCS procedures will be employed prior to re-entry or until that condition/hazard is eliminated. All site personnel involved in confined space entry (i.e., Entry Supervisors, Entrants, Attendants, and Rescue Teams) will receive confined space entry training. 	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Excavators and transport trucks	SSO to inspect each vehicle prior to permitting site access using Heavy Equipment Inspection Checklist provided in Attachment XI.	Heavy equipment operators must demonstrate experience in proper vehicle/equipment operations. Over the road heavy motorized vehicle operators must possess appropriate DOT licenses.
Personal Protective Equipment: Minimum: Hard hats, steel toe boots, sleeved shirt, long pants, safety glasses, high visibility vests Optional items: Hearing protection when required and surgeons gloves when sampling HTRW: VOC's, Metals/dust, PCB's	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations.

ACTIVITY HAZARD ANALYSIS Excavation Trenching of Storm Sewers and Traffic Control Page 7 of 7

All persons working within the operation will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training



Activity/Work Task: Sediment Dewatering activities and Transportation	Overall Risk Assessment Code (RAC) (Use highest code)					
Project Location:LMC MSA	Risk Assessment Code (RAC) Matrix					
Data Branaradi, January 2016	Soverity			Probability		
Date Prepared: January 2016	Severity	Frequent	Likely	Occasional	Seldom	Unlikely
Drangrad by C. Coydor	Catastrophic	Ė	E	Н	Н	M
Prepared by: C. Snyder	Critical	E	Н	Н	M	L
Deviewed by L. Corothoro DhD	Marginal	Н	M	M	L	L
Reviewed by: J. Carothers, PhD	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments,	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)					
etc.)	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely. RAC Ch				Chart	
					E= Extremely H= High Risk	
Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.					M= Moderate Risk L = Low Risk	

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Site set up — Dewatering Pad placement Duties will include Receiving sediments. Draining water from the sediment pumping and containing water in Frac Tanks. Servicing electrical and gas operated pumps	1. Slip, trip and fall hazards	 During set up, in order to minimize slip trip and fall hazards The SSO will survey the area to ensure areas prone to slip, trip, and fall hazards are flagged or removed. Entry/access routes will be determined as well as schedules. All workers are to wear sturdy work shoes that are outfitted with slip resistant aggressive tread. Provide hose and piping guards at crossing points to protect piping and hoses and to minimize trips and falls. Conduct leak tests on all hoses and connections. Clean up spills and releases when they occur to eliminate slippery surfaces Step ladder(s) will be maintained in the dewatering area or access platforms will be constructed to permit 	М

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Dewatering Pad will be built to drain water to a Central Location		monitoring of dewatering. If ladders are employed they will be Fully extended Placed on a flat surface or secured to the box. Personnel will be instructed in the proper use of ladders by a Competent Person. Ladders will be inspected by a Competent Person periodically. Users will inspect before each use. It is strongly recommended that climbing on the roll box frame is discouraged	
2. Pump water operation and maintenance	Contaminant contact during hose change out and flushing	 To minimize contact All high pressure hose connections will either be mechanical connections or will be pinned to prevent inadvertent disconnect. Periodically flush feed and discharge lines and pumps. Flush at the end of the work day. Establish spill provision materials and PPE within the area of the feed discharge and discharge to the frac tanks. This includes Hard hats; Safety Glasses, Steel toed/shank boots, suitable work attire; nitrile surgeons and nitrile supported gloves. During hose or pump opening – Rain suit, chemical resistant over boots, and splash shield Maintain hoses roll off boxes within secondary containment area accessible by truck. Anytime direct contact is anticipated, personnel will Flush the pump and lines out before servicing to remove contaminated sediments and waters. Wear protective clothing to prevent direct contact. This includes Rain suit is splashing potential exists. Impermeable aprons if incidental contact is anticipated. For activities require tactile control, wear nitrile surgeons gloves, layered where necessary. 	L
3. Pumps	Electrical hazards	To control electrical hazards, the following measures will be employed. Route all plug in pumps through a Ground Fault Circuit	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		Interrupter (GFCI) to detect and isolate potential stray currents in these wet areas. Keep power feeds out of standing water. Isolate large to la	
4. Weight assessment and load inspection –	Overweight trucks – Road hazards	 To avoid overloading the following is recommended: Conduct weight determination based on sediment as densities may vary. As sediments are removed an average over the profile should be determined. Based on the above determination, load the trucks to a suitable limit to avoid over loading. Based on the density of the materials this may be only 75%. Weight limits can be confirmed through the use of portable scales. 	M
4A. Load Inspection	1A.Leaking materials; Qualification of drivers	 1A. To avoid leaking and release of materials The trucks during transport may continue to weep water. This is created by the vibratory actions (bumpy roads) and the load settling in the truck. Due to this continue release, 	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 Tail gates shall be sealable to prevent liquid separation and leaking from the box during transport. Add sufficient polymer to permit remaining water to coagulase to prevent separation of water and sediments during transport. All boxes will be tarped or covered. 	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
transfer pumps; associated hoses; Polymer Gas or electric pumps/generators, etc.	Visual inspection of hand tools will be performed by the SSO. Each time a tool is used it will undergo a cursory inspection by the user. SM and SSO to perform regular (e.g., daily) inspections for housekeeping issues. The results of these efforts will be corrected as necessary and will be documented in the Field Logbook	 All personnel 40-Hour General Site Worker Training [OSHA 29 CFR 1910.120 (e)] 8-Hour General Site Worker Refresher Training [OSHA 29 CFR 1910.120 (e)(8)] Site Specific Training – All personnel shall review this Abbreviated Health and Safety Plan prior to the commencement of on-site activity. Participate in a Medical Clearance/Surveillance Program as described in OSHA 29 CFR 1910.120 (f). Complete a Medical Data Sheet Review applicable MSDSs if you are unaware of the hazards and recommended control measures for diesel fuel and grout. Supervisory personnel: 8-Hour General Site Worker Supervisory Training [OSHA 29 CFR 1910.120 (e)(4)]
Personal Protective Equipment: Minimum: Hard hats; Safety Glasses, Steel toed/shank boots, suitable work attire; nitrile surgeons and nitrile supported gloves. During hose or pump opening – Rain suit, chemical resistant over boots, and splash shield	Initial and ongoing PPE inspections will be done so by the users. The SSO will perform periodic inspections to determine the effectiveness of selected PPE and if there are better options.	PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in site activities, and will be confirmed by visual observations of worker activities. The SSO will be responsible for the implementation of the following Site Specific Health and Safety Programs: Hazard Communication – Polymer and supporting petroleum products where employed. Heat stress monitoring will be conducted at the SSOs discretion based on ambient conditions.

ACTIVITY HAZARD ANALYSIS Sediment Dewatering Activities Page 5 of 5

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
HTRW: VOCs, Metals, and		AHA Assessment - During the initial walk through the SM and/or the SSO shall
PCBs		review the AHA to determine applicability or information that will need added given
		site specific conditions.

All persons working within the operational will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training



Activity/Work Task: Excavation and loading dewatered sediment using heavy equipment	of O	Overall Risk Assessment Code (RAC) (Use highest code)			М	
Project Location: LMC MSA		Risk Asse	essment Co	de (RAC) Mat	rix	
Froject Location. Livic WSA	Coverity			Probability		
Date Prepared: January 2016	Severity	Frequent	Likely	Occasional	Seldom	Unlikely
Brongrad by C. Chydor	Catastrophic	E	Е	Н	Н	M
Prepared by: C. Snyder	Critical	E	Н	Н	M	L
Paviawad by L Carathara DhD	Marginal	Н	M	M	L	L
Reviewed by: J. Carothers, PhD	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (see above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely. RAC Chart			Chart		
	"Severity" is the outcome/degree if an incident, near miss, or accident did			High Risk		
		occur and identified as: Catastrophic, Critical, Marginal, or Negligible H= High Risk				
		Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each M= Moderate Ri			Risk	
	"Hazard" on AHA. Annotate	Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Transporting Heavy Equipment to the Site	Vehicle accident; Damaged over- passes, power lines traffic lights and signs, etc.; roadways, etc.; Load Restrictions; Permit restricted transport routes	 Confirm permitted travel route and access points and times when oversized equipment may be moved. The travel route, loading and off-loading area should be identified. To ensure adequate clearance is maintained along the route (overpasses, traffic lights, power lines, etc.) personnel should drive the route the vehicles will take. Make sure turns and routes provide sufficient clearance to movement the transport truck and trailer with load. Confirm there are no load restrictions along the travel route. Do not exceed prescribed weight limits. 	L
Positioning and moving excavators and transport trucks. Positioning Spill Plate	Struck by moving vehicles/ caught between	 Restrict non-essential personnel from operating area. Ensure that excavators and trucks are equipped with audible back-up motion alarms. Spotters or other ground crew are responsible for positioning themselves in view of vehicle operators (stay out of operators' blind spots). DO NOT get in-between trucks or operating equipment or under spill plate. Do not walk behind operating equipment with a restricted view when moving backwards Always leave yourself and escape route. 	M

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 If you activity places you in the area of operating equipment carry a whistle or air horn to alert operators should you find yourself in a compromised position. Wear a high visibility clothing to increase visual recognition. Hard hats and safety glasses, standard work attire are required in the operating area. Structural traffic routes in a single direction where possible. Dump trucks will be equipped with over cab protection. Drivers will remain in the truck during loading or move away Boom length + 10-feet. When exiting the vehicle drivers must comply with PPE requirements. Equipment operators should NOT swing loads over personnel Personnel on the ground should NOT walk under elevated loads. 	
Excavating and loading soils onto haul vehicles	Over loading vehicles	Trucks will be loaded, tarps put into place, decontaminated (as necessary) and weighed prior to leaving the site en-route to the landfill or disposal area.	М
Solio Office Fladii Verilloles	Falling objects – From transporting vehicles Second 1. Se	 Use the excavator to level the load during placement of the excavated materials in the truck to ensure proper balance of the load while also applying slight compaction. Use the excavator to knock the load down below and compress as necessary below the side boards. When loading soil attempt to mix dry and wet materials. Although materials will be dewatered there is a possibility that some sediment may remain wet. Mix quicklime with sediment to displace or absorb water. During transport it is the intent to prevent loaded materials from settling resulting in water collection on top of the load or at and along the Tail Gate. When this condition may be suspected mix with dry materials or quicklime to absorb any water separated from the solids. If the materials cannot be dried enough by mixing, then return to the dewatering pad and further actions determined to dry sediment. The vehicles will be covered with tarps to control and contain any debris potentially blowing out during transport and prevent rain or snow from entering sediment. During backfilling personnel will be kept away from the off-loading area to avoid be struck by materials being placed. Where provided close the cab to reduce noise levels associated with the 	M
		 machinery operation. Wear hearing protection when operating noise levels exceed 85dBA. SSO will be responsible for implementing the Site Specific Hearing Conservation Program. 	

ACTIVITY HAZARD ANALYSIS Excavation and Loading of Dewatered Sediment Page 3 of 4

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		4. Provisions for initial monitoring; selection of types of hearing protection and performance requirements are provided there. Tetra Tech SOPS	
Loading soils into truck transport	Airborne dust, exposure to PCB's, VOCs		L
Sampling activities	1. Chemical exposure	 Wear surgeons' gloves when handling potentially-contaminated media and samples. Avoid contact with potentially-contaminated media to the extent possible. Practice good personal hygiene (hands and face washing) when exiting work area. Hand-to-mouth activities in the work area are prohibited (eating, drinking, smoking, etc.). Exposure via dermal contact and ingestion represent some limited concern during this task. Periodically screen sample with monitoring equipment. If readings above daily-established background levels (BGLs) are noted in borehole, monitor worker breathing zone (BZ) areas. If readings in worker BZ areas exceed the action level: After at least 5 minutes, SSO will approach from upwind direction screening BZ areas. Work may resume when readings in the BZ return to BGLs. When handling soils and potentially contaminated equipment Wear surgeon's gloves when handling potentially-contaminated media and samples Avoid contact with potentially-contaminated media to the extent possible. These are disposable, change out as necessary to avoid break through. When exiting the exclusion zone, wash the outer gloves to remove any residual contamination. This will also permit disposal in the general refuse. Remove gloves, wash hands and face to minimize any potential introduction of contaminants into the body. Leave consumable materials such as cigarettes, snuff chewing tobacco, candies, medications, etc. in the break area to avoid potential contact. 	L

ACTIVITY HAZARD ANALYSIS Excavation and Loading of Dewatered Sediment Page 4 of 4

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 15. Practice good personal hygiene (hands and face washing) when exiting work area, avoiding any hand-to-mouth activities in the work (eating, drinking, smoking, etc.). 16. Practice good housekeeping to avoid the spread of contamination. 	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Excavators and transport trucks	SSO to inspect each vehicle prior to permitting site access using Heavy Equipment Inspection Checklist provided in Attachment XI.	Heavy equipment operators must demonstrate experience in proper vehicle/equipment operations. Over the road heavy motorized vehicle operators must possess appropriate DOT licenses.
Personal Protective Equipment: Minimum: Hard hats, steel toe boots, sleeved shirt, long pants, safety glasses, high visibility vests Optional items: Hearing protection when required and surgeons gloves when sampling HTRW: VOCs, PCBs, metals	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	PPE training in proper use, care, storage, and limitations.

All persons working within the operation will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training



Activity/Work Task Sedin	ment Sampling		Overall Risk A	Assessment	Code (RAC)) (Use highest of	code)	L	
Project Location: LMC N			Risk Assessment Code (RAC) Matrix						
Site: Martin State Airport						` '			
Date Prepared: January 2	2016			Frequent	Likely	Occasional	Seldom	Unlikely	
Prepared by: C. Snyder	Prepared by: C. Snyder		atastrophic	E	Е	Н	Н	M	
110parea by: e. engaer			Critical	E	H	Н	M	<u> </u>	
Reviewed by: J. Carothe	ers, PhD		Marginal Negligible	H M	M	M	L	-	
Notes: (Field Notes, Review C	omments, etc.)	Step 1: Re	view each "Hazard"	with identified			AC (See above)	
			ty" is the likelihood s: Frequent, Likely,				RAC	Chart	
			is the outcome/deg				E= Extrem	ely High Risk	
		and identifi	ed as: Catastrophic,	Critical, Margin	al, or Negligibl	е	H= High R	isk	
			ntify the RAC (Proba				M= Modera		
	T	Hazard of	n AHA. Annotate th	e overall nignes	t RAC at the to	р от АНА.	L = LOW R	L = Low Risk	
ACTIVITY / PHASE	POTENTIAL HAZARE	os	RECOMMENDED ACTIONS / CONTROLS					RAC	
1. Initial Site Surveys - Access/egress into Controlled areas As part of this sampling effort, the following measures will be conducted. An initial site survey will be conducted to Select the best sample locations based on sedimentary deposits, wetland delineation markers, such as depositional areas	Coordinate efforts with far personnel Inherent hazards or res	•	initial entry The FOL apersonnel activities. As part of in the area Requirem where you PPE requi Restriction The FOL a areas pro removed.	and/or the SS l/operators to these discus a and areas to what the ents are sho u should go a irements for a boundaries and/or the SS ne to slip, trip	SO will meet be ensure the essions, inqui to avoid. facilities Em uld there be as an assem the location, SO will surve o, and fall ha		and nsure	L	

ACTIVITY HAZARD ANALYSIS Confirmation Sediment Sampling Page 2 of 7

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Associated with this activity will require travel over the intended sampling or delineation boundaries.			
2. Initial site survey of the intended work areas	1. Slip, trip, fall	 Controlling Slip, trip, and fall hazards All workers are to wear sturdy work shoes that are outfitted with slip resistant aggressive tread. Select the best route to access (not over steep or uneven terrain). Where there is no other option, install rope ladders to assist in entry and exit. Movement through the Marsh area may require the use of Mudders to allow movement over soft terrain or hip waders. This footwear may exacerbate this hazard. Use the Buddy System. To sink in soft ground and not to be able to extract one's self is a possibility. Samples collected for Geotechnical description will be placed in ZipLoc Bags for later transfer to glassware when possible. 	L
3. Clearing vegetation	1. Cuts/lacerations	 To control cuts/laceration hazards Inspect cutting implement to insure handle is intact, no splinters or other structural deficiencies. Always use a sharp cutting instrument. Many accidents result from struggling with dull cutting implements. When using machetes, use ones with a sufficient hilt to avoid potential having your hand slide down the blade. When not in use, place the cutting implement into a protective sheath. Many injuries reported are a result of falling onto unprotected cutting implements. Wear cut-resistant gloves and safety glasses, when using cutting implements due to flying projectiles and sharp edges created as a result of the cutting. This will also permit you to handle vegetation removed to provide access. Always cut away from yourself and others. Maintain at least a 15-foot radius around someone employing a machete or Brush Hook. 	L

ACTIVITY HAZARD ANALYSIS Confirmation Sediment Sampling Page 3 of 7

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
4. Sample site preparation	Electrical storms/ Inclement weather (high winds, heavy rains, etc.)	Inclement weather – Nothing makes a better ground rod than the hand auger in the ground with your hands contacting that hand auger during an electrical storm. Stop all hand augering when approaching storms are evident. If a supported means are not available to track the storm use the 30/30 rule. If there is less than 30 seconds between thunder and lightning, go inside a protected shelter for at least 30 minutes from the last thunder	L
5. Sampling - Surface soil, sediment, and wetland delineation soil sample collection.	Punctures/lacerations	 To control punctures/lacerations hazards When using dedicated (plastic) trowels or spatulas, do not exert too much downward pressure as these devices can fail and result in an injury to your hand. 	L
Using hand augers – Collecting soil and/or sediment core samples will require using a large diameter hand auger for the collection of 0 to 1 foot; Per the SOP, then the diameter employed for one to two feet will be reduced to avoid cross contamination.	Encountering roots, rocks, and other obstructions - The hand auger is constructed of an auger section; auger flight or extension made from thin walled metal tubing; and a T-Handle also made of thin walled metal tubing. Care must be exercised as not to apply too much pressure as the tubing wall can fail. Should this occur, the person twisting and applying downward pressure would fall onto the extension rod, potentially resulting in impalement.	 Controlling hand auger hazards - Inspect the hand auger for structural deficiencies. Replace as necessary. To control potential impalement hazards, do not exert an overabundant amount of force downward or twisting onto the hand auger or use cheater pipes that would result in structure collapse. If significant resistance is met, move the location slightly to more accommodating ground. The obstruction could be a utility. 	
6. Sampling (continued)	Strains or sprains during hand augering, manual lifting and carrying activities	 Controlling muscle strains and sprains – Hand augering can be physically taxing. While this hazard is considered minimal given the number of points and depths, the following control measures will be employed Your muscles, tendons, and ligaments are not as flexible in the early morning hours. Stretch before physical taxing activities to avoid potential injury. In the later afternoon, your muscles, tendons, and ligaments maybe stressed from fatigue. Take breaks as necessary to avoid injury. Rotate duties with your buddy. Additional measures	L

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
	6A. Lifting and carrying sample supplies and equipment through the marsh area	 Practice safe lifting techniques Inspect/clear the intended path of travel and areas where loads will be deposited, test lift each object to ensure you can without injuring yourself, ensure good grasp is obtainable on object, keep back straight and lift with legs not back, obtain help when needed to lift large, bulky, or heavy items. Where necessary break loads in smaller groups for transport. Remember: It is not always the weight of an object to cause a lifting injury, but also how your body is positioned making it more vulnerable to injury even from light loads. 	
7. Sample collection (continued)	1. Contaminant Exposure The COCs of concern include: All hazards are contact based hazards along with hand to mouth transfer and ingestion. This hazard can be more significant during wetland delineation as the sedimentary and soil samples must be closely examined including the texture of the materials. This is usually done by applying some into the palm of the hand and rubbing to determine grain type and consistency. While this can be done with surgeon's gloves, some prefer not to.	 Wear surgeons' gloves when handling potentially-contaminated media and samples. Avoid contact with potentially-contaminated media to the extent possible. Practice good personal hygiene (hands and face washing) when exiting work area. Hand-to-mouth activities in the work area are prohibited (eating, drinking, smoking, etc.). Exposure via dermal contact and ingestion represent some limited concern during this task. Periodically screen sample with monitoring equipment. If readings above daily-established background levels (BGLs) are noted in borehole, monitor worker breathing zone (BZ) areas. If readings in worker BZ areas exceed the action level: After at least 5 minutes, SSO will approach from upwind direction screening BZ areas. Work may resume when readings in the BZ return to BGLs. When handling soils and potentially contaminated equipment Wear surgeon's gloves when handling potentially-contaminated media and samples Avoid contact with potentially-contaminated media to the extent possible. These are disposable, change out as necessary to avoid break through. When exiting the exclusion zone, wash the outer gloves to 	L

ACTIVITY HAZARD ANALYSIS Confirmation Sediment Sampling Page 5 of 7

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		remove any residual contamination. 6. This will also permit disposal in the general refuse. 7. Remove gloves, wash hands and face to minimize any potential introduction of contaminants into the body. 8. Leave consumable materials such as cigarettes, snuff chewing tobacco, candies, medications, etc. in the break area to avoid potential contact. 9. Practice good personal hygiene (hands and face washing) when exiting work area, avoiding any hand-to-mouth activities in the work (eating, drinking, smoking, etc.). 10. Practice good housekeeping to avoid the spread of contamination. Where possible the FOL shall arrange work to proceed from the least contaminated area to the greatest contaminated area thereby reducing the potential for cross contamination. • After placing sample media inside the sample container, wipe down the outside of the container to minimize contact with contaminated media when handling the sample containers.	
Surface water Sampling	Drowning Infectious water borne diseases	 Wear appropriate personal flotation device (PFD). Don't lean over the side of bridge. Wear appropriate gloves. Prevent contaminated water from contacting your skin. Snagging sampling device on floating or submerged debris Be alert to boat traffic. Have a horn to signal a boat within reach. Wear safety goggles and safety clothing to prevent water contact with skin. 	L
8. Sampling/delineatio n/ surveying	8. Natural hazards – Insect stings and bites; snake bites - The season in which the execution of this project will take place is approaching_spring and summer. Many of the reptiles that present a limited hazard will be nesting. Insect populations will be dramatically reduced making some of these hazards inconsequential.	 8. Controlling natural hazards - In a scenario in which immediate response is required the following measures will be employed Ensure field personnel that are allergic to bee stings are identified and have their Doctor prescribed antidote. If snake sightings occur – Wear snake chaps when moving through heavy brush. Know the habitat – Where hunting, ambush will occur Prepare for Snake bite – Apply a pressure wrap above the bite site, moving downward. Keep the victim calm, attempt to minimize physical 	L

ACTIVITY HAZARD ANALYSIS Confirmation Sediment Sampling Page 6 of 7

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS RAC		
		exertion as this may mobilize the venom. Gather a description of the snake so the proper anti-venom may be administered.		
		Again this is considered unlikely but cannot be ruled out.		
EQUIPMENT TO BE USED	INSPECTION REQUIREMENT	S TRAINING REQUIREMENTS		
Hand tools (hand augers, soil corers, spatulas, etc.); machetes, brush hooks.	Visual inspection of hand tools will performed by the SSO. Each time a tool is used it will under a cursory inspection by the user. Noted damage (mushroomed head splintered handle, etc.) will require removal from service. FOL and SSO to perform regular (daily) inspections for housekeeping issues. The results of these efforts be documented in the Field Logborn	 40-Hour General Site Worker Training [OSHA 29 CFR 1910. 8-Hour General Site Worker Refresher Training [OSHA 2 1910.120 (e)(8)] Site Specific Training – All personnel shall review this Abbit Health and Safety Plan prior to the commencement of activity. Participate in a Medical Clearance/Surveillance Progressible of the Normal Shall review this Abbit Health and Safety Plan prior to the commencement of activity. Participate in a Medical Clearance/Surveillance Progressible of the Normal Shall review this Abbit Health and Safety Plan prior to the commencement of activity. Participate in a Medical Clearance/Surveillance Progressible of the Normal Shall review this Abbit Health and Safety Plan prior to the commencement of activity. Participate in a Medical Clearance/Surveillance Progressible of the Normal Shall review this Abbit Health and Safety Plan prior to the commencement of activity. Participate in a Medical Clearance/Surveillance Progressible of the Normal Shall review this Abbit Health and Safety Plan prior to the commencement of activity. Participate in a Medical Clearance/Surveillance Progressible of the Normal Shall review this Abbit Health and Safety Plan prior to the commencement of activity. Participate in a Medical Clearance/Surveillance Progressible of the Normal Shall review this Abbit Health and Safety Plan prior to the commencement of activity. Participate in a Medical Clearance/Surveillance Progressible of the Normal Shall review this Abbit Health and Safety Plan prior to the commencement of activity. Participate in a Medical Clearance/Surveillance Progressible of the Normal Shall review this Abbit Health and Safety Plan prior to the commencement of activity. Participate in a Medical Clearance/Surveillance Progressible of the Normal Shall review this Abbit Health and Safety Plan prior to the commencement of activity. Pa	reviated on-site ram as	
Personal Protective Equipment: Minimum: Work boots; rubber over boots (marsh area) safety glasses, work gloves for clearing access routes; nitrile surgeons for sampling activities. High visibility vest (if hunting is allowed on the facility) and to increase visual recognition; carry a whistle or similar noise producing device when in remote areas to signal for help should it be necessary.	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	anticipated that this has been covered in employees 40 hour	to ving /or the	

ACTIVITY HAZARD ANALYSIS Confirmation Sediment Sampling Page 7 of 7

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Optional items: Hip waders; mudders; snake chaps HTRW: VOCs, Metals, PCB's		

All persons working within the operational will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training



Activity/Work Task: IDW Management and Drum Handling Procedures	Overall Risk Assessment Code (RAC) (Use highest code)				code)	M
Project Location: Lockheed Martin	Ri	sk Assess	sment Co	de (RAC) Ma	ıtrix	
Site: Martin State Airport	Severity			Probability		
Date Prepared: January 2015	Severity	Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: Clyde Snyder	Catastrophic	Е	Е	Н	Н	M
Frepared by. Ciyde Shyder	Critical	Е	H	Н	M	L
Reviewed by: Jennifer Carothers, PhD	Marginal	Н	M	M	۵	L
Reviewed by. Jenniner Carothers, Fild	Negligible	M	L	Г	L	L
Notes: (Field Notes, Review Comments, etc.)	ep 1: Review each "Hazard" w	ith identified saf	ety "Controls" a	and determine RAC	(See above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely. RAC Chart				C Chart	
	Severity" is the outcome/degree if an incident, near miss, or accident did occur nd identified as: Catastrophic, Critical, Marginal, or Negligible E= Extremely High Ris H= High Risk				<u>-</u>	
<u> </u>					H= High R	
	ep 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each azard" on AHA. Annotate the overall highest RAC at the top of AHA. M= Moderate L = Low Risl					

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
1. Storage Area set up	Traffic hazards; Material handling hazards	 Traffic hazards/Material Handling hazards – This area should be easily accessible in order to place and remove the drums accumulated. To further reduce material handling hazards, support spill containment and control, and sampling when necessary, the IDW storage area should be structured as follows: Maximum 4-drums to a pallet with retaining ring bolt and label on the outside for easy access/reference. Maintain a minimum of 4-feet between each row of pallets. This is the minimum distance necessary to wheel drums on a drum dolly. If the site is not secured, the satellite storage area shall be fenced and signs placed indicating the following:	L
		c. Emergency Contact (If different from the primary)	

ACTIVITY HAZARD ANALYSIS IDW Management Page 2 of 4

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 Provide a Drum/Container Inventory to the Primary Point of Contact and to Emergency Services, if they deem it necessary. The inventory should contain: Each drum shall be assigned a unique identification number. This number shall be placed on the label and drum shell using a paint marker (Note: Do not paint the number on the lid as these have a tendency to get exchanged from time to time.) Types of waste materials (decontamination waters; purge waters, etc.) Volumes (Full or level associated with the container after completion of the project location) Where it was derived from (The site and/or wells) Dates (When filling began) Contact – For more information 	
		Ensure all lids are secured.	
2. Material Handling	Lifting (strain/muscle pulls)	 Lifting (strain/muscle pulls) Use mechanical means (i.e. dollies, etc.) to move and handle containers. Use proper lifting techniques described in TtSOP. Fill drums and buckets only to 80% to minimize some of the weight and incidental spill issues. Use help to move and place drums Reminder: The drums you are attempting to move, lift and/or relocate may weigh on the average of 55-Gallon container of purge or decontamination waters = ~500 lbs. (including the 	M
3. Placing the drums	1. Pinches and compressions	 container) Pinches and compressions – During placement of drums/containers on pallets use machinery or assistance from another person where possible. Keeps hand out of the area between drums during placement. It is best to place the drums and pallets then transport buckets to fill the drums already placed. Wear steel toed shoes with adequate lug to support traction when moving heavy containers. If drums are used at the wells, Whale pumps may be used to transfer contents to a drum in the pick up and then again at the storage area. If necessary buckets can also be used to transfer materials. 	M

ACTIVITY HAZARD ANALYSIS IDW Management Page 3 of 4

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
4. Spill prevention and protectionStaging and Labeling Containers.	1. Chemical contaminants exposure	Chemical hazards – Generally encountering contaminants during this activity is low unless the contents of a container must be transferred due to a faulty container [leak(s)]. The outside of containers should be cleaned of residual waters (e.g. splashes, etc.) to avoid potentially exposing all who come in contact. The FOL and/or the SSO will Ensure the outsides of all drums moved to the staging area are washed/wiped clean.	L

Spill Containment - The primary area of concern regarding spills and/or releases are:

- Collection point –Use mortar tubs as secondary containment. In addition, keep the buckets in the mortar tubs during transport in your vehicle.
- Keep the buckets closed during transport.
- Avoid leaving containers open that may off gas during transport.
- Moving/Handling the drums/containers of waste materials. Minimize handling drums as much as possible and:.
 - o Use proper lifting appliances such as drum grapplers, drum dollies, etc.,. Secure containers for movement over long distances.
 - Exercise care when using a backhoe or similar device to lift the drums. This could result in a bucket tooth puncturing the drum resulting in a release.
 - o Place the drums onto a lift gate and flat bed with removable sides for transport to the staging area.

This section describes the procedures the Tetra Tech field personnel will institute when a spill or leak is detected:

- Initiate incidental response measures, including:
 - Employ personal protective equipment (see below). Take actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel (for containers). Spread the absorbent material in the area of the spill, covering it completely.
 - o Transfer material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment and disposal options.
- Re-containerize spills, including 2-inch of top cover (if over soils) impacted by the spill. Await test results for treatment or disposal options.
- Notify the SSO or FOL immediately upon detection of a leak or spill and actions taken or employed.
 - Personal Protective Equipment
 - Nitrile outer gloves
 - Splash Shield
 - Impermeable over-boots
 - Rain suits

ACTIVITY HAZARD ANALYSIS IDW Management Page 4 of 4

Hazard Monitoring Required: Visual observation of work practices by the FOL and/or the SSO to minimize potential physical hazards (i.e., improper lifting, unsecured loads, cutting practices, etc.). Monitoring will only be employed if Spill Containment is implemented. Periodic visual inspection for leaks when filling drums or those at the staging area.	Decontamination Procedures: Not required, unless spill containment protocol is implemented. Then the following will apply Once the spill is secured and all of the spill equipment has been through a soap and water wash and rinse. Personnel will wash/rinse outer protective garment with soap and water. Remove outer protective garments. Wash hands and face.				
Training Required 29 CFR 1910.120 (e) Site Specific Training Figure 8-1 Medical Clearance/Surveillance Required Completed a Medical Data Sheet	g, See	 Emergency Equipment First Aid Kit Fire Extinguisher Map to Hospital and Emergency Contact List (Posted and a copy placed in your First-Aid Kit. Spill Kit (Oil dry, wood shavings, or other absorbent materials, Shovels, brooms, Oil absorbent pads 	H&S Suppor	ting Program Requirements d.	

All persons upon review will sign off on this AHA prior to participating in these activities.

Name (Printed)	Signature	Occupation	Date of Review or Training		



Activity/Work Task: Geophysical, Soil Gas and Land Surveying	Overall Risk Assessment Code (RAC) (Use highest code)				М		
Project Location: Lockheed Martin	Risk Assessment Code (RAC) Matrix						
Site: Martin State Airport		Probability					
Date Prepared: January 2016		Severity	Frequent	Likely	Occasional	Seldom	Unlikely
Drawaya d hara Chada Canadan		Catastrophic	E	E	Н	Н	M
Prepared by: Clyde Snyder		Critical	Е	Н	Н	M	L
Parioused have Josephore Corethore DhD		Marginal	Н	M	M	L	L
Reviewed by: Jennifer Carothers, PhD.		Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	"Probability" is the likelihood to cause an incident near miss or accident and					/e)	
						RAC Chart	
						emely High Risk	
	and identified as: Catastrophic, Critical, Marginal, or Negligible H= High Risk Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each M= Moderate Ri			Risk			
				erate Risk			
	"Haz	"Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				L = Low	Risk

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
Mobilization to the site.	1. Driving	 See Mobilization/demobilization AHA for control measures pertaining to Driver qualifications Distracted driving control measures What to do if you are in an accident 	L
2. Placement of vehicle	1. Struck by – Traffic hazards	 Struck by To minimize potential Vehicle Traffic Hazards Use caution around heavy and/or other fast-moving equipment.	M

ACTIVITY HAZARD ANALYSIS Geophysical and Land Surveying Page 2 of 6

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 Required "Free Space": Maintain at least 6-feet of space between you and moving traffic. Where this is not possible, use flaggers and/or signs to warn oncoming traffic of activities near or within the travel lanes. Face Traffic: Whenever feasible, if you must move within the 6-feet of required space, or into traffic attempt to face moving traffic at all times. Always leave yourself an escape route. Wear High Visibility Vests to increase visual recognition by motorist. Do not rely on the operator's visibility, judgment, or ability. Make eye contact with the driver. Carefully and deliberately use hand signals so they will not startle or confuse motorists or be mistaken for a flagger's direction before moving into traffic. Move Deliberately: Do not make sudden movements that might confuse a motorist. Avoid where possible interrupting Traffic Flow: Minimize crossing traffic lanes. Warning signs shall be placed indicating surveyors working from all approach venues where applicable. Where free space of travel cannot be maintained a Traffic Control Plan will be required. This not anticipated. 	
3. Surveying	Surveying — Vehicle and or traffic distraction. Wondering into traffic pattern or flow.	Restrict flow and speed of traffic when working in traffic patterns	M

ACTIVITY HAZARD ANALYSIS Geophysical and Land Surveying Page 3 of 6

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
4. Surveying - Driving hubs into the ground using hammers to mark identifying control points	1. Flying projectiles/Struck by/ impaled	 Flying projectiles/Struck by To protect from projectiles eye injuries personnel will wear safety glasses. Crack or damage hubs will not be used. Use a suitable hammer to drive the hubs. The hammer shouldn't be so heavy that and additional person must hold the hub while you drive it into the ground. Ensure the hammer head is attached tightly and has no indication of a mushrooming head that could also become a flying projectile. Hub covers with extended handles are recommended for this task. These steel caps fit over hubs to prevent the ejection of shards while the extension handle takes your hands and fingers out of the strike point or area. The down slide, it is another piece of equipment to carry. Place the hubs in a bucket or similar device to prevent an impalement injury. 	L
5. Surveying - Movement over various terrain types, through various vegetation	1. Slips, trips, and falls	 Slips, trips, and falls Remove/identify trip hazards from the work area, so they may be avoided. Maintain good housekeeping within the work area. Select the best route possible for moving over various terrain types and vegetation (See biological hazards, Section 4.0, subsection 5.0 of the HSGM.). Work boots with a rugged lug is recommended to minimize slips, trip, and falls. Lace up boots providing a ankle support is recommended for movement over various terrain. Steel toed boots are not required for this task. 	L
6. Cutting site lines, where necessary using hand tools.	1. Cuts/Lacerations	 Cuts/lacerations; Struck by See Hand tool use for removal of vegetation – Cutting site lines Wear hard hat, safety glasses, and leather gloves when cutting and removing vegetation. Keep cutting tools within their sheath during periods of travel or non-use. Machetes will be equipped with an adequate hilt to avoid the hand sliding down the blade in the event of a fall. 	L

ACTIVITY HAZARD ANALYSIS Geophysical and Land Surveying Page 4 of 6

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
7. Surveying points	Natural hazards – Irritating plants, insects, snakes and other reptiles.	This provision has been added should minor clearing be required. 1. Poisonous plants/Insect Bites Insects populations can vary from ants, bees, spiders, ticks, and mosquitoes, etc These populations within certain regions are prevalent in all areas other regions are not as prevalent to certain populations. This will also be affected by the season in which the work is being conducted. Additional information may be found in the Tetra Tech SOP's.	M
8. Surveying	Inclement weather	 In order to respond to inclement weather scenarios, the following actions will be employed: Electrical/Thunderstorms – Where possible employ a lightning detection equipment to warn field personnel of approaching storms. Where this is not possible, use the 30/30 rule If there is 30 seconds or less between thunder and lightning go inside for 30 minutes or more since the last thunder. Heavy rains/Winter storms – The survey team leader shall assess conditions and determine whether work will continue. This action shall include and assessment concerning traffic in the area and that traffics ability to control their vehicle's and not slide into work crews. In these cases, work will be restricted from along traffic travel patterns. 	M
Preparation and Set up for Geophysical Screening. This will include laying out a grid, removing obstacles where possible	1. Slips, trips, and falls -	 1. Slips, trips, and falls Remove/identify trip hazards from the work area so they may be avoided. Earthen depressions (sink holes) caused through previous excavation activities and settling will present trip and fall hazards. These areas should be flagged so the surveyor knows he/she is approaching a hazard. This is especially prevalent when dragging or pulling the GPR unit. Maintain good housekeeping within the work area. Remove ground litter and debris that may exacerbate this hazard while also interfering with the screening results. Wear boots with an adequate lug to minimize slipping potential when rains have created slippery conditions. 	L
Equipment handling	Lifting (strain/muscle pulls)	Lifting (strain/muscle pulls) Seek assistance when moving the GPR unit due to size configuration and sensitivity in and out of transport vehicles.	L

ACTIVITY HAZARD ANALYSIS Geophysical and Land Surveying Page 5 of 6

ACTIVITY / PHASE	POTENTIAL HAZARDS	RECOMMENDED ACTIONS / CONTROLS	RAC
		 Take breaks as often as necessary when carrying the unit for extended periods of time Use proper lifting techniques described in the TtSOP's. 	
Marking subsurface anomalies	Flying projectiles; struck by broken hubs	 Flying projectiles/Struck by When hammering wooden hubs into the ground there is a possibility that shards may break off. To protect from potential eye injury during this activity personnel will wear safety glasses. Crack or damage hubs will not be used. Use a suitable hammer to drive the hubs. The hammer shouldn't be so heavy that and additional person must hold the hub while you drive it into the ground. Inspect the hammer to insure the head is attached tightly and there are no indication of mushrooming head that could also become a flying projectile should it break off. Use paint with an extend paint spray attachment, then come back and drive the hubs using a hub cap driving implement. This removes hands and protects against shards being splintered and driven off. Wear safety glasses anytime you are engaged impact related activities such as driving hubs. 	L
Conducting soil gas, EM and GPR Surveys	1. Traffic hazards/Struck by	 To minimize potential Vehicle Traffic Hazards Be extremely cautious around heavy and/or fast-moving equipment. DO NOT place obstructions along the sides of the service or access roads that may cause personnel to move into the flow of traffic. Provide a required Free Space of Travel. Required "Free Space": Maintain at least 6-feet of space between you and moving traffic. Where this is not possible, use flaggers and/or signs to warn oncoming traffic of activities near or within the travel lanes. Face Traffic: Whenever feasible, if you must move within the 6-feet of required space, or into traffic attempt to face moving traffic at all times. Always leave yourself an escape route. Wear High Visibility Vests to increase visual recognition. 	L

ACTIVITY HAZARD ANALYSIS Geophysical and Land Surveying Page 6 of 6

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
	nspect handles; heads; cutting implements	General operating/demonstrated skill of the survey personnel.
Personal Protective Equipment: In	nspect PPE to Ensure it s in adequate condition	 All personnel Site Specific Training – All personnel shall be instructed and attest to the review and understanding of this HASP prior to the commencement of on-site activity. Periodically, Tailgate Training Sessions will be conducted to review activities in progress, results of site surveys, and upcoming tasks. It is recommended that AHAs be reviewed prior to conducting the identified task. Complete a Medical Data Sheet Survey License and/or Certification Proof Decontamination Procedures: Not required. Good personal hygiene practices are to be employed prior to breaks lunch or other period when hand to mouth contact occurs. This will minimize potential ingestion exposures. Perform a close body inspection to remove ticks and associated insects when exiting unimproved areas (heavy vegetation).

All persons will sign this AHA indicating that they have reviewed the document and are aware of their responsibilities as stated in the AHA.

Name (Printed)	Signature	Occupation	Date Reviewed/Training



ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: Multi-media sampling activities	Overall Risk Assessment Code (RAC) (Use highest code)			L			
Project Location: LMC MSA	Risk Assessment Code (RAC) Matrix						
Site: Martin State Airport	Coverity			Probabili	ty		
Date Prepared: January 2016	Severity	Frequent	Likely	Occasional	Seldom	Unlikely	
Dranged by C. Coydor	Catastrophic	E	Е	Н	Н	M	
Prepared by: C. Snyder	Critical	Е	Н	Н	M	L	
Beviewed by I Carathara DhD	Marginal	Н	M	M	L	L	
Reviewed by: J. Carothers, PhD	Negligible	M	L	L	L	L	
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)						
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely. RAC Chart				AC Chart		
	"Severity" is the outcome/degree if an incident, near miss, or accident did				E= Extreme	E= Extremely High Risk	
	occur and identified as: Catastrophic, Critical, Marginal, or Negligible H= High Risk				sk		
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each M= Moderate Risk				te Risk		
	"Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				k		

JOB STEPS	HAZARDS	CONTROLS	RAC
Site Set Up	1. Inclement weather	 If electrical storms or inclement weather are in the area, as determined through local forecasting or weather alerts issued, the FOL/SSO will suspend outside activities. The 30-30 rule shall be applied, which is "if a time interval of 30 seconds or less is between lightning and its thunder, go inside (building/vehicle) and stay inside for at least 30 minutes." If no additional lightning and/or thunder is noted within this 30 minutes, work may resume at the FOL/SSO direction. Personnel will be directed to seek suitable shelter that will provide adequate protection from the elements. Lightning threat detection will be coordinated within MCAS Beaufort existing systems. 	L
	2. Minor cuts abrasions handling equipment and tools	1. Wear cut-resistant gloves when handling items with sharp or rough edges.	L

ACTIVITY HAZARD ANALYSIS Multi-media Sampling Block D Page 2 of 5

JOB STEPS	HAZARDS	CONTROLS	RAC
	3. Slips, Trips, Falls	 Clear intended work areas and walking paths of roots, weeds, limbs and other ground hazards. Practice good housekeeping to keep the site clear of obstructions, materials, equipment and other tripping hazards. Ensure that work boots have adequately-aggressive sole design. Use caution when working on uneven and wet ground. 	L
	4. Insect bites, snake bites, and contact with poisonous plants.	 Shake out boots before donning. Use insect repellants. Products containing DEET should be applied to exposed skin. Products containing Permethrin should be applied to clothing only. Follow manufacturer's recommendations. Tape up pants leg to work boot joints with duct tape and wear light-colored clothing to better see and remove any insects. Avoid potential nesting areas (brush, deadfall, etc.) where insects or snakes may be present. Perform close body inspections at least daily upon leaving the site. 	L
Taking groundwater samples using a small battery-operated pump and placing into sample containers	Exposure to contaminants of concern	 Wear surgeon's gloves when handling potentially-contaminated media and samples. Avoid contact with potentially-contaminated media to the extent possible. Follow good decontamination and practice good personal hygiene (hands and face washing) when exiting work area. Hand-to-mouth activities in the work area will be prohibited (eating, drinking, smoking, etc.). Exposure via dermal contact and ingestion represent some limited concern during this task. Air Monitoring PID with 11.7 ev lamp Action Level: PID Action Level: >1 ppm above BG sustained for for 4 exposures of 5 minutes in the BZ areas in any one work day for VOC's. Visible Dust employ dust suppression area wetting Monitoring will be conducted in the breathing zone of the Driller to collect data for the worst case scenario in order to evaluate air emissions from this source point. 	L
	3. Contact with utilities	 Inspect for buried and overhead utilities in the vicinity of the sampling location. Verify the location of utility lines in accordance with Tetra Tech SOP Utility Locating and Excavation Clearance. 	L

ACTIVITY HAZARD ANALYSIS Multi-media Sampling Block D Page 3 of 5

JOB STEPS	HAZARDS	CONTROLS		
Soil and sediment sampling (surface and subsurface)	1. Cuts and lacerations – when cutting acetate liners without the proper material handling devices.	 Always cut away from yourself and others. Do not place items to be cut in your hand or on your knee. Change blades as necessary to maintain a sharp cutting edge as many accidents result dull cutting attachments. Wear cut-resistant gloves (leather or heavy cotton) at least on the non-knife/saw hand, where possible. When cutting acetate liners use the tubing retention tub to secure the tube. Use the knife intended for that purpose. Geoprobe® makes a kit for this purpose. 	L	
	2. Chemical exposure	 Wear surgeon's gloves when handling potentially-contaminated media and samples. Avoid contact with potentially-contaminated media to the extent possible. Follow good decontamination and practice good personal hygiene (hands and face washing) when exiting work area. Hand-to-mouth activities in the work area will be prohibited (eating, drinking, smoking, etc.). Exposure via dermal contact and ingestion represent some limited concern during this task. Air Monitoring PID with 11.7 ev lamp Action Level: PID Action Level: >1 ppm above BG sustained for for 4 exposures of 5 minutes in the BZ areas in any one work day for VOC's. Visible Dust employ dust suppression area wetting Monitoring will be conducted in the breathing zone of the Driller to collect data for the worst case scenario in order to evaluate air emissions from this source point. 	L	
Decontamination:	1. Chemical spread	 When handling soils and potentially contaminated equipment Wear surgeon's gloves when handling potentially-contaminated media and samples Avoid contact with potentially-contaminated media to the extent possible. These are disposable, change out as necessary to avoid break through. When exiting the exclusion zone, wash the outer gloves to remove any residual contamination. This will also permit disposal in the general refuse. 	L	

ACTIVITY HAZARD ANALYSIS Multi-media Sampling Block D Page 4 of 5

JOB STEPS	HAZARDS	CONTROLS	RAC
		 Remove gloves, wash hands and face to minimize any potential introduction of contaminants into the body. Leave consumable materials such as cigarettes, snuff chewing tobacco, candies, medications, etc. in the break area to avoid potential contact. Practice good personal hygiene (hands and face washing) when exiting work area, avoiding any hand-to-mouth activities in the work (eating, drinking, smoking, etc.). Practice good housekeeping to avoid the spread of contamination. 	

EQUIPMENT	INSPECTION	TRAINING
Peristaltic pump, tubing, sample collection tools and containers (jars, spatulas, spoons, etc.) Safety Equipment: Portable eye wash bottle Monitoring Instruments: PID (11.7eV)	Visual inspection prior to use by user.	Training/experience in proper sample collection, handling and chain of custody requirements.
Personal Protective Equipment: Minimum: nitrile surgeon's type gloves, safety toe boots, safety glasses Optional items: Hardhat, hearing protection. Wear chemical-resistant coveralls (e.g., Tyvek) or aprons and surgeon's nitrile gloves under leather/cotton work gloves. , High-visibility vests when near active traffic areas. Steel toe/shank boots are required when working in areas where there is a danger of foot injuries due to falling or rolling objects or of objects piercing the sole.(provided that the footwear satisfies ANSI Z- 41 requirements for protective footwear) shall be used HTRW: VOC's, Metals and PCB's	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	OSHA 40 hour HAZWOPER training, plus appropriate 8-hour annual refresher training for the task participants. Supervisors must have completed additional 8 hours of HAZWOPER training. ALSO: Review of AHA during pre-task tailgate safety briefing with the intended task participants. PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in site activities, and will be confirmed by visual observations of worker activities.

ACTIVITY HAZARD ANALYSIS Multi-media Sampling Block D Page 5 of 5

I have read and understand this AHA:

Name (Printed)	Signature	Date



ACTIVITY HAZARD ANALYSIS (AHA)

Activity/Work Task: Monitor Gamma Radiation Survey During Intrusive Work	Overall Risk A	Assessment	Code (RAC)	(Use highest of	code)	М	
Project Location: LMC MSA	Ris	sk Assess	ment Co	de (RAC) Ma	itrix		
Site: Martin State Airport	Severity			Probability			
Date Prepared: January 2016	Severity	Frequent	Likely	Occasional	Seldom	Unlikely	
Brongrad by C. Spydor	Catastrophic	Е	Е	Н	Н	M	
Prepared by: C. Snyder	Critical	Е	Н	Н	M	L	
Paviawad by	Marginal	H	M	M	Ш	L	
Reviewed by:	Negligible	M	L	٦	L	L	
Notes: (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)						
	"Probability" is the likelihood to cause an incident, near miss, or accident and Identified as: Frequent, Likely, Occasional, Seldom, or Unlikely. RAC Chart						
"Severity" is the outcome/degree if an incident, near mis							
						isk	
					M= Moder		
	"Hazard" on AHA. Annotate	the overall high	nest RAC at the	top of AHA.	L= Low Risk		

JOB STEPS	HAZARDS	CONTROLS	RAC
Gamma Radiation Survey Survey	1. Radiation Exposure	Direct exposure contact will be avoided due to the: Radiation Protection Plan, TSP and this HASP Availability of radiation detection equipment.	L
	2. Exposure Surveys	 When excavating or drilling in unknown areas, the instrument range selector switch (if applicable) shall be selected to the highest range and moved down through the lower ranges until the meter indicates on scale per RSO. Always survey a sufficient number of locations to determine average and maximum general area and contact radiation levels. A Ludlum Model-19 or equivalent should be used for performing exposure rate surveys for gamma radiation. The instrument should be operated in accordance with the manufacturer supplied operations manual and any applicable requirements from work specific documents (i.e. work instructions or TSPs). Care should be taken to ensure that the instrument has been allowed to stabilize between individual measurements. When performing a gamma survey, the RCT should: 	L

JOB STEPS	HAZARDS	CONTROLS	RAC
		 Attempt to determine the source of radiation fields. Record the highest level as the general area exposure rate. Perform contact exposure rate measurements with the detector within 1 inch of the surface to be surveyed. Perform surveys at approximately 1 meter (waist level) from surface to establish posting requirements for the area. Verify the exposure rates of known hot spots. 	

EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Sample collection tools and containers (bags, putty knives scrapers, spatulas, spoons, etc.) Safety Equipment: Monitoring Instruments: PSPCs, hand-held instruments, Radiation Scaler/Sample Counter and alpha-beta scintillation detectors (See Section 7.1 and 7.2 of this HASP)	Initial PPE inspection performed by SSO. Ongoing (prior to each use) inspections responsibilities of PPE users.	Radiation Worker, Supervisor and Inspector Initial and Refresher Training as required. OSHA 40 Hazardous Waste Operations and Emergency Response (HAZWOPER) training, plus appropriate 8-hour annual refresher training for the task participants. Supervisors must have completed additional 8 hours of HAZWOPER training. ALSO: Review of AHA during pre-task tailgate safety briefing with the intended task participants.
Personal Protective Equipment: Minimum: nitrile surgeon's type gloves, safety toe boots, safety glasses Optional items: Hardhat when in overhead hazard areas, hearing protection in high noise areas. If contact with contaminants is likely, wear chemical-resistant coveralls (e.g., Tyvek) or aprons and leather/cotton work gloves over the surgeon's nitrile gloves HTRW: Cs-137; Co-60;Sr-90; H-3; Pu-239; Ra-226; Th-232; U-235; U-238		PPE training in proper use, care, storage, and limitations. It is anticipated that this has been covered in employees' site and 40 hour HAZWOPER training, which is to be verified by the SSO through initial training documentation and review prior to permitting personnel to participate in site activities, and will be confirmed by visual observations of worker activities. SSO trained in proper calibration, use, and care of air monitoring devices used. This is a general component of 40 hour HAZWOPER training, and SSO must become very familiar with the Operator's Manual for any instrument used.

ACTIVITY HAZARD ANALYSIS Monitor Gamma Radiation Survey During Intrusive Work Page 3 of 3

I have read and understand this AHA:

Name (Printed)	Signature	Date

ATTACHMENT V EQUIPMENT INSPECTION CHECKLIST FOR DRILL/DPT RIGS

Equipment Inspection Checklist for Drill/DPT Rigs

Company:				Unit/Serial No#:			
	respection Date: / / Time: : Equipment Type: (e.g., Drill Rigs Hollow Stem, Mud Rotary, Direct Push, HDD) Project Name: Project No#:						
Yes	No	NA	Requirement	Comments			
			 Emergency Stop Devices Emergency Stop Devices (At points of Have all emergency shut offs identified field crew? Has a person been designated as Operator? 	ed been communicated to the			
			 Highway Use Cab, mirrors, safety glass? Turn signals, lights, brake lights, etc approved for highway use? Seat Belts? Is the equipment equipped with audik 				
			up lights? Horn and gauges Brake condition (dynamic, park, etc.) Tires (Tread) or tracks Windshield wipers Exhaust system Steering (standard and emergency) Wheel Chocks? Are tools and material secured to transport? Especially those within the Are there flammables or solvents or stored within the cab?	o prevent movement during e cab?			
			 Are tools or debris in the cab that may of the vehicle (in and around brakes, 	·			

Equipment Inspection Checklist for Drill Rigs Page 2

Unit/Serial No#:	Inspection Date: / /

Yes	No	NA	Requirement	Comments
			Fluid Levels:	
			 High Pressure Hydraulic Lines Obvious damage Operator protected from accidental release Coupling devices, connectors, retention cables/pins are in good condition and in place 	
			Mast Condition	
			 Hooks Are the hooks equipped with Safety Latches? Does it appear that the hook is showing signs of wear in excess of 10% original dimension? Is there a bend or twist exceeding 10% from the plane of an unbent hook? Increase in throat opening exceeding 15% from new condition Excessive nicks and/or gouges Clips 	
			 Number of U-Type (Crosby) Clips (cable size 5/16 – 5/8 = 3 clips minimum) (cable size 3/4 – 1 inch = 4 clips minimum) (cable size 1 1/8 – 1 3/8 inch = 5 clips minimum) 	

Equipment Inspection Checklist for Drill Rigs Page 3

Unit/Serial No#:	Inspection Date: //////
------------------	-------------------------

Yes	No	NA	Requirement	Comments
			Power cable and/or hoist cable • Reduction in Rope diameter π (5/16 wire rope>1/64 reduction nominal size -replace)	
			 (3/8 to 1/2 wire rope>1/32 reduction nominal size-replace) (9/16 to 3/4 wire rope>3/64 reduction nominal size-replace) Number of broken wires (6 randomly broken wires in one rope lay) 	
			 (3 broken wires in one strand) Number of wire rope wraps left on the Running Drum at nominal 	
			use (≥3 required) Lead (primary) sheave is centered on the running drum Lubrication of wire rope (adequate?) Kinks, bends – Flattened to > 50% diameter	
			Hemp/Fiber rope (Cathead/Split Spoon Hammer) • Minimum ¾; maximum 1 inch rope diameter (Inspect for physical	
			damage)Rope to hammer is securely fastened	
			Safety Guards – • Around rotating apparatus (belts, pulleys, sprockets, spindles, drums, flywheels, chains) all points of operations protected from	
			 accidental contact? Hot pipes and surfaces exposed to accidental contact? High pressure lines Nip/pinch points 	
			Operator Qualifications • Does the operator have proper licensing where applicable, (e.g.,	
			CDL)?Does the operator, understand the equipment's operating instructions?	
			 Is the operator experienced with this equipment? Is the operator 21 years of age or more? 	

Equipment Inspection Checklist for Drill Rigs Page 4

Unit/Ser	ial No#:_		Inspection Date: _	1 1
Yes	No	NA	Requirement	Comments
			PPE Required for Drill Rig Exclusion Zone	
Approve	d for Use		Other Hazards • Excessive Noise Levels?	
Site Hea	Ith and S	Safety C	Officer Operator	

ATTACHMENT VI

TETRA TECH RADIATION AND CONTAMINATION SURVEY STANDARD OPERATING PROCEDURE

Standard Operating Procedure RADIATION AND CONTAMINATION SURVEYS

SOP 006

Revision 0

Prepared By:	
Laure Bally	3/16/2012
Project Health Physicist	Date
Approved By:	
Eich J. al Reneier	3/16/2012
Project Radiation Safety Officer	Date

REVISION HISTORY

Revision (Date)	Rev. No	Prepared By	Description of Changes	Affected Pages
March 16, 2012	0	L. Bailey	Final Issue	All

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1.0 PURPOSE

The purpose of this procedure is to specify methods and requirements for radiological surveys and documentation of acquired data.

Adherence to this procedure will provide reasonable assurance that the surveys performed have reproducible results. This guidance for control of radiation exposures provided in this procedure is in accordance with the as low as reasonably achievable (ALARA) philosophy.

This procedure will be used by Tetra Tech (Tt) personnel and its subcontractors to perform radiation and contamination surveys.

2.0 SCOPE

This procedure shall be implemented by Tt staff and subcontractor personnel when conducting radiation or contamination surveys.

Subcontractors may use their procedures for conditions or activities not covered by this procedure following approval by Tt and the Radiological Affairs Support Office (RASO).

3.0 MAINTENANCE

The Project Health Physicist (PHP) is designated the procedure owner and is responsible for updating this procedure.

4.0 RESPONSIBILITIES

The following personnel (or their qualified designee) will be directly involved with the procedures discussed herein.

Project Radiation Safety Officer – The PRSO has the authority to control all radiation safety onsite. All changes to procedures require approval by the PRSO. All incidents/notifications shall be reported to the PRSO.

Project Health Physicist - The PHP is responsible for the overall implementation and compliance with this procedure during all project operations. The PHP or designee shall ensure that personnel are adhering to the requirements of this procedure. The PHP or designee shall review and approve documentation generated by this procedure.

Site Project Manager - The Site Project Manager (SPM), if applicable, is responsible for ensuring that personnel performing the tasks required by this procedure are properly assigned. The SPM is responsible for the training of personnel working with radioactive

materials. The SPM is responsible for ensuring that personnel conducting radiation and contamination surveys are familiar with the requirements of this SOP and have access to a copy of the Radiation Work Permits (RWPs). Survey documentation will be reviewed SPM or designee.

Site Supervisor - The Site Supervisor (SS), if applicable, is responsible for assisting in the assignment of personnel that will perform the tasks required by this procedure. The SS is responsible for the control of radioactive material, coverage of radiation workers, and to ensure that personnel under their cognizance observe proper precautions.

Radiological Control Technician - The Radiological Control Technician (RCT) shall be responsible for the performance of the requirements of this procedure and documentation of work performed.

5.0 DEFINITIONS AND ABBREVIATIONS

Activity - The rate of disintegration (transformation) or decay of radioactive material. The units of activity for the purpose of this procedure are disintegrations per minute (dpm) for loose and fixed surface contamination, picocuries per gram (pCi/g) for soil, or microcuries per milliliter (μ Ci/mL) for airborne contamination.

Contamination - Deposition of radioactive material in any place it is not desired. Contamination may be due to the presence of alpha particle, beta particle or gamma ray emitting radionuclides.

Exposure Rate - The amount of radiation (exposure) delivered at a given point per unit time. Typical units are microroentgen per hour (μ R/hr).

Fixed Contamination - Radioactive contamination that is not readily removed from a surface by applying light to moderate pressure when wiping with a paper or cloth disk swipe, or masslin.

Minimum Detectable Activity (MDA) - For purposes of this procedure, MDA for removable radioactive contamination is defined as the smallest amount of sample activity that will yield a net count with a 95 percent confidence level based upon the background count rate of the laboratory counting instrument used.

Minimum Detectable Concentration (MDC) - For purposes of this procedure, MDC is the *a priori* activity level that a specific instrument and technique can be expected to detect 95 percent of the time for portable survey instruments.

Radiation Work Permit (RWP) - A document generated in accordance with SOP 002 to provide:

- A description and scope of the work to be performed
- The existing radiological conditions in the work area
- The radiological limits of applicability for the RWP, if radiation levels exceed limits then a new RWP or a modification to the existing RWP must be made
- The protective measures to be employed during the work to protect the worker(s)
- The period of time the RWP is valid
- Special instructions to workers and RCTs during the course of work
- The proper approvals required to begin work

Radiologically Controlled Area (RCA) – An area containing radioactive materials (in excess of the levels provided in Table 1 of Standard Operating Procedure SOP 010, *Radiologically Controlled Areas – Posting and Access Control*) to which access is controlled to protect individuals from exposure to contamination and ionizing radiation.

Removable Surface Contamination - Radioactive contamination that is readily removed from a surface by applying light to moderate pressure when wiping with a paper or cloth disk swipe, or masslin.

Uncontrolled Area - An uncontrolled area is any area where access is not controlled for radiological purposes.

6.0 PROCEDURE DETAILS

6.1 GENERAL

Radiation surveys are performed to identify radiation areas, measure the exposure rate, and assess the intensity and shape of those areas to determine control requirements at the worksite.

Contamination surveys are conducted to detect loose surface contamination and fixed contamination. Loose surface contamination is normally detected indirectly by a swipe sample or wipe performed on the item or surface of interest. Fixed contamination levels are measured directly.

Survey results, locations, and any unusual conditions shall be documented and described on Attachments 1 and 2, Radiation/Contamination Survey Form and Radiation/Contamination Survey Supplement, respectively.

When performing surveys, express readings as the actual observed number. Do not report "<MDA" or "<Bkg". When background corrections are made, results may be expressed as negative numbers as applicable.

6.1.1 Discussion

Radiation and contamination surveys shall be performed on an as-needed basis. The need for performing a survey is identified by, but not limited to the following conditions:

- An RWP is needed to perform an approved job.
- A condition exists where radiological data are needed.
- An investigation is required due to abnormal conditions or indications.
- An ongoing job requires a survey to update radiological postings and/or an RWP.
- As required to support Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM; NUREG-1575) based survey activities.

6.1.2 PLANNING AND PREREQUISITES

Instruments used to perform radiation and contamination surveys shall be operated in accordance with their operation procedure. Steps to be completed during the planning phase include the following:

- Obtain and review any site-specific survey plans [such as a Task-specific Plan (TSP), work instruction, and time-critical removal action (TCRA) Work Plan] and previous surveys performed in the area.
- Obtain appropriate survey instruments and prepare the instruments for use.
- Obtain the necessary forms, swipes, and protective clothing that will be used during the survey.

Prior to entering an area to perform a survey, each radiation detection instrument shall be:

- Battery Checked.
- Checked for obvious physical damage.
- Quantitatively response-checked daily, prior to use.
- Checked to ensure that the instrument calibration is current.

If any of the above conditions are unsatisfactory, the instrument shall be tagged out of service and not used.

6.2 PROCEDURE PROCESS

6.2.1 EXPOSURE SURVEYS

When entering posted or suspected high radiation areas, or unknown areas, the instrument range selector switch (if applicable) shall be selected to the highest range and moved down through the lower ranges until the meter indicates on scale.

Always survey a sufficient number of locations to determine average and maximum general area and contact radiation levels.

A Ludlum Model-19 or equivalent should be used for performing exposure rate surveys for gamma radiation. The instrument should be operated in accordance with the manufacturer supplied operations manual and any applicable requirements from work specific documents (i.e. work instructions or TSPs). Care should be taken to ensure that the instrument has been allowed to stabilize between individual measurements.

When performing general area exposure rate surveys, the RCT should:

- Attempt to determine the source of radiation fields.
- Record the highest level as the general area exposure rate.
- Perform contact exposure rate measurements with the detector within 1 inch of the surface to be surveyed.
- Perform surveys at approximately 1 meter (waist level) from surface to establish posting requirements for the area.
- Verify the exposure rates of known hot spots.

6.2.2 REMOVABLE CONTAMINATION SURVEYS

6.2.2.1 Removable Contamination Swipe

The following guidance shall be used unless an approved site-specific survey/work instruction directs otherwise. Specific survey instructions will be prepared and given in work specific documents (i.e. work instructions or TSPs) for radioisotopes requiring unusual sampling techniques, such as tritium (³H).

6.2.2.2 Swipe Surveys

- 1. Label or number swipes, as necessary, to identify each swipe.
- 2. Wipe the swipes over approximately 100 square centimeters (cm²) (16 square inches) of the surface to be sampled.
- 3. Apply moderate pressure.
- 4. Exercise care on rough surfaces so as not to tear the swipes.
- 5. Exercise care on wet surfaces so as not to degrade the swipes. Ensure that surfaces are not submerged in water and that cloth swipes or similar are used on wet/damp surfaces.

When surveying an area:

- 1. Obtain swipes from sample points, which are representative of the average and maximum contamination levels in the area, as identified during preliminary surveys. These areas could include:
 - a. Areas of high traffic
 - b. On and under benches or tables
 - c. Beneath piping and components
 - d. On accessible wall surfaces
 - e. On piping and significant components
 - f. Near drains, sumps and low spots
- 2. Swipe floor and component surfaces, which display evidence of (potentially) contaminated water leakage.
- 3. Ensure contamination is not spread to clean areas when obtaining swipes.

When surveying equipment:

- 1. Obtain swipes on large surfaces.
- 2. Obtain swipes in cracks or crevices where contamination may have settled.
- 3. Obtain swipes on openings to internal surfaces.
- 4. Handle swipes in a manner that will prevent cross-contamination such as by placing each swipe in a separate envelope.

6.2.2.3 Counting Swipes

A Ludlum Model 2929 scaler with a Model 43-10-1 ZnS(Ag) scintillation probe (or equivalent) will normally be used for counting swipes.

Swipes will be counted in the field with a portable instrument. If high levels are identified the counting lab will be notified.

- 1. Count the swipes in accordance with the operating procedure for the instrument.
- 2. Record swipe results in dpm/100 cm².
- 3. Store/archive used swipes as radioactive material until disposal is approved by RASO.

6.2.2.4 Removable Contamination Surveys Using Large-area Wipes (LAWs)

Large-area contamination surveys using LAWs are appropriate for monitoring the radiological cleanliness of non-contaminated areas or equipment, to track area

decontamination progress, or for initially verifying that surfaces are free from contamination.

There are no specific requirements concerning the amount of area to be wiped when performing LAWs. The area wiped should be determined based on the use of the survey data and the dust loading of the LAW material.

6.2.2.5 Performing LAWs

Use masslin, oil-impregnated cloths, or equivalent media to perform LAWs. Select an appropriate collection material and method based upon the survey conditions such as wet surfaces, rough surfaces, heavily soiled area and oily and greasy surfaces.

- 1. Label or number the cloths, as necessary, to assist in determining the location of the sample.
- 2. Determine the size of the area to be sampled based on the results of the survey.
- 3. Wipe the collection media over the surface using moderate pressure by hand, with a masslin mop, or other approved techniques.

6.2.2.6 Evaluating LAWs

- 1. Allow wet swipe to dry prior to counting.
- 2. Scan the swipe with an appropriate field instrument (2221/43-68, or equivalent), in an area with a low background.
- 3. Hold the detector within ½ inch or less above the swipe and move the detector over the swipe at a maximum rate of 1 inch per second.
- 4. If any indication of an increased count rate is noted, pause to allow the meter reading to stabilize.
- 5. If the swipe reading is indistinguishable from background, consider the surveyed surface to be free from contamination. If the LAW reading is greater, conduct further surveys, using swipes over a 100 cm² area, to isolate the boundaries of the contamination.
- 6. Dispose of used LAW media as radioactive waste if there is any detectable activity observed above background.

6.2.3 Surveys for Fixed Alpha/Beta Contamination

Fixed contamination surveys are used to obtain indications of fixed contamination levels on surface areas, pieces of equipment, or tools for characterization and/or release surveys. Fixed contamination surveys are also performed to assess if residual contamination is present greater than the release criteria for the radionuclide(s) of concern.

A Ludlum Model-2221/43-68 or equivalent should be used for performing fixed contamination surveys for alpha and beta radiation.

6.2.3.1 Scan Surveys

- 1. When surveying for fixed alpha/beta contamination, the probe should be held within 1/4 inch or less from the surface being surveyed. The movement rate of the detector probe should be 1 inch per second or slower.
- Whenever practical, 100 percent of accessible areas being surveyed should be direct scan surveyed, unless the applicable work planning document indicates otherwise.
- 3. Scan ranges are documented as the range from the lowest measurement to the highest measurement observed.

6.2.3.2 Static Surveys

- 1. Count time for conducting static measurements will be dependent upon the isotope of concern and the MDA for the instrument being used.
- 2. Static measurements should be performed at regions showing the highest indicated reading during the scan survey or as required by a work specific document (i.e. TSP or work instruction) or frequently enough to ensure the detection of residual activity.
- 3. When taking a static measurement for fixed alpha/beta contamination, the probe should be held within 1/4 inch or less from the surface being surveyed.
- 4. Results should be reported in units of net counts per minute (cpm) above background or dpm/100 cm².

The following formula should be used for converting direct probe readings from cpm to dpm/100 cm²:

$$A_{S} = \frac{R_{S+B} - R_{B}}{\varepsilon_{i} \varepsilon_{s} \frac{W_{A}}{100 \text{ cm}^{2}}}$$

where,

 A_S = total surface activity (dpm/100 cm²)

 R_{S+B} = the gross count rate of the measurement in cpm,

 R_B = the background count rate in cpm

 ε_i = the instrument efficiency (counts per particle)

 ε_s = the contaminated surface efficiency (particles per disintegration)

 W_A = the physical area of the detector window (cm²)

In the absence of experimentally determined surface efficiencies, ISO-7503-1 and NUREG-1507, provide conservative recommendations for surface efficiencies. ISO-7503-1, recommends a surface efficiency of 0.25 for alpha emitters. NUREG-1507 provides surface efficiencies based on studies performed primarily at Oak Ridge Institute for Science and Education (ORISE). A surface efficiency of 0.25 will be used for alpha/beta emitters.

6.2.4 GAMMA SURVEYS

A Ludlum Model 12 or equivalent should be used for gamma radiation surveys.

A single detector or an array of detectors may be used to perform gamma scans.

6.2.4.1 Scan Surveys

- 1. Set the audio response switch to the "on" position.
- 2. If a single detector is used, traverse a path at a maximum speed of approximately 0.5 meters per second and slowly move the detector assembly in a serpentine (S-shaped) pattern, while maintaining the detector approximately 10 centimeters (cm) (4 inches) from the area being surveyed.
- 3. If a detector array is used, it will be pushed or pulled in a straight line with the detector centers positioned approximately 30 cm apart.
- 4. Scan ranges should be recorded from the lowest reading to the highest reading noted.
- 5. If data logging is being performed, the scan data will be collected at the time interval necessary to obtain the measurements required for the survey.
- 6. Locations of radiation levels greater than 3 standard deviations above background shall be marked and identified for further investigations.
- 7. Measurement results are recorded in cpm.

6.2.4.2 Static Surveys

- 1. Static gamma measurements require positioning the detector assembly approximately 10 cm (4 inches) above the surface and completing a stationary 60-second survey.
- Static measurements should be performed as required in the applicable work planning document or frequently enough to ensure the detection of residual activity.
- 3. Measurement results are recorded in cpm.

6.2.5 ROUTINE RADIOLOGICAL SURVEYS

6.2.5.1 Frequency Requirements for Routine Surveys

Appropriate routine radiological surveys shall be performed at the following frequencies unless directed otherwise by the applicable work planning document or the PHP or designee.

Exposure Rate Surveys

Surveys should be performed as frequently as necessary to ensure that radiological postings accurately reflect actual conditions during activities that have the potential to change exposure rates. Additionally, radiation surveys should be performed under the following circumstances:

- Upon initial entry into potential radiation areas after extended periods of closure.
- Daily, in the vicinity of contamination concentration points on operating highefficiency particulate air (HEPA)-filtered ventilation units.
- Weekly, in occupied office spaces located inside radiologically controlled areas.
- Weekly, or upon entry if entries are less frequent than weekly, inside radiation areas and radioactive material storage areas.
- Weekly, along radiation area boundaries to ensure that the radiation areas do not extend beyond the posted boundaries.

Contamination Surveys

- Daily when in use, or once per shift in high-use situations at contamination control points, radiological change areas, or step-off pads.
- Daily, in count rooms and laboratories that are used to analyze potentially contaminated samples.
- Daily, in office spaces located inside radiologically controlled areas.
- Daily, in lunchrooms, eating areas, locker rooms and shower areas adjacent to radiologically controlled areas.
- Weekly, for all designated lunchrooms and offices for the project.
- Weekly, or upon entry if entries are less frequent, in the areas where radioactive materials are handled or stored.
- Weekly, or upon entry if entries are less frequent, in posted contamination areas.

6.2.5.2 Identifying and Scheduling Routine Radiological Surveys

The PHP or designee shall identify and schedule routine surveys as required by the radiological conditions and work activities.

Routine survey schedules shall be developed using a standard system for designating surveys as follows:

Frequency of survey:

Daily	D
Weekly	W
Monthly	М
Quarterly	Q
Semiannually	S
Annually	Α
Upon Entry	U

Routine survey schedules shall be submitted to and approved by the PHP or designee.

Routine survey tracking forms should be prepared using the approved routine survey schedules.

Changes to any routine survey schedule shall be submitted to and approved by the PHP, or designee.

6.2.5.3 Survey Log

Completion of surveys shall be documented using the assigned survey log (see Attachment 3) for the project. This is not limited to initial surveys but includes routine surveys. Each survey shall be assigned a unique tracking number consistent with the practices of the project.

6.2.5.4 Performance of Routine Surveys

RCTs shall perform routine surveys in accordance with the RWP and the other applicable procedures.

Upon completion of a routine survey, the RCT shall initial the appropriate Survey Log.

6.2.5.5 Periodic Evaluation of Routine Surveys

Routine survey schedules (see Attachment 4) shall be reviewed and updated periodically to ensure that all areas within the project boundaries are receiving appropriate routine survey coverage.

Changes of conditions within the project area will be reported to the PHP or designee and may require a modification of the routine radiological survey schedule and/or RWP.

6.2.5.6 Management Notification

The PHP shall be notified, in writing by the SPM, of any failure to complete a routine survey as scheduled. The missed survey will be completed as soon as possible after the discovery that it was missed.

7.0 RECORDS

Radiation/Contamination Survey Form

Radiation/Contamination Survey Supplement

Survey Log

Routine Survey Schedule

8.0 REFERENCES

Number	Title				
10 CFR 20	Standards for Protection Against Radiation				
ISO-7503-1	Evaluation of Surface Contamination				
NUREG-1507	Minimum Detectable Concentration/Activities for Typical Radiation Survey Instruments for Various Contaminants and Field Conditions				
NUREG-1575	Multi-Agency Radiation Survey and Site Investigation Manual				
SOP 002	Issue and Use of Radiation Work Permits				

9.0 ATTACHMENTS

Forms provided in this section illustrate the minimum requirements for their respective subject matter. Alternative documents or electronic data logging may be used providing the information is presented in a clear and concise manner and the content meets or exceeds the information required to complete these documents.

Radiation and Contamination Surveys

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Attachment 1, Radiation/Contamination Survey Form

Attachment 2, Radiation/Contamination Survey Supplement

Attachment 3, Survey Log

Attachment 4, Routine Survey Schedule

ATTACHMENT 1 - RADIATION/CONTAMINATION SURVEY FORM

DATE: 1	ГІМЕ:	INSTRUMENTATION USED						
SURVEY NUMBER:		Model Inst/Det.	Serial Number	Calibration Due Date	% Efficiency	MDC/MDA (dpm/100cm ²)	Background (dpm/100cm ²)	
LOCATION:								
SURVEYOR:								
REVIEWED BY:								
PHP/SPM:								
Isotopes of Concern:								
Description or drawing:								
					All radiation readings in μr/hr unless otherwise noted.			
						e location or fixed α	β readings.	
					#denotes G/A		n readings.	
Routine (Daily / W	eekly /		M		*denotes highe	est radiation reading		
Monthly)			Non-routine		Δdenotes static	location.		

ATTACHMENT 2 - RADIATION/CONTAMINATION SURVEY SUPPLEMENT

SURVEY NUMBER:									
SURVEY	OR:			LC	CATION	l:			
Location	Exposu (μR	Exposure Rate (μR/hr)		Fixed + Removable			Removable		Comments
Location	Contact	1 Meter	Gamma (cpm)	Alpha dpm/probe	Beta/Ga dpm/pr		Alpha dpm/100cm ²	Beta/Gamma dpm/100cm ²	Comments
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
Reviewer Date/Time:			PHP	/SPM		Date/Time:			

ATTACHMENT 3 – SURVEY LOG

Project:	Location:
Project:	Location:

Survey Number	Date	Survey Description	Surveyor
Project # Year			(Init.)

Reviewed/Approved By:		/
	PHP/SPM	Date

Radiation and Contamination Surveys

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ATTACHMENT 4 – ROUTINE SURVEY SCHEDULE

Survey Description	January	February	March	April	May	June	July	August	September	October	November	December
•	Surveyor Init											
	Date											
	#	#	#	#	#	#	#	#	#	#	#	#
	Surveyor Init											
	Date											
	#	#	#	#	#	#	#	#	#	#	#	#
	Surveyor Init											
	Date											
	#	#	#	#	#	#	#	#	#	#	#	#
	Surveyor Init											
	Date											
	#	#	#	#	#	#	#	#	#	#	#	#
	Surveyor Init											
	Date											
	#	#	#	#	#	#	#	#	#	#	#	#

Prepared/Submitted By:		/	Reviewed/Approved By:		/
	Technician	Date		PHP/SPM	Date

ATTACHMENT VII

TETRA TECH RADIOLOGICAL CLOTHING SELECTION, MONITORING, AND DECONTAMINATION

Standard Operating Procedure

RADIOLOGICAL PROTECTIVE CLOTHING SELECTION, MONITORING AND DECONTAMINATION

SOP 022

Revision 0

Prepared By:	
Laure Bully	3/16/2012
Project Health Physicist	Date
Approved By:	
	0/40/0040
Eich J. Olkeneier	3/16/2012
Project Radiation Safety Officer	Date

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REVISION HISTORY

Revision (Date)	Rev. No	Prepared By	Description of Changes	Affected Pages
March 16, 2012	0	L. Bailey	Final Issue	All

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1.0 PURPOSE

This procedure provides the methods for donning, wearing, and removing protective clothing while working within, accessing or leaving known or suspected areas with radioactive contamination.

2.0 SCOPE

This procedure will be used by Tetra Tech (Tt) personnel and its subcontractors while performing activities in known or suspected areas with radioactive contamination.

3.0 MAINTENANCE

The Project Health Physicist (PHP) maintains and is responsible for updating this procedure.

4.0 RESPONSIBILITIES

The following personnel (or their qualified designee) will be directly involved with the procedures discussed herein.

Project Radiation Safety Officer – The PRSO has the authority to control all radiation safety onsite. All changes to procedures require approval by the PRSO. All incidents/notifications shall be reported to the PRSO.

Project Health Physicist – The PHP is responsible for the overall implementation and compliance with this procedure during all project operations. The PHP or designee shall ensure that personnel are adhering to the requirements of this procedure. The PHP or designee shall review and approve documentation generated by this procedure.

Site Project Manager – The Site Project Manager (SPM), if applicable, is responsible the overall implementation and compliance with this procedure during all project operations. The SPM is responsible for ensuring that personnel assigned tasks involving access to radiological controlled areas (RCAs) are adequately trained in the use of protective clothing, are familiar with the requirements of this SOP, and have access to a copy of the associated Radiation Work Permits (RWPs).

Site Supervisor – The Site Supervisor (SS), if applicable, is responsible for the control of radioactive material, coverage of radiation workers, and assuring that personnel under their cognizance observe proper precautions. Documentation required by this procedure will be reviewed by the SS, or designee.

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Radiological Control Technician – The Radiological Control Technician (RCT) shall be responsible for the performance of the requirements of this procedure and documentation of work performed.

5.0 DEFINITIONS AND ABBREVIATIONS

Contaminated Area – Any area where removable surface contamination levels exceed the following limits:

EQUIPMENT AND MATERIAL SURFACE CONTAMINATION LIMITS

Radionuclide	Removable ¹ (dpm/100 cm ²)	Fixed ¹ (dpm/100 cm ²)
Alpha	20 α	100 α
Beta (Strontium-90)	200 β ⁻	1,000 β-
Beta / Gamma	1,000 β -, γ	5,000 β-,γ

Notes:

AEC – Atomic Energy Commission

cm² – square centimeters

dpm - disintegrations per minute

Hot Particle – A discrete, minute, fragment of radioactive material.

Radiologically Controlled Area (RCA) – An area containing radioactive materials to which access is controlled to protect individuals from exposure to contamination and ionizing radiation.

6.0 PROCEDURE DETAILS

6.1 SELECTION OF PROTECTIVE CLOTHING

The following factors should be considered when selecting protective clothing (PC):

- The levels and types of radiological material present or expected in the work area.
- The presence of chemical hazards.
- The base in which the contamination is carried (dry, wet, oily).
- The work to be performed or work in progress.

¹ Limits for equipment and materials based on Regulatory Guide 1.86 (AEC, 1974)

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- The location of the contamination (e.g. floor, walls, overhead, air handling systems, sewer systems).
- The physical configuration of the work area.
- Environmental conditions such as heat and humidity.
- Exposure situation (vapor, pressured splash, liquid splash, intermittent liquid contact, and continuous liquid contact).
- Toxicity of the radioactive materials and/or chemical(s) (ability to permeate the skin and systemic toxicity).
- Physical properties of the contaminant (vapor pressure, molecular weight, and polarity).
- Functional requirements of the task (dexterity, thermal protection, fire protection, and mechanical durability requirements).

Table 6-1 provides guidance for the selection of protective clothing when radiological hazards are present or suspected.

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TABLE 6-1

GUIDE FOR THE SELECTION OF RADIOLOGICAL PROTECTIVE CLOTHING

Removable Contamination Levels	Clothing for Access Only No Work *	Clothing for Work or Access During Work *
General contamination levels < 1000 dpm/100 cm ²	Level D PPE	Level D PPE
General contamination levels > 1000 dpm/100 cm², but ≤ 10,000 dpm/100 cm²	Glove liners Gloves Booties, cloth or PVC Tyvek Rubber shoe covers**	Glove liners Gloves Booties, cloth or PVC Tyvek Rubber shoe covers**
General contamination levels > 10,000 dpm/ 100 cm², but ≤ 100,000 dpm/100 cm²	Glove liners Gloves Booties, cloth or PVC Tyvek Cap (or hood) Rubber shoe covers**	Glove liners Gloves Booties, cloth or PVC Tyvek Cap (optional) Hood Rubber shoe covers**
General contamination levels > 100,000 dpm/100 cm ²	Glove liners Gloves (2 pair) Booties, cloth or PVC Tyvek Cap (optional) Hood Rubber shoe covers**	Glove liners Gloves (2 pair) Booties (2 pair), cloth or PVC Tyvek (2 pair) Cap Hood Rubber shoe covers**

Notes:

- Plastics or partial plastics may be required anytime water or liquid chemicals are present, such as when handling wet components.
- ** Composition of Rubber shoe covers will be selected based on work area conditions and presence of any chemical hazards.

cm² – square centimeters

dpm – disintegration per minute

PPE – personal protective clothing

PVC - polyvinyl chloride

The guidelines specified in Table 6-1 for protective clothing selection may be modified under unusual circumstances. The following are examples:

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- Wet areas Where splashing water or spray is present, use rain suits in addition to the protective clothing listed in Table 6-1. A second set of coveralls may not be necessary when a rain suit is worn.
- Standing water In addition to the clothing requirements for wet areas, use hip boots or waders for deep standing water areas.
- Face shields Consider for use when there is significant beta radiation or a likelihood of water splashing and respirators are not required.
- High temperature areas Consult with the SPM and Site Safety Officer (SSO).

Actual requirements will be specified in the RWP.

6.2 PROCEDURE PROCESS

6.2.1 Donning Protective Clothing

- 1. Select the protective clothing specified on the RWP.
- 2. Inspect the clothing for holes, tears, or other indications of damage. If damaged, remove protective clothing from service.
- 3. Put on any additional required special dosimetry (for example, finger rings) prior to donning protective clothing.
- 4. Place dosimetry, if worn, in the upper body area on interior portion of the breast tab with the window of the dosimeter facing out. When Tyvek is worn that does not have a breast tab or pocket, dosimetry should be attached per the direction of the SPM, or designee.
 - The dosimeter shall not be worn inside clothing or placed in pockets if exposure of bare skin to beta radiation is expected.
- 5. If a respirator is specified on the RWP, then:
 - Ensure that any required surgeons cap or hood is situated such that it will
 not interfere with the respirator face to facepiece seal area.
 - Don the respirator.
 - Don the hood if required, allowing it to overlap the rubber around the lens of the face piece and fall over the shoulder.
 - If required, tape the hood to the respirator and to the coveralls.
 - Ensure that any required hood is slack enough around the shoulders to allow for full head movement.
- 6. Don rubber gloves.

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- More than one pair of rubber gloves may be required for certain jobs.
- Tape the innermost pair of rubber gloves to the coverall sleeves.
- Leather work gloves may be substituted for outer rubber gloves on some jobs as specified by the corresponding RWP.
- 7. If specified on the RWP, then don additional PPE as required.

6.2.2 REMOVAL OF PROTECTIVE CLOTHING

- 1. Remove any tape and place in the designated collection receptacle.
- 2. Remove outer gloves, if worn.
- 3. If worn remove the hood and place it in the designated collection receptacle.
- 4. If worn, then remove respirator.
- 5. Remove dosimetry if worn and place on the final step-off-pad.
- 6. Remove coveralls by peeling off inside out and rolling downward over the shoes or inner booties.
- 7. Carefully place coveralls in the designated collection receptacle.

CAUTION: Pushing clothing or trash into an already full collection container to compress the contents is forbidden as the act can result in the potential for airborne radioactivity.

8. Perform a personal self frisk, or be frisked by an RCT, in accordance with corresponding RWP requirements and check dosimetry, if worn.

The sequence for protective clothing removal may vary from that described above:

- At the discretion of the RCT providing job coverage.
- As designated on the assigned RWP.
- Dependent upon radiological and hazardous material conditions encountered during the work evolution.

6.2.3 MONITORING

6.2.3.1 Exit Surveys

1. Use the portable instrument staged for the area of concern, which should have both a visual and an audible response.

- 2. Ensure that the instrument is set on slow response, if available, and operating with an audible response.
- 3. Verify that the instrument is operational on the lowest scale and that the area background count rate is acceptable.
- 4. Hold the detector with the window at approximately ½ inch from the surface being monitored.
- 5. Move the detector over the surface being monitored at a rate not to exceed 2 to 3 inches per second.
- 6. If an increase in the audible response is noted, then cease detector movement and allow the meter 5 to 10 seconds to stabilize.
- 7. Pause (approximately 5 seconds) at the nose and mouth area to check for indications of inhalation/ingestion of radioactive material.
- 8. Pay particular attention to hands, feet (shoes), elbows, knees, or other areas with a high potential for contamination.
- 9. If no contamination can be detected as indicated by an alarm or by an audible or visual response distinguishable from background, then exit the area.
- 10. If an audible or visual response distinguishable from background is noted, then notify the RCT.
- 11. Remain in the area until a RCT arrives to provide assistance.
- 12. If personnel are found to be contaminated, proceed to the procedures outlined in Section 6.2.3.2.

6.2.3.2 Contaminated Personnel

- 1. Notify the SPM or SS of any individual with known or suspected contamination.
- 2. If the contamination is on a personal article of clothing, then perform the following:
 - Survey the inside surface(s) which was against the skin.
 - Verify that no contamination was transferred to the skin.
- 3. If the contamination is on the skin, then determine if the contamination is in the form of a hot particle.
- 4. If the contamination is a hot particle, then:
 - Quickly evaluate the particle.
 - o Particle size
 - Radiation type
 - o Visible characteristics
 - Attempt to collect and retain the particle for subsequent evaluation.

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- Decontaminate the individual in accordance with Section 6.2.4.
- 5. If the contamination is not a particle, then:
 - Evaluate the contamination levels.
 - Decontaminate the individual in accordance with Section 6.2.4.
- 6. Complete the applicable parts of the Personnel Contamination Report (Attachment 1).

6.2.4 Personnel Decontamination

NOTE: First aid measures take precedence over decontamination efforts. The SS shall request support from qualified medical personnel when an injured person requires decontamination.

- Perform personnel decontamination in a manner that prevents the spread of contamination to other body parts or the ingestion or inhalation of radioactive material.
- 2. Take appropriate precautions to minimize the spread of contamination when proceeding from the control point or step-off pad to the decontamination area.
- 3. Personnel will not be released if detectable skin contamination is present unless authorized by the PHP or designee.
- 4. When performing skin decontamination:
 - Exercise care to avoid damaging the skin.
 - If skin irritation becomes apparent, then discontinue the decontamination and notify the SPM and PHP.
 - Record results after each decontamination attempt.
 - Indicate the method of decontamination used.
 - Decontamination of ears, eyes and mouth shall be limited to damp swabs, water or saline solution rinses conducted by the individual. Further decontamination shall be performed under the direction of qualified medical personnel.
 - Decontamination of nasal passages shall be limited to repeated nose blowing by the individual. Supplemental nasal irrigations shall be performed under the direction of qualified medical personnel, as required.
 - Use of decontamination processes or materials other than those listed in Table 6-2 will only be performed under the specific direction of qualified medical personnel.

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- Immediately report incidents of individual contamination to the SPM and PHP.
- Note the final survey results and time of survey.
- Record the area of the skin contaminated in cm² on Attachment 1.
- For contamination distributed over an area greater than or equal to the area of the probe, the measured activity may be assumed to be distributed over the probe area (area of typical pancake probe is 15.5 cm²).
- If the area of contamination is less than the area of the probe but greater than 1 cm², the actual area of the activity must be determined.
- If the contamination area is less than or equal to 1 cm², assume an area of 1 cm².
- When skin decontamination has been successfully completed, obtain the information needed to complete the Personnel Contamination Report.
- Complete the applicable parts of the Personnel Contamination Report (Attachment 1).

TABLE 6-2
PERSONNEL DECONTAMINATION METHODS

METHOD	EFFECTIVE FOR	INSTRUCTIONS
Masking Tape	Dry contamination, Hot particles	Apply tape to skin by lightly patting. Remove carefully.
Waterless Hand Cleaner	All skin contamination	Apply to affected area and allow it to melt onto the skin. Remove with cotton or soft disposable towel.
Soap and Tepid Water	All skin contamination except tritium	Wash area with soap and lukewarm water. Repeat until further attempts do not reduce the level. A cloth or surgical hand brush may be used with moderate pressure.
Soap and Cool Water	Tritium contamination	Wash area with soap and cool water. Repeat until further attempts do not reduce the level. A cloth may be used with moderate pressure.
Carbonated Water	All skin contamination	Apply to affected area with cotton or soft disposable towel and wipe with dry towel.
Cornmeal Detergent Paste	All skin contamination	Mix cornmeal and powder detergent in equal parts with enough water to form a paste. Rub onto affected area for 5 minutes. Remove with cotton or disposable towel. Rinse skin.
Shampoo	Hair contamination	Wash hair and rinse. Repeat as necessary.
Parafilm	All particulate contamination	Apply to affected area of skin. Remove.
Sweating	All skin contaminations	Cover affected area with impermeable cover (plastic, glove, Parafilm) to cause sweating. Remove after sweating has occurred and wipe area.

6.2.5 RADIOLOGICAL FOLLOW-UP

The RCT shall:

1. Ensure that the Personnel Contamination Report (Attachment 1) has been completed.

- Check the location of the contamination event Contaminated Area, Hot Particle Area, clean area inside a radiological control area (RCA), or clean area outside RCA.
- 3. Enter any additional information felt to be pertinent.
- 4. Complete the "Contamination Event Description and Cause" sections of Attachment 1.
- 5. If the event was directly related to wearing protective clothing, then complete Section A, "Event Directly Related to Wearing PC".
 - Check the appropriate Contamination Event Description.
 - Check the appropriate Basic Cause.
- 6. If the contamination occurred while removing protective clothing, then complete Section B, "Event Occurred While Removing PC".
 - Check the appropriate "Contaminating Event Description".
 - Check the appropriate "Basic Cause".
- 7. If the contamination event was not related to wearing protective clothing, then complete Section C, "Event Not Directly Related to Using PC".
 - Check the appropriate "Contaminating Event Description".
 - Check the appropriate "Basic Cause".
- 8. Review the report with the individual and have them sign and date the form.
- 9. Sign and date the form.

The SS shall:

- 1. Review the Personnel Contamination Report to verify that all required information has been accurately recorded.
- 2. Complete the "Radiological Task Supervisor" section.
 - Check the appropriate brackets ([]) to indicate actions taken.
 - Enter any comments.
- 3. Sign and date the form.
- 4. Request support from the qualified medical personnel when:
 - The personnel decontamination methods provided in this procedure are ineffective; or
 - Injured personnel require decontamination.

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- 5. Determine reimbursements and disposition of personal property that cannot be decontaminated.
- 6. Forward the completed Personnel Contamination Report to the SPM for review.

The SPM and Site Safety Officer shall:

- 1. Review and sign the Personnel Contamination Report.
- 2. Conduct an investigation into the cause of the contamination.
- 3. Conduct training on the cause of the contamination and lessons learned and preventive measures.
- 4. Sign and transmit the Personnel Contamination Report to the PHP or designee for review.

7.0 RECORDS

The administrative form included in this procedure (Personnel Contamination Report) shall not be modified without the written authorization of the SPM and the documented concurrence of the PHP or designee. In no case shall modifications reduce the content required by the original form.

8.0 REFERENCES

Number	Title
None	

9.0 ATTACHMENTS

The following form is attached to this procedure:

Attachment 1, Personnel Contamination Report

ATTACHMENT 1

PERSONNEL CONTAMINATION REPORT

Name		Company		Date	Time
EID	Dosimeter#	Dept.		Supervisor	
Instrument	1	Serial #		Cal. Due Date	
Probe		Serial #		Cal. Due Date	
Location of Personn	el Contamination			RWP#	
				Survey#	

	Contamination Levels (Use # to reference drawing)							
Number	Time	Initial Count Rate	Size of Area (cm ²)	Time	Final Count Rate		
Decontamination Methods	Wash	n Number of w	ashes	Ot	her:			
	Show	ver Number of sh	nowers					
Radiological Control Technician Signature:				Date				
I acknowledge the at	I acknowledge the above information represents the contamination event.							
Individual Signature:				Date				

Name EID

CLOTHING CONTAMI	NATION						
Item:	Max cpm	[] Dec	con/Return	[] Contaminated/Retained			
Item:	Max cpm	[] Dec	con/Return	[] Contaminated/Retained			
Item:	Max cpm	[] Dec	con/Return	[] Contaminated/F	Retained		
RADIOLOGICAL FOLI	LOW-UP						
Location of Event:	[] Contamination Area		[] Clean ar	ea inside RCA	[] Clean area ou	utside RCA	
Follow-up actions:							
Additional information:							
CONTAMINATION EV	ENT DESCRIPTION and	d CAUS	E				
	A - Eve	nt Direct	ly Related To	Wearing PC			
Contaminati	ing Event Description			<u>B</u> :	asic Cause		
[] Contaminated by physic	al compromise of PC (tear,	etc.)	[] lm	proper donning of PC			
[] Contamination penetration				proper PC use related			
[] Contamination came from				ork area not deconned	•	ole	
[] Contaminated skin by to	•			actical limitation of ava			
[] Contamination came from	-			[] Improper PC requirement on RWP			
[] Contamination came from	m airborne radioactivity			[] Improper control by RCT of worker activity in PC			
	[] Improper laundry/monitoring of PC						
0 ()		ent Occu	rred While Re	-			
·	ing Event Description				asic Cause	50	
[] Contaminated during removal of hood				ck of knowledge in pro			
[] Contaminated during removal of respiratory equipment [] Contaminated during removal of outer PC				ck of knowledge in pro Worker actions while	•	•	
[] Contaminated during rer				CT technician actions	removing FC - accid	uem	
[] Contaminated during rer				Improper monitoring o	of PC		
[] Contamination came from	Tell control of the c		[][]	impropor mormoring o			
[1		t Not Dir	ectly Related	To Using PC			
Contaminati	ing Event Description		•	-	asic Cause		
[] Contaminated while in a	rea designated as clean Ro	CA	[] No	ncompliance with pos	tings/rad controls		
[] Contaminated while in a	rea designated clean non -	RCA	[] lm	proper monitoring/con	trol of rad material	by worker	
[] Contaminated by liquid			[] lm	[] Improper actions at work area (sitting, lying)			
[] Contamination spread to			[] Ac	[] Accidental contact with contamination beyond worker			
[] Improper control of airbo	orne radioactive material			control			
				irveys not appropriate	for existing condition	ns	
F. I. Landa and decreased the decrease and		Health P	hysics Superv				
[] Interview with job covera	-			eleased with residual o			
[] Exclude individual from further RCA access [] Discussed with individual and supervisor				[] Initiated skin dose calculation[] No further action required, routine close out			
[] Discussed with marvidue	and supervisor		[]140	Turtiler action require	u, routine close out	·	
Site Supervisor			/				
	Print			Sig	n	Date	
Cita Dual4 MA-			/	_			
Site Project Manager	Print			Sig	n	Date	
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Radiation Safety Officer	Print			Sig	n	Date	

ATTACHMENT VIII EXCAVATION SAFETY PROCEDURES



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This program outlines minimum requirements to protect employees who may be exposed to hazards during trenching and excavation activities and to provide general guidance for compliance with Title 29 of the *Code of Federal Regulations* (CFR), Part 1926, Subpart P, "Excavations."

1.0 SCOPE

This program and procedures applies to all sites and activities involving excavation or trenching as defined in 29 CFR 1926 Subpart P.

2.0 RESPONSIBILITIES

Project managers (PMs) shall ensure that all excavation, shoring, and trenching activities are conducted in accordance with the requirements outlined in this document and Subpart P of 29 CFR 1926. Project managers must also ensure that projects involving trenching and excavation are staffed by an individual trained and qualified to perform "competent person" duties as described in this procedure. Operating unit health and safety managers (HSMs) will provide assistance to PMs in implementing this SWP.

The site safety coordinator (SSC) is responsible for on-site enforcement of this SWP.

3.0 DEFINITIONS

The following definitions apply to this SWP:

Benching: Forming one or a series of horizontal levels or steps in the sides of an excavation to protect employees from cave-ins.

Competent Person: One capable of identifying existing or predictable hazards in the work environment that are unsanitary or dangerous to employees and who has authorization to take prompt corrective measures to eliminate the hazards.

Excavation: Any manmade cut, cavity, trench, or depression in an earth surface formed by earth removal.



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Shoring: Metal, hydraulic, mechanical, or timber system that supports the sides of an excavation and that is designed to prevent cave-ins.

Sloping: Sloping the sides of an excavation at an incline away from the excavation to protect employees from cave-ins.

Trench: A narrow excavation (in relation to its length) that is usually deeper than it is wide but less than 15 feet wide.

4.0 PROCEDURES

Described below are the general safety requirements and protective system requirements for trenching and excavation activities.

4.1 General Safety Requirements

General safety requirements that must be in place before work begins are as follows:

- Utility companies or a utilities locating service in the area must be notified before
 excavation or trenching activities begin to arrange for locating and protecting
 underground utilities.
- Access to trenching areas must be controlled and limited to authorized personnel.
 Prior to entering a trench or excavation, workers must notify the project manager,
 SSC, and nearby equipment operators whose activities could affect the trench or excavation.
- No person may enter a trench or work at the foot of the face of an excavation until a qualified, competent person has inspected the excavation and determined whether sloping or shoring is required to protect against cave-in or subsidence and the appropriate protection has subsequently been installed.
- Trenches and excavations must be assessed by a qualified, competent person, even in the absence of working personnel, whenever heavy equipment will be operating nearby in order to ensure that the trench or excavation will support the weight of the equipment without subsistence or causing the accidental overturning of machinery.

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- Trenches and excavations must be inspected regularly (daily at a minimum) to ensure that changes in temperature, precipitation, shallow groundwater, overburden, nearby building weight, vibration, or nearby equipment operation have not caused weakening of the sides, faces, and floors and to ensure that personnel protection is being maintained. Form TEC Trenching and Excavation Checklist or its equivalent is to be used to document inspections.
- When subsidence or tension cracks are apparent anywhere in an excavation, all work should be stopped until the problem is corrected.
- The competent person must inspect trenches or excavations after any precipitation event to ensure integrity has been maintained.
- Sufficient ramps or ladders must be provided in excavations 4 or more feet deep to allow quick egress. Ramps or ladders may be placed no more than 25 feet apart, must be secured from shifting, and must extend at least 3 feet above the top of the trench or excavation. Structural ramps must be designed by a competent person.
- Material removed from an excavation or trench must be placed far enough from the edge (at least 2 feet) to prevent it from sliding into the excavation or trench or from stressing the trench or excavation walls. Worker protection must also be provided from loose rock or soil on the excavation faces.
- If trenches or excavations are near walkways or roadways, guards or warning barriers must be placed to alert pedestrians and drivers of the presence of the trench or excavation.
- If possible, trenches or excavations should be covered or filled in when unattended. Otherwise, strong barriers must be placed around the trench or excavation and lighting must be provided at night if the trench or excavation is near a walkway or roadway.
- When a hazardous atmosphere could exist, the excavation must be tested for appropriate hazardous substances and oxygen level before personnel entry. Excavation where hazardous atmospheres exist must be treated as a confined space. Entry must follow procedures outlined in "Confined Spaced Entry Program," Document Control No. 2-5.



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Entry is not allowed into excavations where water has accumulated.

4.2 Protective System Requirements

Protective systems protect employees from cave-ins, material that could fall in or roll off the face of the excavation, and collapse of adjacent structures. Protective systems include shoring, shielding, sloping and benching, and other systems. Sloping and benching and shoring system requirements are described below.

4.2.1 Sloping and Benching Requirements

Sloping and benching system construction must follow the guidelines established in Appendix B to Subpart P of 29 CFR 1926. Maximum allowable slopes for excavations are summarized below. All slopes indicated are expressed as the ratio of horizontal distance (H) to vertical rise (V).

Soil or Rock Type	Maximum Allowable Slope (H:V) for Excavations Less than 20 Feet Deep
Stable Rock	Vertical (90°)
Type A	0.75:1 (53°)
Type B	1:1 (45°)
Type C	1.5:1 (34°)

Soil types are defined in Appendix A to Subpart P of 29 CFR 1926 and are summarized below.

- **Type A:** Cohesive soils with an unconfined compression strength of 1.5 tons per square foot (ton/ft²) or greater (such as clay, silty clay, sandy clay, or clay loam)
- **Type B:** Cohesive soils with unconfined compression strength of greater than 0.5 but less than 1.5 ton/ft² (such as angular gravel, silt, silt loam, or sandy loam)
- **Type C:** Cohesive soils with an unconfined compression strength of less than 0.5 ton/ft² (such as gravel, sand, loamy sand, submerged soil, or unstable submerged rock)

Sloping and benching for excavations greater than 20 feet deep must be designed by a registered professional engineer.



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Soil types must be determined by the competent person using at least one visual and one manual test. Manual tests include plasticity, dry strength, thumb penetration, and drying tests.

4.2.2 Shoring System Requirements

Appendixes C, D, and E to Subpart P of 29 CFR 1926 outline requirements for timber shoring for trenches, aluminum hydraulic shoring for trenches, and alternatives to timber shoring, respectively. Guidelines for shoring systems are listed below.

- If it is not economically feasible or there are space restrictions to prevent cutting the trench or excavation walls back to a safe angle of repose, all trenches or excavations 5 feet deep or more must be shored.
- Shoring should be erected as trenching or excavation progresses and as closely as possible to the excavation floor.
- Shoring timber dimensions must meet the minimum timber requirements specified in Tables C1.1 through C1.3 of Appendix C to Subpart P 29 CFR 1926.
 Aluminum hydraulic shoring must be constructed using the guidelines and dimension requirements specified in Appendix D of the same standard.
- Trench shields may be used instead of shoring or bracing. Shields must be constructed of steel flat sides welded to a heavy framework of structural pipe. Shields should be moved along by the excavator as trenching or excavation proceeds.

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10/1/2008	Chris McClain	Update from 1998 format

ATTACHMENT IX

TRENCHING AND EXCAVATION COMPETENT PERSON CHECKLIST

TRENCHING AND EXCAVATION C	OMPETENT PERSON CHEC	KLIST		
Contract Name and Number:	Contractor/Subcontractor:			
Government Inspector:	Location:			
Contractor Inspector:	Date:			
Weather (circle one) Dry Rai	ning Previous Rain	Freezing		
COMPETENT PERSON INFOR	RMATION	Yes	No	N/A
Competent Persons Name:				
Length of experience in this occupation:				
Length of experience with this employer:				
Does the designated individual have training in:				
Soil Analysis?				
Use of protective Systems?				
Requirements of 29 CFR 1926.650-652?				
List Training Experience:				
Does the designated individual have knowledge about	t:			
Soil Analysis? (Describe types of soils and properties)				
Lieu of protective evetere? (Miles and the life being	d and barrens at the father with a di			
Use of protective systems? (What method is being used	a and now was it determined)			
Requirements of 29 CFR 1926.650-652?				
Does the designated individual have authority to:				
Does the designated individual have authority to: Take prompt corrective action to eliminate existing	and predictable hazarde?			
Stop work?	and predictable nazards:			
GENERAL				
When was the last inspection of the excavation condu	ucted?			
*				
Was an inspection done and documented prior to the				
Were inspections done and documented as needed t	hroughout the work shift?			

This checklist is based on OSHA requirements. Use of this checklist is optional.

TRENCHING AND EXCAVATION COMPETENT PERSON CHECKLIST	Γ (con.)		
GENERAL (con.)	Yes	No	N/A
Were inspections done and documented after rainstorms or other hazard-increasing occurrence?			
Is the excavation deeper than 4 feet?			
WATER CONDITIONS			
Is dewatering equipment being used on the site?			
If yes is the competent person monitoring the equipment and it's proper operation?			
Has the excavation been subject to water accumulation?			
Has the soil in the trench been adversely affected?			
If yes has the competent person inspected the excavation and taken action?			
EGRESS			
Is a means of egress provided every 25 feet?			
Is a ramp used for access or egress to the excavation? (if no skip to the next section.			
Is the ramp used solely for employee access?			
If yes was it designed by competent person for safe access and egress?			
If yes, is the competent person who designed the ramp qualified?			
Does the ramp meet specifications?			
CONFINED SPACES			
Is there a potential for a hazardous atmosphere in the trench? If not, why?			
Is air monitoring equipment on site?			
Has a qualified person been assigned to assess the hazards of confined space? (OSHA Definition: A Qualified Person is designed by the employer in writing, as capable (by education and/or specialized training) of anticipating, recognizing and evaluating employee exposure to hazardous substances or other unsafe conditions in a confined space. This person shall be capable of specifying necessary control and/or protective section to ensure safety.)			
Is emergency rescue equipment as outlined in 29 CFR 1926.651(g)(2)(I) readily accessible to employees?			
Government Inspector		Date	
		Date	
Signature of Competent person (contractor		Date	
Printed Name of Competent person			

This checklist is based on OSHA requirements. Use of this checklist is optional.

ATTACHMENT X

TETRA TECH, INC. CONFINED SPACE ENTRY PROGRAM

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ATTACHMENT I- TETRA TECH, INC. CONFINED SPACE ENTRY PROGRAM

ATTACHMENT II - CONFINED SPACE ENTRY PROGRAM FOR PROJECT SITES INVOLVING CONFINED SPACES WHERE ENTRIES WILL NOT BE PERFORMED

ATTACHMENT III - SUBCONTRACTOR PERMIT REQUIRED CONFINED SPACE ENTRY

TETRA TECH CONFINED SPACE ENTRY PROGRAM

1.0 PURPOSE

To establish a uniform procedure specifying the minimum requirements for confined space entry operations performed by (or managed by) Tetra Tech, Inc.

2.0 SCOPE

For the purpose of clarification, this program applies to confined space operations which falls within the definitions provided below for confined spaces and permit required confined spaces.

- **2.1 Confined space** A confined space means a space that:
 - Is large enough and so configured to permit an employee to enter and perform work; and,
 - Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, pits, etc.); and,
 - Is not designed for continuous employee occupancy.
- **2.2** Permit required confined space (PRCS). A confined space having one or more of the following characteristics:
 - Contains a hazardous atmosphere, or possesses the potential to contain a hazardous atmosphere.
 - Contains a material which has the potential for engulfing an entrant.
 - Has an internal configuration such that an entrant entering the PRCS could become entrapped or asphyxiated by inwardly converging walls or a floor which slopes downward, tapering to a smaller cross-section.
 - Contains any other recognized serious safety or health hazard, or by virtue of the task to be undertaken, may generate unsafe conditions.

This procedure applies to projects with a scope of work that includes the performance of confined space entry operations by Tetra Tech or subcontracted personnel. This program has been developed on the basis of two principle requirements. These are as follows:

- That this program will be implemented on a SITE SPECIFIC basis, establishing flexibility to provide for the protection of the health and safety of Tetra Tech and subcontractor personnel, as well as for internal and regulatory compliance. This concept recognizes that Tetra Tech personnel work on many different sites, often with only brief field operations tasks, as opposed to longer term project sites. Therefore, this performance-based program has been developed to establish the minimum requirements for confined space entry operations at any individual Tetra Tech office location or project site.
- That confined space entry operations will be performed using a PERMIT-REQUIRED system, with the requirements of this procedure followed as minimum

requirements. Recognizing the Federal OSHA regulatory delineation between a Non-permit Confined Space and a Permit-Required Confined Space¹, and also recognizing that OSHA standards are minimum requirements. It is Tetra Tech policy that confined space entry operations will be performed in accordance with the written permit system specified in this procedure.

3.0 RESPONSIBILITIES

<u>Project Manager (PM)/Task Order Manager (TOM)</u> - The PM/TOM is also ultimately responsible for the effective compliance with these requirements. The PM/TOM will ensure that sufficient information has been provided to the PHSO to develop a site-specific Confined Space Entry Program appropriate for the nature of the planned activities. This is to be accomplished in conjunction with the preparation of the site-specific Health and Safety Plan (HASP). In addition, the PM/TOM will ensure that confined space entry is only considered as a last resort.

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¹ Occupational Safety and Health Administration Title 29 CFR 1910.146, <u>Permit-Required Confined Spaces</u>, paragraph (b) "Definitions".

<u>Tetra Tech Health and Safety Manager (HSM)</u>: Provide technical management and oversight of this program, and to aid Tetra Tech employees in effectively implementing these requirements. The Tetra Tech HSM will also be responsible for monitoring the overall effectiveness of this program. This will be accomplished by:

- Reviewing completed permits on an annual basis.
- Performing field audits of select project sites where confined space entry operations are performed.
- Maintaining proficiency in regulatory requirements on confined space entry matters.
- Modifying elements of this program, when or as appropriate.
- Establishing minimum components of confined space entry training course material, both for in-house and subcontractor-provided training courses
- Maintaining appropriate record-keeping for this program.

<u>Project Health and Safety Officer (PHSO)</u> - The PHSO shall ensure that confined space activities are adequately addressed in the Site Specific Health and Safety Plan for assigned projects. In addition, it is the PHSO responsibility to provide technical assistance to the SSO and/or the Field Operations Leader. The PHSO must also ensure that the requirements of this program are satisfied for confined space entry operations performed or managed at their location, whether by Tetra Tech personnel or by subcontractors. Other responsibilities include ensuring that:

- If training is provided by subcontractors, that an appropriate organization is selected, and that the training course material satisfies the Tetra Tech requirements.
- No individual participates in any confined space entry operations unless they are fully compliant with program requirements.
- The HSM is alerted when activities at a project site will involve confined space entry operations.
- A properly completed written program is present at every site where confined spaces exist.
- Appropriate documentation is maintained for that office, and that written permits are submitted to the HSM at the conclusion of project activities to facilitate the annual permit review requirement.

<u>Site Safety Officers (SSO):</u> Ensure that the requirements of this program are satisfied for confined space entry operations performed or managed at their site location, whether by Tetra Tech personnel or by subcontractors. Other responsibilities include ensuring that:

- Confined spaces are identified and labeled as such.
- Personnel to participate in confined space are trained to the appropriate level for the tasks to be performed and documentation certifying this training is obtained and maintained on site. In addition, ensure drilling/practice requirements to establish proficiency are up to date.
- Personnel meet the necessary medical qualifications for this type of activity.
- Rescue services are established and confirmed on the dates the confined space operations will be conducted.
- Provide the intended rescue services, the necessary information concerning the hazards associated with the confined space operations. This includes Material Safety Data Sheets, where available, information concerning hazard atmospheres and any associated physical hazards.

- The duties of the Entry Supervisor is completed in their entirety. In many cases the SSO will serve as the Entry Supervisor.
- The site-specific program for confined space operations is completed at each site, where applicable.

<u>Field Operations Leader (FOL)</u> – The FOL may share responsibility with the SSO or in the absence of an SSO ensure the implementation of this program for operations conducted under their direction. Substitution for the SSO will depend on the nature of the confined space operations and the anticipated severity of the hazards conveyed in the confined space. Substitution shall proceed based on the PHSO recommendation.

<u>Tetra Tech Employees</u> - The employees are responsible for following the tenets of this Confined Space Entry Program and/or conditions or modifications of this program, that may be site-specific in nature. In addition the employees are responsible for reporting any deficiencies or inadequacies of these program or site-specific elements to the SSO and/or the FOL.

4.0 PROCEDURES

4.1 Introduction

Tetra Tech recognizes that the participation of Tetra Tech personnel in confined space entry operations can be one of the most potentially dangerous types of field activities that they may encounter in their work. The risks associated with this type of work are most remarkable because they can be immediate and severe. It is for this reason that the requirements of this program will be strictly enforced at Tetra Tech locations.

There are two commonly encountered situations in which Tetra Tech field personal operate. These include project sites where we are the contractor performing work at a client location, and project sites where we are the prime contractor, and we have a subcontractor working under our direction. Also, specific to addressing confined space concerns, we need to address sites where confined spaces exist but our work scope will not involve entry versus sites where actual entry is necessary. As the regulatory requirements for each of these scenarios vary, separate procedures are established in the following sections of this overall program. These procedures involve the use of a simple, fill-in-the-blank written program that is to be completed

4.2 General Requirements

The following are General Requirements for each Tetra Tech Confined Space Entry policy and program.

Confined space entry operations on any Tetra Tech project site will be performed only a last resort. Available alternative means to accomplish the task objectives must be exhausted before commencing any confined space entry activities.

The following represents scenarios where Tetra Tech, Inc. personnel and/or subcontractor personnel working under the direction of Tetra Tech, Inc. would require the use of this program.

- Tetra Tech, Inc. personnel will enter a confined space.
- There are confined spaces in the area of operation under the guidance/control of Tetra Tech, Inc.
- Subcontractor personnel will enter a confined space under the guidance and/or direction of Tetra Tech, Inc.

Therefore, any project site where planned activities may involve work in or near a confined space must have a written Confined Space Entry Program completed on site and available prior to the commencement of site activities. The program must be attached to the Health and Safety Plan prepared for that project. The written program shall be completed by the assigned SSO, and will be kept current and available for review by the Tetra Tech HSM.

Work involving entry into a confined space will be performed by written permit only. There will be no exceptions to this requirement without the express, written consent of the Tetra Tech HSM.

4.2.1 Role and Responsibility of the Site Safety Officer

For applicable projects, the assigned SSO must be thoroughly familiar with this procedure and with the OSHA regulation on Permit-Required Confined Spaces, and will be responsible for completing the on-site elements of this program. The SSO will also be responsible for implementing the specific requirements of the program on his/her site, including ensuring that:

- Confined spaces at the site are properly identified, labeled, and inventoried. Signs should be appropriate size (12x18 minimum or greater) and color designation
- Site personnel are made aware of these spaces, and that unauthorized entry is prohibited. This is to be covered as part of the site-specific health and safety training.
- Entries are performed using the written permit system specified in the site written program.
- Necessary training requirements are satisfied, and that appropriate training documents are collected and maintained.
- Personnel participating in the confined space operation are medically (physically and psychologically) qualified to do so. Documentation to be provided are the medical surveillance clearance and the ability to wear respiratory protection.
- Necessary entry equipment is on hand, and maintained in proper working order.
 Equipment will be inspected by the SSO to ensure operation status.
- Permits are completed specifying a duration only long enough to perform the job.
- A trained and equipped rescue team is on standby prior to the beginning of the confined space activity. It will be the SSO responsibility to ensure the rescue teams capabilities and equipment resources to support the planned operation.
- The rescue team is fully aware of the potential hazards which may be encountered and pertinent information has been provided by the SSO.

The SSO will, in the majority of cases, serve as the Entry Supervisor. This means that he/she is responsible for determining that acceptable entry conditions are present before and during entry, for authorizing (by completing and signing the written permits) and overseeing entries, and for terminating entries and canceling permits.

4.2.2 Testing and Monitoring of Confined Spaces

Air monitoring in the confined space must be performed before and periodically during entry operations. The frequency, types, and sequence of air monitoring are clearly specified in the site specific program included as Attachment I. While that program specifies that periodic air monitoring during an entry may be acceptable for an isolated space, it is recommended that continuous monitoring always be performed, even for a completely isolated space. Acceptable entry conditions are as specified in Table 1, below.

Table 1
Acceptable Entry Conditions

Testing Sequence	Atmospheric Parameter	Acceptable Entry Condition		
1 st	Oxygen content in air	≥ 19.5% and ≤ 23.5%		
2 nd	Flammable or explosive conditions	≤ 10% of an LEL* for gases, vapors or mists ≤ LEL for airborne combustible dusts		
3 rd	Toxic concentrations of chemical hazards	Any exposure reaching a substances published Action Level, Permissible Exposure Limit, Threshold Limit Value, or Recommended Exposure Limit. These will be specified in the site Health and Safety Plan		
4 th	Any other atmospheric condition that is Immediately Dangerous to Life or Health	Varies by specific parameter		

*LEL = Lower Explosive Limit, sometimes also referred to as LFL for Lower Flammability Limit. For dusts, this may be approximated as a visual condition where the dust obscures vision at a distance of 5 feet or less.

If the acceptable entry conditions do not exist, or appear that they may not be constant throughout the entry, the SSO can use the following approach:

- Ensure that the space is properly isolated (block and bleed lines, use Lockout/Tagout procedures, etc.
- Purge, inert, flush, or ventilate the space to control or eliminate the hazard.

If acceptable entry conditions still do not exist due to flammability or explosive concerns, the entry must not be authorized. If the limiting factor is toxic airborne concerns, appropriate PPE may be used to allow the entry (Note: PPE is chosen as a control option always only as a last resort. Efforts should be made to control hazards through engineering controls).

4.2.3 Rescue

When confined space entry operations are performed, personnel and equipment must be adequate and available to effect non-entry rescue operations in the event of an emergency. This shall include items such as body harnesses (or wristlets, as a second choice), tie-offs, mechanical retrieval apparatus, etc. This equipment must be available and in use during entry operations. This will enable the Attendant and other authorized personnel to perform an emergency rescue and extract an injured person from outside of the space. Rescue procedures requiring other personnel to enter a space to assist or evacuate an injured or incapacitated entrant are expressly prohibited. Also, unauthorized personnel must be prohibited from participating in emergency rescue operations.

It is anticipated that in most instances, we will be prepared to provide non-entry emergency rescue services ourselves, at least to the point of removing an injured person and stabilizing them until professional emergency services can be summoned. The identity of the specific emergency response service and the method for contacting them will be clearly identified on the permit completed by the SSO. At least one member of the team serving in the role of Attendant or Rescue member (a non-entrant) must have current certification in First Aid and CPR. (Note: The person of choice must ensure that Bloodborne Pathogen Program requirements are satisfied whenever First Aid or CPR practice is authorized.)

4.3 Employee Training

Personnel must be adequately trained in order to be authorized to participate in confined space operations. Training must be performance-based so that participants can successfully demonstrate proficiency in performing their assigned duties. Training shall take place before an individuals first assignment, when their assigned duties change, or when changes occur in the site's written program. Also, if a new hazard is suspected that was not addressed in the employee's training, supplemental training will be required. Retraining may also be conducted when through periodic inspections or reviews identify deficiencies in confined space operations.

Whether training is provided in-house or by a training contractor, the contents of the training must satisfy the requirements of this program, and will be held to the criteria published by the Hazardous Waste Action Coalition Risk Management Committee, Health and Safety Subcommittee (entitled "Confined Space Entry Training Courses", published in 1996). A copy of these criteria are available from the Tetra Tech HSM. These criteria are directly applicable as they have been specifically developed by health and safety representatives of firms from within our industry (hazardous waste/environmental consulting).

The SSO will ensure that appropriate training has taken place for authorized individuals, and will have on-hand at the site documentation for each involved employee attesting to:

- Employee name
- · Signature or initials of the instructor
- · Dates of training

Site-specific training for authorized individuals will cover the duties of the entrants and attendants. This will address the aspects for each of these positions as presented below.

4.3.1 Authorized Entrants Training

- Hazards that may be encountered in the space
- How to properly use the necessary equipment
- Communication methods with the Attendant
- Recognizing when emergency exit of the space is necessary

4.3.2 Attendant Training

- Hazards that may be encountered in the space
- Behavioral effects of hazard exposure
- To continuously maintain an accurate count of entrants and know their identity
- To never leave the space unless relieved by another attendant
- Communication methods and aspects with Entrants
- Monitoring of the space
- How and when to summon emergency services

- Control unauthorized personnel issues
- Performance of non-entry rescues

4.3.3 Entry Supervisor Training

- Hazards that may be encountered in the space
- Verifies that tests have been conducted (by checking permit entries)
- Verifies that procedures and equipment specified in the permit are in place before signing it and putting it into effect
- When and how to terminate the entry and cancel the permit
- Verify that rescue services are available at the time of the entry and that the means for summoning them are operable
- Removes or prevents unauthorized personnel from entering the space

4.4 Coordination with Clients

Tetra Tech operations will involve arrangements where we are serving as a contractor to a client facility. That is, we will not be addressing entering spaces that we own or control. Therefore, appropriate coordination with the client representative will be essential to properly understand the nature of any confined spaces and to successfully perform the work. When the scope of work entails (or may entail) working in or near confined spaces, the PM/TOM must gather the following information as part of the initial data gathering process:

- Obtain any available information regarding confined spaces, including descriptions, potential or known hazards, and the client's confined space entry program information.
- Determine, if the client has located and designated confined spaces in the work area.
- Establish how the client desires to coordinate our work with their operations, relative to the confined spaces.
- If the scope of work will involve actual entry by Tetra Tech personnel, inform the client of our program.

Gathered information is to be provided to the PHSO responsible for preparing the site-specific Health and Safety Plan.

At the conclusion of any confined space entry work done at a client location, the PM/TOM is to request a debriefing meeting, so that a representative from the project team can communicate hazards that were encountered in the work.

4.5 Project Sites Involving Confined Spaces Where Entries Will Not Be Performed

In many instances, we may be performing work at sites where confined spaces exist and our scope of work does not involve any entry into those spaces. In this application, the SSO has only to ensure that spaces in our work area are adequately identified and posted, and complete the one-page written program in Attachment II and post it on site in the work area.

4.6 <u>Confined Space Entry Operations Involving Subcontractors</u>

For some projects, the scope of work may require a specialized of a subcontractor. When the work involves requiring a subcontractor to perform a confined space entry, the SSO must complete and utilize the written program included as Attachment III. We must provide our subcontractor with the following information:

- Information regarding the confined space(s), including descriptions, potential or known hazards, and the details of our confined space entry program.
- Information on the location and designations (postings) of the confined spaces in the work area.
- Establish how we desire to coordinate our work with their operations, relative to the confined spaces.
- If the scope of work will involve actual entry by subcontractor personnel, inquire if they have their own Permit-Required Confined Space Program and obtain it for our review.
- If the nature of the work is such that Tetra Tech and subcontractor personnel will have to perform concurrent operations in or near a confined space, very close coordination will be necessary and the Tetra Tech HSM must be contacted for guidance.

At the conclusion of any confined space entry work done by a subcontractor, a debriefing meeting will be held by the SSO to learn of any hazards that were encountered in the work.

4.7 Program Evaluations and Availability

The Tetra Tech HSM is responsible for performing evaluations of this overall Program to ensure its continued effectiveness. These reviews will be properly documented, and will occur as follows:

- Annually, at the end of each calendar year.
- At any time when an indication is discovered that a component of the program is not effective.
- In the event of any modifications in the regulatory requirements for confined space operations.
- If the event of changes or mandates from Tetra Tech, Inc. Corporate Health and Safety.

Annual Program evaluations will entail a review of canceled written permits prepared and used during the course of that year by Tetra Tech locations. The various site-specific written programs that these permits were prepared under are also subject to review. Canceled permits will be retained by the Tetra Tech HSM for no less than one calendar year.

Field audits of project work sites where confined space operations are conducted will also be performed. These will be coordinated through the Tetra Tech HSM, and will do on an unannounced, random basis.

Information gathered and program modifications that become necessary will be communicated to Tetra Tech personnel by the Tetra Tech HSM.

4.7.1 Equipment and Evaluation of Confined Spaces

Spaces must be properly evaluated before and during entry operations. Figure 2 specifies the criteria for equipment inspections that will be maintained on this site to evaluate and support Confined Space Entry operations.

4.7.2 Confined Spaced Signage

Each of these spaces have been (or will be, upon creation) clearly posted with signs stating "DANGER - PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER" or "DANGER - CONFINED SPACE - DO NOT ENTER" as applicable.. Unauthorized entry into any of these spaces is strictly prohibited.

The remaining text represents the site-specific portion of this program and the activities to be conducted when involved in one or more of the scenarios defined above.

5.0 DEFINITIONS

<u>Acceptable entry conditions</u> - The conditions that must exist and be maintained in a confined space in order to allow entry and work activities to be performed by personnel. For purposes of this program, this definition will also reflect those conditions which must be maintained and must not be compromised. Therefore, acceptable entry conditions are defined as, but not limited to, the following:

- A "hazardous atmosphere" either does not exist, or it can be adequately controlled to allow entry. Examples of control measures may include ventilating, purging, or inerting the PRCS, or a combination of these measures. Additionally, the use of appropriate personal protective equipment may be considered a control measure when other engineering and administrative controls are not feasible or are unable to be adequately controlled.
- The space to be entered has been properly isolated. This involves ensuring that energy sources have been identified and secured in a zero energy state to the greatest possible extent. This is accomplished through the use of energy control measures such as lockout procedures, blanking or blinding techniques, double block and bleed procedures, or other appropriate energy control methods. This effort must be documented, and members associated with the entry must concur that control sources have been identified, tested, and are disabled.
- The space to be entered does not contain a material that could engulf an entrant. If such
 a material is involved, adequate control methods such as shoring or sloping of the material
 must be adequately implemented prior to initiation of the entry.
- The space to be entered does not contain any other serious hazard potential(s) which cannot be contained or controlled to the satisfaction of the entry supervisor.

<u>Attendant</u> - An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs attendant's duties assigned by this Confined Space Entry Program.

<u>Authorized entrant</u> - An employee who is authorized by Tetra Tech to enter a confined space or a permit required confined space.

<u>Blanking or blinding</u> - The absolute closure of a pipe, line, or duct by the fastening of a solid plate that completely covers the bore, which ensures no leakage occurs beyond the plate.

Confined space. A confined space means a space that:

- Is large enough and so configured to permit an employee to enter and perform work; and,
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, pits, etc.); and,
- Is not designed for continuous employee occupancy.

<u>Double block and bleed</u> - The closure of a line, duct, or pipe by closing and locking two in line valves and by opening and locking a drain or vent valve in the line between the two closed valves.

<u>Emergency</u> - Any occurrence (including any failure of hazard control or monitoring equipment) or event internal and/or external of the confined space and/or permit-required confined space, that could endanger entrants.

<u>Entry</u> - The action by which a person passes through an opening into a confined space. Entry includes ensuing work activities that are performed in the confined space. Entry is considered to

have occurred as soon as any part of the entrant's body breaks the plane of an opening into the confined space.

<u>Entry permit</u> - The written or printed document which is provided by the employer to allow and control entry into a confined space and/or a permit required confined space. The permit contains pertinent information regarding the space to be entered.

<u>Entry supervisor</u> - The person responsible for determining if acceptable entry conditions are present the confined space and/or the permit required confined space where entry is planned. The Entry supervisor is also responsible for authorizing entry, overseeing entry operations, and for terminating the entry as conditions dictate.

<u>Hazardous atmosphere</u> - An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self rescue, injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 percent of its lower explosive limit -LEL (sometimes referred to as the lower flammable limit - LFL).
- Airborne combustible dust at a concentration that meets or exceeds 10 percent of its LEL/LFL.
- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent.
- Atmospheric concentration of any substance for which a dose or a permissible exposure limit is established. Also an atmospheric concentration which could impede the entrant's ability to self rescue resulting in employee exposure and adverse health effects associated with that exposure.
- Any other atmospheric condition that is immediately dangerous to life or health.

<u>Hot Work Permit</u> - The employer's written authorization to perform operations (e.g., welding, cutting, burning, heating, etc.) capable of providing a source of ignition.

<u>Immediately Dangerous to Life or Health (IDLH)</u> - Any condition which poses an immediate or delayed threat to life, or a condition that would cause irreversible adverse health effects. In addition, an IDLH condition includes any condition which would interfere or impede an individual's ability to escape unaided from a confined space and/or a permit-required confined space.

<u>Inerting</u> - The displacement of the hazardous atmosphere in a permit-required confined space by introducing a non-reactive gas (such as nitrogen) to such an extent that the resulting hazardous atmosphere would be pushed from the permit-required confined space rendering that permit-required confined space non-reactive. Inert spaces are still considered hazardous due to the displacement of oxygen.

<u>Isolation</u> - The process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as:

- blanking or binding;
- misaligning or removing sections of lines, pipes, or ducts;
- a double block and bleed system;
- lockout of energy sources, and the reduction of potential energy sources to their zero mechanical state;
- · blocking or disconnecting mechanical linkages.

<u>Line breaking</u> - The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or by the SSO.

<u>Lockout</u> - [As defined by OSHA 29 CFR 1910.147 (b)] The placement of a lockout device on an energy isolating device, in accordance with an established procedure, which ensures that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

<u>Permit required confined space</u> (PRCS). A confined space having one or more of the following characteristics:

- Contains a hazardous atmosphere, or possesses the potential to contain a hazardous atmosphere.
- Contains a material which has the potential for engulfing an entrant.
- Has an internal configuration such that an entrant entering the PRCS could become entrapped or asphyxiated by inwardly converging walls or a floor which slopes downward, tapering to a smaller cross-section.
- Contains any other recognized serious safety or health hazard, or by virtue of the task to be undertaken, may generate unsafe conditions.

<u>Permit system</u> - The employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

<u>Prohibited condition</u> - Any condition in a confined space and/or a permit-required confined space that is not allowed by the permit during the period when entry is authorized.

<u>Tagout</u> - [As defined by OSHA 29 CFR 1910.147 (b)] The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed. It should be emphasized that any time tagout is employed as an energy control measure, it must offer the same level of protection as its energy control measure counterpart lockout.

<u>Testing</u> - The process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space. Details pertaining to testing methods and procedures are discussed in Section 4.4 of this program.

ATTACHMENT I

TETRA TECH, INC.
CONFINED SPACE
ENTRY OPERATIONS

PROJECTS SITES INVOLVING CONFINED SPACE ENTRY OPERATIONS

The written program presented will be used at Tetra Tech project sites where confined space entry operations are planned. That program has been developed to provide the SSO with a standardized tool to serve two purposes:

- To protect the health and safety of Tetra Tech and subcontractor personnel working in or near confined spaces.
- To comply with Federal regulatory requirements.

PERSONNEL RESPONSIBLE FOR PROGRAM COMPLETION

The following persons are available to provide assistance in elements of this program including question/conflict resolution and modification variances. These persons exercise the primary responsibility for the implementation of this site-specific program.

Site Safety Officer:	Phone #:
Field Operations Leader:	Phone #:
Project Health and Safety Officer:	Phone #:
Health and Safety Manager:	Phone #:

PERSONNEL WHO WILL PARTICIPATE IN CONFINED SPACE OPERATIONS

The following list of personnel, represent personnel or subcontractor personnel working under the provision of this confined space entry program. The persons listed below represent only those who will actively engage in confined space operations by way of assignment.

Personnel Name and Signature	Role in the Confined Space Entry Program	Confi Traini Initial	ned Space ng (Dates) Refresher	Medical Clearance (Date)	i.e., most recent drill (vertical/horizontal); First-Aid Training
					First-Ald Training

RESCUE SERVICES

e Rescue Department will serve as the identified rescue service.					
The rescue service can be ob	tained at () The entry operation will	be coordinated			
through the rescue service. F	Pertinent information will be provided prior to entry.	Notification shall			
take place prior to, and after e	entry operations cease.				

CONFINED SPACE INVENTORY/STATUS

The following inventory represents the confined spaces at this project site. These spaces are listed by way of planned entry or proximity. This list will be updated by the SSO and/or the FOL as necessary.

CONFINED SPACE INVENTORY/STATUS

Confined Space/Permit-Required Confined Space Identified	Location/ Tasks To Be Conducted	Type of Entry	Hazards Identified	1.1.1.1.1.1.1 Control Measures

CONFINED SPACE ENTRY PERMIT

Entries into Identified Confined Spaces Will Be By Written Permit Only.

The Confined Space Entry Permit will guide and direct field personnel regarding aspects of the entry by using the permit as a checklist. It is based on this application that no spaces on the permit be left unchecked.

The assigned authorized entrant(s) and attendant(s) will complete the Confined Space Entry Permit. However, entry is not permitted until the Entry Supervisor reviews the permit and signs off.

Figure 1 will be used as the written permit on this site. Permits will be reviewed, issued, and canceled by the SSO, who will also serve in the role of Entry Supervisor. Permits must be completed before any entry operations begin. Completed permits will be reviewed with involved personnel as part of their task-specific training, and then posted at or near the entrance to the space.

HAZARD MONITORING

Spaces will be initially evaluated by the Authorized Entrant and Attendant as follows:

- Pre-entry, to determine that satisfactory entry conditions exist
- Continuously, if the space cannot be isolated For activities at _____
- Periodically, if the space can be isolated (at least once every ___ minutes)

The sequence for conducting these evaluations will be (from first to last):

- 1. Oxygen level
- 2. Lower Explosive Level (for gases, vapors, mists, or particulates)
- 3. Toxic gases or vapors

Specific equipment and instrument action levels are specified on the permit.

Information derived from the monitoring activity will be recorded on the Entry Permit. This information will be used to determine if acceptable entry conditions exist and whether entry is permitted. The SSO will review the information collected and authorize entry, if conditions are determine to be acceptable.

Figure 1

CONFINED SPACE ENTRY PERMIT

<u>CONFINI</u>	ED SPACE ENTRY	/ PERMIT	1			No:	
INITIAL ATMOSPHER	RIC TESTS PERFORMI	ED.					
CAUTION: Toxic of	or flammable gasses or ns within the confined s	vapors may	/ /s check tl	in the confined ne oxygen content	space. Be sure to ver first.	nt at various i	ntervals and
		IN	IITIAL T	ESTING			
HAZARD	ACCEPTABLE	<u></u>		DATE AN	D TESTER	ACCEP	TABLE
TESTED	RANGE	REA	DING	TIME	INITIALS	YES	NO
%Oxygen	19.5-23.5%		9/	ó			
%LEL	10% or less		9	,			
	PEL=	PPM=					
	PEL=	PPM=					
	PEL=	PPM=					
EVACUATION PROC	CEDURE						
Assembly Points:							
RESCUE PROCEDU notify the Fire Dept. for PLAN DESCRIPTION	ı			iate external extra	ction; If unable to facilit	ate external e	extraction;
PHONE NUMBER	ON-SITE RESCUE R RADIO NU			GER NUMBER	OUTSIDE SOUR	RCES AND PH	HONE
(252) 335-6222					FIRE DEPARTMENT		
					AMBULANCE		
					HOSPITAL		
					OTHER		
SPECIAL EQUIPMENT	T NEEDED						
LIFELINES HOISTING APPAI VENTILATION EC TEMPORARY LIC NON-SPARKING	SSES/WRISTLETS RATUS QUIPMENT <u>:</u> BHTING (Type/voltage):						
ENTRY SUPERVISO	R'S SIGNATURE		DATE	PERMIT RECEI	VER SIGNATURE	DAT	ΓE

CONFINED SPACE ENT	RY PERMIT					No:	
GENERAL INFORMATION:							
DESCRIPTION OF THE CONFI	NED SPACE:						
DATE ISSUED	TIME ISSUED		DATE EXPIR	PES.		TIME EXPIRES	
<i>5</i> /(12 10002 <i>B</i>	THINE IOCOLD					TIME EXTINCE	•
	:					:	
ENTRY SUPERVISOR							
ATTENDANT(S)							
COMMUNICATION BETWEEN	ATTENDANT(S) – Eľ	NTRANTS					
' VOICE	' LIGHT		' RADIO			' OTHER	
DESCRIPTION OF WORK:							
CHECKLIST FOR ISOLATION AN	D UNAUTHORIZED	ACCESS PI	REVENTION				
			Yes	NO	NA	INITIAL	
External Battery(ies)	in Place						_
Mechanical Lockout/	•						_
Lines/Pipes Disconne	ected			Ц	닏		_
Lines/Pipes Blocked							_
Lines/Pipes Capped			\sqcup	\sqcup			_
Lines/Pipes Blinded							_
Warning Signs							_
Other:							
REPORT ANY UNAUTHORIZED	-	PHONI	E NO.	RADIC	NO.	PAGEF	R NO.
Health Sciences Department a	nd Project						
Management							
PRE-ENTRY CHECKLIST	CLUNC	1	N 41	CLIANIC	A / E. N. T. II	LATION	
PURGING, INERTING, OR FLU	SHING		IVI	ECHANIC	AL VENTII	LATION	
PERFORMED YES] NO ☐ NA		Confined Space				
	_	Air Exchan	ge Rate Requir				 .
METHOD USED Nitrogen				Initial	Continuo	ous Partial	Description
☐ Water ☐	Other (specify)	Fresh Air I	njection 🔲	hrs.		□ □	
=	_	General		hrs.			
		Local Exha	nust 🔲	hrs.			
SPECIFIC HAZARDOUS TASKS	·	•					
Certain tasks performed in confine	ed spaces greatly incr	rease the risl	ks to entrants.	Check tas	ks to be p	erformed.	
□ WELDING/GRINDING			PAINTING	OR CLEA	NING WIT	TH SOLVENTS	
☐ THERMAL CUTTING		Ī	CLEANING	S/SWEEPI	NG/VACU	UMING	
SOLDERING/BRAZING	1	Ī	SCRAPING				
☐ ELECTRICAL		ř	CHEMICAL	-			
OTHER, EXPLAIN:			_ CITEMIOAL	- 50-			
_ OTTEN, EXILAN							<u></u>
Additional Permits Required	Hot Work Perr					cavation Clearar	
ENTRY SUPERVISOR'S SIGNA	TURE	DATE	PERMIT RE	CEIVER S	SIGNATUI	KE	DATE

CONFINED SPACE ENTRY PERMIT PERIODIC ATMOSPHERIC TEST RESULTS

No:

	IERIC TEST RESULTS	_		_		
TESTER	ATMOSPHERIC	ACCEPTABLE	HAZARD MONITORING	ACCEPTABLE		
INFORMATION	HAZARD TESTED	RANGE OF HAZAR	D	RESULTS	YES	NO
Date	Oxygen Content (%0 ₂)	19.5%-23.5%		%		
Time:	Combustible Gas (%LEL)	0%-10%		%		
Initials:	Other (Specify)	PEL	ppm	Ppm		
Date	Oxygen Content (%0 ₂)	19.5%-23.5%	•	%		
Time:	Combustible Gas (%LEL)	0%-10%		%		
Initials:	Other (Specify)	PEL	ppm	Ppm		
Date	Oxygen Content (%0 ₂)	19.5%-23.5%	• •	%		
Time:	Combustible Gas (%LEL)	0%-10%		%		
Initials:	Other (Specify)	PEL	ppm	Ppm		
Date	Oxygen Content (%0 ₂)	19.5%-23.5%		%		
Time:	Combustible Gas (%LEL)	0%-10%		%		
Initials:	Other (Specify)	PEL	ppm	Ppm		
Date	Oxygen Content (%0 ₂)	19.5%-23.5%		%		
Time:	Combustible Gas (%LEL)	0%-10%		%		
Initials:	Other (Specify)	PEL	ppm	Ppm		
Date	Oxygen Content (%0 ₂)	19.5%-23.5%		%		
Time:	Combustible Gas (%LEL)	0%-10%		%		
Initials:	Other (Specify)	PEL	ppm	Ppm		
Date	Oxygen Content (%0 ₂)	19.5%-23.5%		%		
Time:	Combustible Gas (%LEL)	0%-10%		%		
Initials:	Other (Specify)	PEL	ppm	Ppm		
Date	Oxygen Content (%0 ₂)	19.5%-23.5%		%		
Time:	Combustible Gas (%LEL)	0%-10%		%		
Initials:	Other (Specify)	PEL	ppm	Ppm		
Date	Oxygen Content (%0 ₂)	19.5%-23.5%		%		
Time:	Combustible Gas (%LEL)	0%-10%		%		
Initials:	Other (Specify)	PEL	ppm	Ppm		
Date	Oxygen Content (%0 ₂)	19.5%-23.5%	•	%		
Time:	Combustible Gas (%LEL)	0%-10%		%		
Initials:	Other (Specify)	PEL	ppm	Ppm		

CONFINED SPACE ENTRY PERMIT	No:
PERSONNEL ENTRY LOG	
DESCRIPTIONOF CONFINED SPACE	
ENTRY SUPERVISOR	DATE
ATTENDANT(S)	I

	TIMES IN AND OUT							
AUTHORIZED ENTRANT'S NAME	IN	OUT	IN	OUT	IN	OUT	IN	OUT
								-
								

EQUIPMENT INSPECTION

Equipment to be used in support of the confined space operation(s) will be inspected by the SSO or duly appointed representative, prior to initial use. Inspections will entail a physical examination and an operational check. The Confined Space Equipment Inspection Record will be used to document these inspections. Where appropriate existing inspection records for instance Respiratory Equipment Checklist will be used in place of the Confined Space Equipment Inspection Record.

PERMIT TERMINATION

A confined space entry permit can be terminated for a number of reasons. These include, but not limited to, the following:

- Scope of work change
- · Acceptable conditions within the space change
- Time limit expires
- Planned activities are completed

Upon termination of an active permit the following steps will take place.

- The Confined Space Permit and any other associated permit (AHA, Hot Work Permit, etc.) or hazard monitoring results will be copied. The copies will be forwarded to the PHSO for evaluation.
- Upon evaluation the PHSO will forward the copied permits to the HSM for record-keeping and review.
 The PHSO will include any relevant comments for the HSM to be considered during his/her review.
- The HSM will maintain the completed permits and associated materials for a period of one year from the date of issue.

TYPE OF EQUIPMENT	Visual Condition	Operational Status			
Testing and Monitoring Serial #	Acceptable Needs repaired	Functional Yes No	Calibrates Yes No Span Concentration		
Ventilation Equipment Fans/blowers (Flow rate/per unit) Compressor unit (as applicable) Hoses/Connections (as applicable) Power Cords/Connections (as applicable) Back-up Energy Source	Acceptable Needs repaired	Functional Yes No	Confined Space Estimated Volume: Ventilation Unit Flow Rate Input:Exhaust: Estimated Changes/Hour:		
Power Cords Connections and Plugs Protective Cages Ground Fault Interrupter Back-up Energy Source	Acceptable Needs repaired	Functional Yes No	Adequate lighting Yes No for safe operations?		
Site Preparation Warning/Hazard Signs (Size, Legible, Correct Color Designation) Barrier Systems (Tape, fencing, etc.) Traffic Control Provisions (Foot & Vehicular) Energy Control Provisions Additional Permits Required (Hot, Excavation, Energy Control, etc.) Permits Posted	Acceptable Unacceptable	Functional Yes No			

TYPE OF EQUIPMENT	Visual Condition		Operational Status			
TypeIntrinsically Safe? Back-up Communication method? Will line of sight be maintained during the entry operations? Will relay points be established to support radio communications?	Acceptable	Unacceptable	No	Function Yes	al No 🗆 🗆	Comments:
Rescue/Emergency Equipment Retrieval/Fall Arresting Systems [Tripods, Hoist(extraction cables, connections), lifeline, harnesses] Stretcher Fire Extinguishment -Type_Rating First-Aid Equipment/Supplies	Acceptable	Needs repaire	ed	Function Yes	al No D	Method/Means to summon Rescue Team provided?
Personal Protective Equipment Hard Hat Safety Glasses Splash Shield Splash Suits Type Steel Toe Work Boots Chemically Resistant Overboots Hearing Protection Gloves – Type Heat Shielding	Acceptable L	Jnacceptable	N/A			tach Respiratory Protection Checklist.

RECORD KEEPING

The following represent records to be maintained on-site supporting confined space entry operations. As stated in the administrative guidelines, these records will be copied upon completion and submitted to the PHSO and/or the HSM for review and evaluation. Records to be maintained are as follows:

Completed Elements of this Program

- Completed Confined Space Entry Permits
- Associated AHA, Hot Work Permits, Excavation Permits, as applicable.
- Training Records
 - Confined Space Training Records (To define level of training Entry Supervisor, Authorized Entrant, Attendant, Rescue). These records should identify initial and refresher dates and be accompanied by official Certificates of Training.
 - Site Specific Training Documentation of this completed Program.
- Medical Surveillance Evaluations

GENERAL REQUIREMENTS AND RESPONSIBILITIES

Only properly authorized and trained personnel will be permitted to participate in entry operations. The Entry Supervisor (the site Health and Safety Officer) will be responsible for conducting these authorizations and for ensuring that training requirements are satisfied. Persons involved with entry operations will be properly designated on the Permit. At least one Entry Attendant will be stationed outside of the space at all times during any confined space entry operation. The identity of the Attendant(s) will be clearly indicated on the entry permit. Attendants will not be assigned any additional duties that could interfere with fulfilling their responsibilities as space Attendants. **Multiple spaces will not be monitored by a single attendant**. This type of approach is strictly prohibited.

Emergency rescue operations will be non-entry means only. Emergency procedures will be specified on the entry permit.

If entry operations will involve the use of contractor personnel, the Subcontractor Permit Required Confined Space Program (See Attachment III of the Tetra Tech Confined Space Entry Operations Program) must be completed by the site Health and Safety Officer and maintained onsite.

At the conclusion of entry operations, the SSO will ensure that personnel and equipment have been removed from the space, that a final space evaluation is performed, and the permit will be canceled and filed. A copy of the canceled permit must be sent to the Tetra Tech Health and Safety Manager at the conclusion of the project, and not later than by November 30 for projects where work continues toward the end of a calendar year in order to facilitate the annual program evaluation process.

ATTACHMENT II

For
Project Sites Involving Confined Spaces
Where Entries Will Not be Performed

CONFINED SPACE ENTRY PROGRAM For

Project Sites Involving Confined Spaces Where Entries Will Not be Performed

Site Name and Address:	Project No
Project Manager/Task Order Manager: Site Manager: Site Safety Officer:	
following:	y be created by project activities) at this site include the
Each of these spaces have been (or "DANGER - PERMIT REQUIRED CON	will be, upon creation) clearly posted with signs stating
	T permitted by site personnel is for any reason.
Site Manager:	Date / /
Site Safety Officer:	Date / /

POST THIS ON SITE

ATTACHMENT III

SUBCONTRACTOR PERMIT-REQUIRED CONFINED SPACE ENTRY OPERATIONS

SUBCONTRACTOR PERMIT-REQUIRED CONFINED SPACE ENTRY OPERATIONS

Site Name and Address: Project No				
Project Manager/Task Order Man	ager:			
Telephone Number: ()	<u>-</u>			
Site Manager:				
Site Safety Officer:				
Subcontractor Performing Confine	ed Space Entry Operations:			
1.0 General				
This project site contains the confined spaces specified in Table 1. Entry into any of these spaces will be written permit only, and in compliance with the requirements of OSHA 29 CFR 1910.146. Permits will be coordinated with and submitted to the site Health and Safety Officer.				
	Table 1			
	Confined Spaces			
	at the			
Site				
Space	Reason For Entry	Associated Hazards		

	ure of the work to be performed by
	(name of subcontractor)
is	
This wil	involve/require entry into
	(description of space)
The haz	ards recognized or anticipated with this space include or may include (check and describe at apply)
	a hazardous atmosphere involving
	Material that could engulf an entrant, specifically
	An internal configuration such that an entrant could be trapped or asphyxiated by inwardly
converg	ing walls or by a floor which slopes downward and tapers to a smaller cross-section
	Other serious safety or health hazards
	ech has implemented the following precautions/procedures for the protection of our employees ir
or near	this space:
•	Education and training on confined space recognition Posting with "DANGER - PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER" o "DANGER - CONFINED SPACE - DO NOT ENTER" signs Other means as follows:
·	Other means as follows.
If Tetra	Tech and will need to perform concurrent operations in o
near the	space, activities will be conducted in accordance with the following coordinated system:
near un	
near the	

3.0 Subcontractor Debrief

Work was concluded on/_/ The following	ng confined space hazards were confronted or
created during entry operations.	
Problems encountered in administering or complying wit	h the site Confined Space Entry Program were as
follows:	
Suggestions for improvements of this program discussed	d during the debrief included
Signature of Subcontractor Agent	SSO Signature

ATTACHMENT XI HEAVY EQUIPMENT INSPECTION CHECKLIST

Heavy Equipment Inspection Checklist

Company: Inspection Date: / / Time: : Project Name:			Unit/Serial No#:	Unit/Serial No#:	
			(e.g., earthmoving equipment - tractors backhoes, bulldozers, etc.)		
Yes	No	NA	Requirements	Comments	
			Seat BeltsAre available for intended operator and passengers (where applicable)Seat Belts are operational?		
			 Roll-Over Protection (ROPS) Roll-over protection structures (ROPS) are provided on vehicles and heavy equipment (including scrapers, tractors, loaders, bulldozers, carryalls, etc.) 		
			Brakes • Brake systems capable of stopping and holding fully		
			loaded equipmentParking Brake functions properlyWheel Chocks available (where and as applicable)		
			Access Non-slip stepsGrab Handles (3-Point Grab/Step Mounting Points)		

Yes	No	NA	Requirements	Comments
			 Audible Alarms Audible alarms – All bidirectional machines, such as rollers, compacters, front-end loaders, bulldozers, and similar equipment, shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving 	
			 in either direction. Back up Alarms – All self propelled equipment with an obstructed view to the rear will be equipped with a reverse gear signal alarm distinguishable from the surrounding noise level. 	
			Horn functioning properly	

Yes	No	NA	Requirements	Comments
			 Fenders for equipment that can exceed 15mph Fire Extinguisher Are exhaust emissions directed away from the Operator? Cab Clean, free from debris, tools or equipment that can interfere with foot Control. Free from storage of flammable material/solvents Mirrors, Safety glass Equipped with defrosters Windshield wipers Turn signals, lights, brake lights, etc. (front/rear) for equipment approved for highway use? Gauges functioning properly Tires (Tread) or tracks Steering (standard and emergency) Are tools and material secured to prevent movement during transport? 	
			Fluid Levels: Engine oil Transmission fluid Brake fluid Cooling system fluid Hoses and belts Hydraulic oil 	

Yes	No	NA	Requirements	Comments
			 Fueling Fueling of vehicles and heavy equipment is done with the engine off. 	
			 No smoking is permitted at or near the fuel storage or refueling area. A sign is posted stating: NO SMOKING WITHIN 50 FEET. 	
		Ш	 No sources of ignition are present near the fuel storage or refueling area. 	
			 A dry chemical or carbon dioxide fire extinguisher (rated 6:BC or larger) is in a location accessible to the fueling area, no closer than 50-feet. 	
			Safety cans available?	
			 Safety Guards – Around rotating apparatus (belts, pulleys, sprockets, spindles, drums, flywheels, chains) all points of operations protected from accidental contact? 	
			 Hot pipes and surfaces are protected from accidental contact? 	
			High pressure pneumatic lines have safety cable to prevent thrashing should it become disconnected? Attachments	
			Have the attachments designed for use (as per manufacturer's recommendation) with this equipment been inspected and are considered suitable for use?	

Yes	No I	NA	Requirements	Comments
Approv		Use	Operator Qualifications Does the operator have proper licensing where applicable, (e.g., CDL)? Does the operator, understand the equipment's operating instructions? Is the operator experienced with this equipment? Is the operator 21 years of age or more? PPE Required Hardhat Safety glasses Work gloves Chemical resistant gloves Chemical resistant Boot Covers Apron Coveralls Tyvek, Saranex, cotton) Key(s)? Operating Manual? Other Hazards Excessive Noise Levels Chemical hazards (Drilling supplies - Sand, bentonite, grout, fuel, etc.) SDS available?	
	Site He	ealth	and Safety Officer Operator	

ATTACHMENT XII

OSHA HEALTH & SAFETY
CONSTRUCTION-RELATED
REGULATIONS - P - 650 TO 699
SUBPART P - EXCAVATIONS

OSHA Health & Safety Construction-related Regulations - P - 650 to 699

Subpart P - Excavations

§ 1926.650 - Scope, application, and definitions applicable to this subpart.

- **(a)** Scope and application. This subpart applies to all open excavations made in the earth's surface. Excavations are defined to include trenches.
- (b) Definitions applicable to this subpart.

Accepted engineering practices means those requirements which are compatible with standards of practice required by a registered professional engineer.

Aluminum Hydraulic Shoring means a pre-engineered shoring system comprised of aluminum hydraulic cylinders (crossbraces) used in conjunction with vertical rails (uprights) or horizontal rails (wales). Such system is designed specifically to support the sidewalls of an excavation and prevent cave-ins.

Bell-bottom pier hole means a type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.

Benching (Benching system) means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

Cave-in means the separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or other wise injure and immobilize a person.

Competent person means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Cross braces mean the horizontal members of a shoring system installed perpendicular to the sides of the excavation, the ends of which bear against either uprights or wales.

Excavation means any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Faces or sides means the vertical or inclined earth surfaces formed as a result of excavation work.

Failure means the breakage, displacement, or permanent deformation of a structural member or connection so as to reduce its structural integrity and its supportive capabilities.

Hazardous atmosphere means an atmosphere which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen deficient, toxic, or otherwise harmful, may cause death, illness, or injury.

Kickout means the accidental release or failure of a cross brace.

Protective system means a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Ramp means an inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.

Registered Professional Engineer means a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

Sheeting means the members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield (Shield system) means a structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either premanufactured or job-built in accordance with 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

Shoring (Shoring system) means a structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent caveins.

Sides. See "Faces."

Sloping (Sloping system) means a method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Stable rock means natural solid mineral material that can be excavated with vertical sides and will remain intact while exposed. Unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against caving-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

Structural ramp means a ramp built of steel or wood, usually used for vehicle access. Ramps made of soil or rock are not considered structural ramps.

Support system means a structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated data means tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench (Trench excavation) means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Trench box. See "Shield."

Trench shield. See "Shield."

Uprights means the vertical members of a trench shoring system placed in contact with the earth and usually positioned so that individual members do not contact each other. Uprights placed so that individual members are closely spaced, in contact with or interconnected to each other, are often called "sheeting."

Wales means horizontal members of a shoring system placed parallel to the excavation face whose sides bear against the vertical members of the shoring system or earth.

§ 1926.651 - Specific excavation requirements.

- **(a)** Surface encumbrances. All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary, to safeguard employees.
- (b) Underground installations.
- **(b)(1)** The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.
- **(b)(2)** Utility companies or owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.
- **(b)(3)** When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means.
- **(b)(4)** While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.
- (c)(2) Means of egress from trench excavations. A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees.

- **(d)** Exposure to vehicular traffic. Employees exposed to public vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.
- (e) Exposure to falling loads. No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with 1926.601(b)(6), to provide adequate protection for the operator during loading and unloading operations.
- **(f)** Warning system for mobile equipment. When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs. If possible, the grade should be away from the excavation.
- (h) Protection from hazards associated with water accumulation.
- **(h)(1)** Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.
- **(h)(2)** If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.
- **(h)(3)** If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require an inspection by a competent person and compliance with paragraphs (h)(1) and (h)(2) of this section.
- (i) Stability of adjacent structures.
- (i)(1) Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.
- (i)(2) Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:
- (i)(2)(i) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or
- (i)(2)(ii) The excavation is in stable rock; or
- (i)(2)(iii) A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

- (i)(2)(iv) A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.
- (i)(3) Sidewalks, pavements and appurtenant structure shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.
- (j) Protection of employees from loose rock or soil.
- (j)(1) Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the face to stop and contain falling material; or other means that provide equivalent protection.
- (j)(2) Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.
- (k) Inspections.
- **(k)(1)** Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.
- **(k)(2)** Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.
- (I) Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Gurardrails which comply with 1926.502(b) shall be provided where walkways are 6 feet (1.8 m) or more above lower levels.

§ 1926.652 - Requirements for protective systems.

- (a) Protection of employees in excavations.
- (a)(1) Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with paragraph (b) or (c) of this section except when:
- (a)(1)(i) Excavations are made entirely in stable rock; or
- (a)(1)(ii) Excavations are less than 5 feet (1.52 m) in depth and examination of the ground by a competent person provides no indication of a potential cave-in.
- (a)(2) Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

- **(b)** Design of sloping and benching systems. The slopes and configurations of sloping and benching systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (b)(1); or, in the alternative, paragraph (b)(2); or, in the alternative, paragraph (b)(3); or, in the alternative, paragraph (b)(4), as follows:
- **(b)(1)** Option (1) Allowable configurations and slopes.
- **(b)(1)(i)** Excavations shall be sloped at an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal), unless the employer uses one of the other options listed below.
- **(b)(1)(ii)** Slopes specified in paragraph (b)(1)(i) of this section, shall be excavated to form configurations that are in accordance with the slopes shown for Type C soil in Appendix B to this subpart.
- **(b)(2)** Option (2) Determination of slopes and configurations using Appendices A and B. Maximum allowable slopes, and allowable configurations for sloping and benching systems, shall be determined in accordance with the conditions and requirements set forth in appendices A and B to this subpart.
- **(b)(4)** Option (4) Design by a registered professional engineer.
- **(b)(4)(i)** Sloping and benching systems not utilizing Option (1) or Option (2) or Option (3) under paragraph (b) of this section shall be approved by a registered professional engineer.
- (b)(4)(ii) Designs shall be in written form and shall include at least the following:
- (b)(4)(ii)(A) The magnitude of the slopes that were determined to be safe for the particular project;
- (b)(4)(ii)(B) The configurations that were determined to be safe for the particular project;
- (b)(4)(ii)(C) The identity of the registered professional engineer approving the design.
- **(b)(4)(iii)** At least one copy of the design shall be maintained at the jobsite while the slope is being constructed. After that time the design need not be at the jobsite, but a copy shall be made available to the Secretary upon request.
- (c) Design of support systems, shield systems, and other protective systems. Designs of support systems, shield systems, and other protective systems shall be selected and constructed by the employer or his designee and shall be in accordance with the requirements of paragraph (c)(2) as follows:
- (c)(2) Option (2) Designs Using Manufacturer's Tabulated Data.
- **(c)(2)(i)** Design of support systems, shield systems, or other protective systems that are drawn from manufacturer's tabulated data shall be in accordance with all specifications, recommendations, and limitations issued or made by the manufacturer.
- **(c)(2)(ii)** Deviation from the specifications, recommendations, and limitations issued or made by the manufacturer shall only be allowed after the manufacturer issues specific written approval.

- **(c)(2)(iii)** Manufacturer's specifications, recommendations, and limitations, and manufacturer's approval to deviate from the specifications, recommendations, and limitations shall be in written form at the jobsite during construction of the protective system. After that time this data may be stored off the jobsite, but a copy shall be made available to the Secretary upon request.
- (e) Installation and removal of support-
- (e)(1) General.
- **(e)(1)(i)** Members of support systems shall be securely connected together to prevent sliding, falling, kickouts, or other predictable failure.
- **(e)(1)(ii)** Support systems shall be installed and removed in a manner that protects employees from cave-ins, structural collapses, or from being struck by members of the support system.
- (e)(1)(iii) Individual members of support systems shall not be subjected to loads exceeding those which those members were designed to withstand.
- **(e)(1)(iv)** Before temporary removal of individual members begins, additional precautions shall be taken to ensure the safety of employees, such as installing other structural members to carry the loads imposed on the support system.
- (e)(1)(v) Removal shall begin at, and progress from, the bottom of the excavation. Members shall be released slowly so as to note any indication of possible failure of the remaining members of the structure or possible cave-in of the sides of the excavation.
- (e)(1)(vi) Backfilling shall progress together with the removal of support systems from excavations.
- (e)(2) Additional requirements for support systems for trench excavations.
- **(e)(2)(i)** Excavation of material to a level no greater than 2 feed (.61 m) below the bottom of the members of a support system shall be permitted, but only if the system is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the support system.
- (e)(2)(ii) Installation of a support system shall be closely coordinated with the excavation of trenches.
- **(f)** Sloping and benching systems. Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.
- (g) Shield systems.
- (g)(1) General.
- (g)(1)(i) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.

- **(g)(1)(ii)** Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.
- (g)(1)(iii) Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.
- (g)(1)(iv) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.
- **(g)(2)** Additional requirement for shield systems used in trench excavations. Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

Subpart P Appendix A - Soil Classification

- (a) Scope and application.
- (a)(1) Scope. This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The appendix contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.
- (a)(2) Application. This appendix applies when a sloping or benching system is designed in accordance with the requirements set forth in 1926.652(b)(2) as a method of protection for employees from cave-ins. This appendix also applies when timber shoring for excavations is designed as a method of protection from cave-ins in accordance with appendix C to subpart P of part 1926, and when aluminum hydraulic shoring is designed in accordance with appendix D. This Appendix also applies if other protective systems are designed and selected for use from data prepared in accordance with the requirements set forth in 1926.652(c), and the use of the data is predicated on the use of the soil classification system set forth in this appendix.
- **(b)** *Definitions.* The definitions and examples given below are based on, in whole or in part, the following; American Society for Testing Materials (ASTM) Standards D653-85 and D2488; The Unified Soils Classification System; The U.S. Department of Agriculture (USDA) Textural Classification Scheme; and The National Bureau of Standards Report BSS-121.

Cemented soil means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive soil means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sideslopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil means soil that does not exhibit visible signs of moisture content.

Fissured means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil means gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Layered system means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist soil means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

Saturated soil means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or sheer vane.

Soil classification system means, for the purpose of this subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the environmental conditions of exposure.

Stable rock means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil means soil which is underwater or is free seeping.

Type A means cohesive soils with an unconfined, compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if: (i) The soil is fissured; or (ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or (iii) The soil has been previously disturbed; or (iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or (v) The material is subject to other factors that would require it to be classified as a less stable material.

Type B means: (i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or (ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam. (iii) Previously disturbed soils except those which would otherwise be classed as Type C soil. (iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or (v) Dry rock that is not stable; or (vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C means: (i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48kPa) or less; or (ii) Granular soils including gravel, sand, and loamy sand; or (iii) Submerged soil or soil from which water is freely seeping; or (iv) Submerged rock that is not stable, or (v) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined compressive strength means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet soil means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) Requirements

- **(c)(1)** Classification of soil and rock deposits. Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.
- **(c)(2)** Basis of classification. The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analyses shall be conducted by a competent person using tests described in paragraph (d) below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.
- **(c)(3)** Visual and manual analyses. The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.
- **(c)(4)** Layered systems. In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.
- **(c)(5)** Reclassification. If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.
- (d) Acceptable visual and manual tests.-
- **(d)(1)** Visual tests. Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.
- (d)(1)(i) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.
- (d)(1)(ii) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
- (d)(1)(iii) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall off a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.

- (d)(1)(iv) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.
- (d)(1)(v) Observed the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.
- (d)(1)(vi) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.
- (d)(1)(vii) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.
- (d)(2) Manual tests. Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.
- (d)(2)(i) Plasticity. Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.
- (d)(2)(ii) Dry strength. If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.
- (d)(2)(iii) Thumb penetration. The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488 "Standard Recommended Practice for Description of Soils (Visual Manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tsf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.
- (d)(2)(iv) Other strength tests. Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.
- (d)(2)(v) Drying test. The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry:
- (d)(2)(v)(A) If the sample develops cracks as it dries, significant fissures are indicated.

(d)(2)(v)(B) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as an unfissured cohesive material and the unconfined compressive strength should be determined.

(d)(2)(v)(C) If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

Subpart P Appendix B - Sloping and Benching

(a) Scope and application. This appendix contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in 1926.652(b)(2).

(b) Definitions.

Actual slope means the slope to which an excavation face is excavated.

Distress means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and ravelling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Short term exposure means a period of time less than or equal to 24 hours that an excavation is open.

- (c) Requirements -
- (c)(1) Soil classification. Soil and rock deposits shall be classified in accordance with appendix A to subpart P of part 1926.
- (c)(2) Maximum allowable slope. The maximum allowable slope for a soil or rock deposit shall be determined from Table B-1 of this appendix.
- (c)(3) Actual slope.
- (c)(3)(i) The actual slope shall not be steeper than the maximum allowable slope.
- (c)(3)(ii) The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope shall be cut back to an actual slope which is at least 1/2 horizontal to one vertical (1/2H:1V) less steep than the maximum allowable slope.

(c)(3)(iii) When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved. Surcharge loads from adjacent structures shall be evaluated in accordance with 1926.651(i).

(c)(4) Configurations. Configurations of sloping and benching systems shall be in accordance with Figure B-1.

TABLE B-1.

Maximum Allowable Slopes

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V) ¹ FOR EXCAVATIONS LESS THAN 20 FEET DEEP ³
STABLE ROCK	VERTICAL (90 Deg.)
TYPE A ²	3/4:1 (53 Deg.)
TYPE B	1:1 (45 Deg.)
TYPE C	1 1/2:1 (34 Deg.)

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

Figure B-1 - Slope Configurations

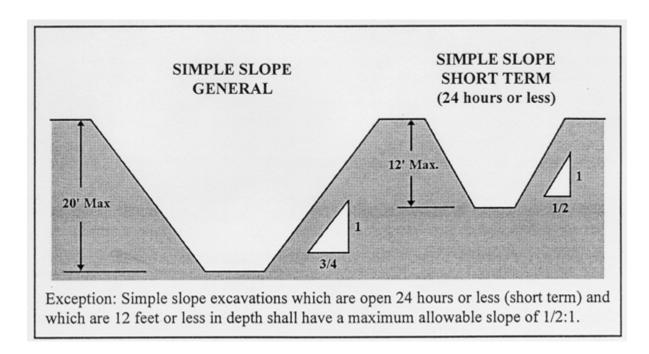
(All slopes stated below are in the horizontal to vertical ratio)

B-1.1 Excavations made in Type A soil.

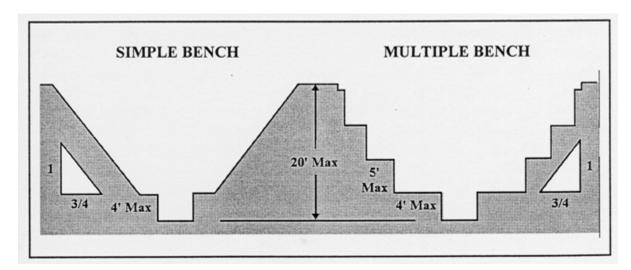
1. All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of 3/4:1.

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

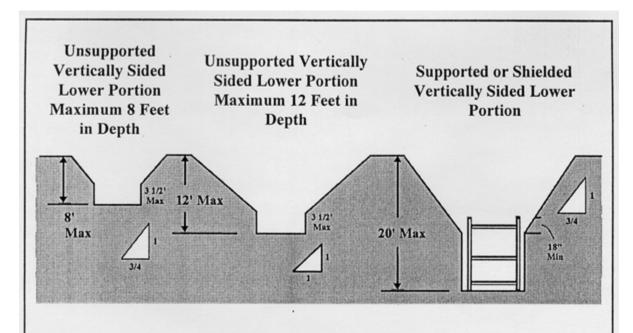
³ Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.



2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 3/4 to 1 and maximum bench dimensions as follows:



3. All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of 3 1/2 feet.



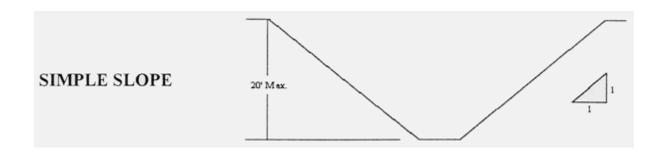
All excavations more than 8 feet but not more than 12 feet in depth with unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3 1/2 feet.

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 3/4:1. The support or shield system must extend at least 18 inches above the top of the vertical side.

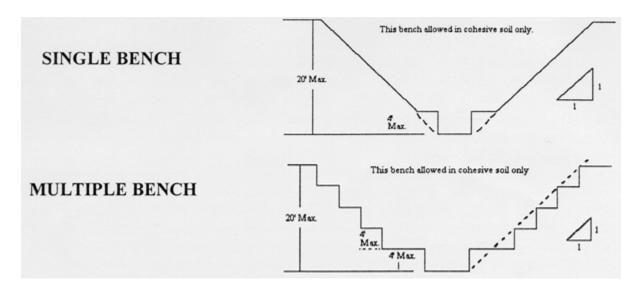
4. All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the other options permitted under 1926.652(b).

B-1.2 Excavations made in Type B soil.

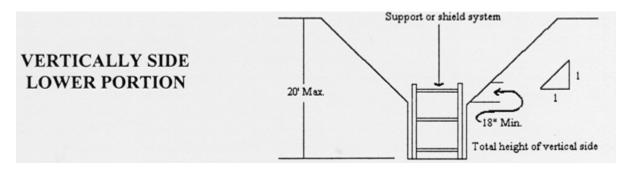
1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.



2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows:



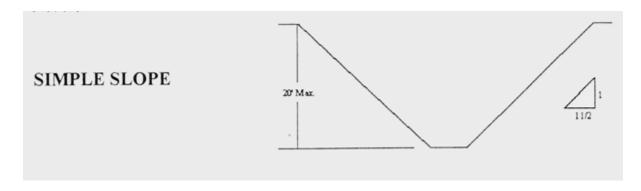
3. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1.



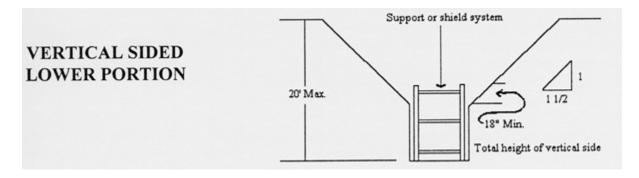
4. All other sloped excavations shall be in accordance with the other options permitted in 1926.652(b).

B-1.3 Excavations made in Type C soil.

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1 1/2:1.



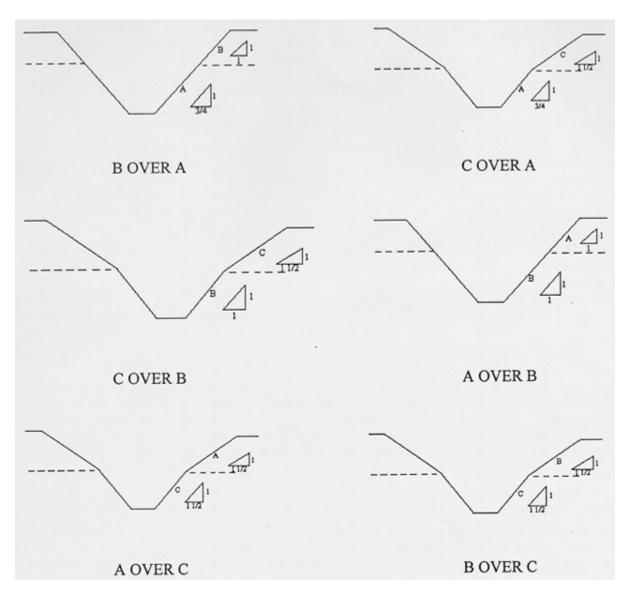
2. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1 1/2:1.



3. All other sloped excavations shall be in accordance with the other options permitted in 1926.652(b).

B-1.4 Excavations made in Layered Soils

1. All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.



2. All other sloped excavations shall be in accordance with the other options permitted in 1926.652(b).

ATTACHMENT XIII

TETRA TECH DECONTAMINATION OF FIELD EQUIPMENT AND WASTE HANDLING STANDARD OPERATING PROCEDURE



TETRA TECH NUS, INC.

Subject DECONTAMINATION OF FIELD EQUIPMENT

STANDARD OPERATING PROCEDURES

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Effective Date	Revision
09/03	3

Applicability

Tetra Tech NUS, Inc.

Prepared

Earth Sciences Department

Approved D. Senovich

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1.0 PURPOSE

Decontamination is the process of removing and/or neutralizing site contaminants that have contacted and/or accumulated on equipment. The objective/purpose of this SOP is intended to protect site personnel, general public, and the sample integrity through the prevention of cross contamination onto unaffected persons or areas. It is further intended through this procedure to provide guidelines regarding the appropriate procedures to be followed when decontaminating drilling equipment, monitoring well materials, chemical sampling equipment and field analytical equipment.

2.0 SCOPE

This procedure applies to all equipment including drilling equipment, heavy equipment, monitoring well materials, as well as chemical sampling and field analytical equipment decontamination that may be used to provide access/acquire environmental samples. Where technologically and economically feasible, single use sealed disposable equipment will be employed to minimize the potential for cross contamination. This procedure also provides general reference information on the control of contaminated materials.

3.0 GLOSSARY

<u>Acid</u> - For decontamination of equipment when sampling for trace levels of inorganics, a 10% solution of nitric acid in deionized water should be used. Due to the leaching ability of nitric acid, it should not be used on stainless steel.

Alconox/Liquinox - A brand of phosphate-free laboratory-grade detergent.

<u>Decontamination Solution</u> - Is a solution selected/identified within the Health and Safety Plan or Project-Specific Quality Assurance Plan. The solution is selected and employed as directed by the project chemist/health and safety professional.

<u>Deionized Water (DI)</u> - Deionized water is tap water that has been treated by passing through a standard deionizing resin column. This water may also pass through additional filtering media to attain various levels of analyte-free status. The DI water should meet CAP and NCCLS specifications for reagent grade, Type I water.

<u>Potable Water</u> - Tap water used from any municipal water treatment system. Use of an untreated potable water supply is not an acceptable substitute for tap water.

<u>Pressure Washing</u> - Employs high pressure pumps and nozzle configuration to create a high pressure spray of potable water. High pressure spray is employed to remove solids.

<u>Solvent</u> - The solvent of choice is pesticide-grade Isopropanol. Use of other solvents (methanol, acetone, pesticide-grade hexane, or petroleum ether) may be required for particular projects or for a particular purpose (e.g. for the removal of concentrated waste) and must be justified in the project planning documents. As an example, it may be necessary to use hexane when analyzing for trace levels of pesticides, PCBs, or fuels. In addition, because many of these solvents are not miscible in water, the equipment should be air dried prior to use. Solvents should not be used on PVC equipment or well construction materials.

<u>Steam Pressure Washing</u> - This method employs a high pressure spray of heated potable water. This method through the application of heat provides for the removal of various organic/inorganic compounds.

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4.0 RESPONSIBILITIES

<u>Project Manager</u> - Responsible for ensuring that all field activities are conducted in accordance with approved project plan(s) requirements.

<u>Field Operations Leader (FOL)</u> - Responsible for the onsite verification that all field activities are performed in compliance with approved Standards Operating Procedures or as otherwise dictated by the approved project plan(s).

<u>Site Health and Safety Officer (SHSO)</u> - The SHSO exercises shared responsibility with the FOL concerning decontamination effectiveness. All equipment arriving on-site (as part of the equipment inspection), leaving the site, moving between locations are required to go through a decontamination evaluation. This is accomplished through visual examination and/or instrument screening to determine the effectiveness of the decontamination process. Failure to meet these objectives are sufficient to restrict equipment from entering the site/exiting the site/ or moving to a new location on the site until the objectives are successfully completed.

5.0 PROCEDURES

The process of decontamination is accomplished through the removal of contaminants, neutralization of contaminants, or the isolation of contaminants. In order to accomplish this activity a level of preparation is required. This includes site preparation, equipment selection, and evaluation of the process. Site contaminant types, concentrations, media types, are primary drivers in the selection of the types of decontamination as well as where it will be conducted. For purposes of this SOP discussion will be provided concerning general environmental investigation procedures.

The decontamination processes are typically employed at:

- Temporary Decontamination Pads/Facilities
- Sample Locations
- Centralized Decontamination Pad/Facilities
- Combination of some or all of the above

The following discussion represents recommended site preparation in support of the decontamination process.

5.1 Decontamination Design/Constructions Considerations

5.1.1 Temporary Decontamination Pads

Temporary decontamination pads are constructed at satellite locations in support of temporary work sites. These structures are generally constructed to support the decontamination of heavy equipment such as drill rigs and earth moving equipment but can be employed for smaller articles.

The purpose of the decontamination pad is to contain wash waters and potentially contaminated soils generated during decontamination procedures. Therefore, construction of these pads should take into account the following considerations

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- Site Location The site selected should be within a reasonable distance from the work site but should avoid:
 - Pedestrian/Vehicle thoroughfares
 - Areas where control/custody cannot be maintained
 - Areas where a potential releases may be compounded through access to storm water transport systems, streams or other potentially sensitive areas.
 - Areas potentially contaminated.
- Pad The pad should be constructed to provide the following characteristics
 - Size The size of the pad should be sufficient to accept the equipment to be decontaminated as well as permitting free movement around the equipment by the personnel conducting the decontamination.
 - Slope An adequate slope will be constructed to permit the collection of the water and potentially contaminated soils within a trough or sump constructed at one end. The collection point for wash waters should be of adequate distance that the decontamination workers do not have to walk through the wash waters while completing their tasks.
 - Sidewalls The sidewalls should be a minimum of 6-inches in height to provide adequate containment for wash waters and soils. If splash represents a potential problem, splash guards should be constructed to control overspray. Sidewalls maybe constructed of wood, inflatables, sand bags, etc. to permit containment.
 - Liner Depending on the types of equipment and the decontamination method the liner should be of sufficient thickness to provide a puncture resistant barrier between the decontamination operation and the unprotected environment. Care should be taken to examine the surface area prior to placing the liner to remove sharp articles (sticks, stones, debris) that could puncture the liner. Liners are intended to form an impermeable barrier. The thickness may vary from a minimum recommended thickness of 10 mil to 30 mil. Achieving the desired thickness maybe achieved through layering lighter constructed materials. It should be noted that various materials (rubber, polyethylene sheeting) become slippery when wet. To minimize this potential hazard associated with a sloped liner a light coating of sand maybe applied to provide traction as necessary.
 - Wash/drying Racks Auger flights, drill/drive rods require racks positioned off of the ground to permit these articles to be washed, drained, and dried while secured from falling during this process. A minimum ground clearance of 2-feet is recommended.
 - Maintenance The work area should be periodically cleared of standing water, soils, and debris. This action will aid in eliminating slip, trip, and fall hazards. In addition, these articles will reduce potential backsplash and cross contamination. Hoses should be gathered when not in use to eliminate potential tripping hazards.

5.1.2 Decontamination Activities at Drill Rigs/DPT Units

During subsurface sampling activities including drilling and direct push activities decontamination of drive rods, Macro Core Samplers, split spoons, etc. are typically conducted at an area adjacent to the operation. Decontamination is generally accomplished using a soap/water wash and rinse utilizing buckets and brushes. This area requires sufficient preparation to accomplish the decontamination objectives.

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Buckets shall be placed within mortar tubs or similar secondary containment tubs to prevent splash and spills from reaching unprotected media. Drying racks will be employed as directed for temporary pads to permit parts to dry and be evaluated prior to use/re-use.

5.1.3 Decontamination Activities at Remote Sample Locations

When sampling at remote locations sampling devices such as trowels, pumps/tubing should be evacuated of potentially contaminated media to the extent possible. This equipment should be wrapped in plastic for transport to the temporary/centralized decontamination location for final cleaning and disposition.

5.2 Equipment Decontamination Procedures

The following represents procedures to be employed for the decontamination of equipment that may have contacted and/or accumulated contamination through site investigation activities.

5.2.1 Monitoring Well Sampling Equipment

- 5.2.1.1 <u>Groundwater sampling pumps This includes pumps inserted into the monitoring well such</u> as Bladder pumps, Whale pumps, Redi-Flo, reusable bailers, etc.
- 1) Evacuate to the extent possible, any purge water within the pump.
- 2) Scrub using soap and water and/or steam clean the outside of the pump and tubing, where applicable.
- 3) Insert the pump and tubing into a clean container of soapy water. Pump a sufficient amount of soapy water through the pump to flush any residual purge water. Once flushed, circulate soapy water through the pump to ensure the internal components are thoroughly flushed.
- 4) Remove the pump and tubing from the container, rinse external components using tap water. Insert the pump and tubing into a clean container of tap water. Pump a sufficient amount of tap water through the pump to evacuate all of the soapy water (until clear).
- 5) Rinse equipment with pesticide grade isopropanol
- Repeat item #4 using deionized water through the hose to flush out the tap water and solvent residue as applicable.
- 7) Drain residual deionized water to the extent possible, allow components to air dry.
- 8) Wrap pump in aluminum foil or a clear clean plastic bag for storage.

5.2.1.2 <u>Electronic Water Level Indicators/Sounders/Tapes</u>

During water level measurements, rinsing with the extracted tape and probe with deionized water and wiping the surface of the extracted tape is acceptable. However, periodic full decontamination should be conducted as indicated below.

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^{* -} The solvent should be employed when samples contain oil, grease, PAHs, PCBs, and other hard to remove materials. If these are not of primary concern, the solvent step may be omitted. In addition, do not rinse PE, PVC, and associated tubing with solvents.

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- 1) Wash with soap and water
- 2) Rinse with tap water
- 3) Rinse with deionized water

Note: In situations where oil, grease, free product, other hard to remove materials are encountered probes and exposed tapes should be washed in hot soapy water.

5.2.1.3 Miscellaneous Equipment

Miscellaneous equipment including analytical equipment (water quality testing equipment) should be cleaned per manufacturer's instructions. This generally includes wiping down the sensor housing and rinsing with tap and deionized water.

Coolers/Shipping Containers employed to ship samples are received from the lab in a variety of conditions from marginal to extremely poor. Coolers should be evaluated prior to use for

- Structural integrity Coolers missing handles or having breaks within the outer housing should be removed and not used. Notify the laboratory that the risk of shipping samples will not be attempted and request a replacement unit.
- Cleanliness As per protocol only volatile organic samples are accompanied by a trip blank. If a
 cooler's cleanliness is in question (visibly dirty/stained) or associated with noticeable odors it should
 be decontaminated prior to use.
 - 1) Wash with soap and water
 - 2) Rinse with tap water
 - 3) Dry

If these measures fail to clean the cooler to an acceptable level, remove the unit from use as a shipping container and notify the laboratory to provide a replacement unit.

5.2.2 Down-Hole Drilling Equipment

This includes any portion of the drill rig that is over the borehole including auger flights, drill stems, rods, and associated tooling that would extend over the borehole. This procedure is to be employed prior to initiating the drilling/sampling activity, then between locations.

- 1) Remove all soils to the extent possible using shovels, scrapers, etc. to remove loose soils.
- Through a combination of scrubbing using soap and water and/or steam cleaning remove visible dirt/soils.
- 3) Rinse with tap water.
- 4) Rinse equipment with pesticide grade isopropanol
- 5) To the extent possible allow components to air dry.
- 6) Wrap or cover equipment in clear plastic until it is time to be used.

5.2.3 Soil/Sediment Sampling Equipment

This consists of soil sampling equipment including but not limited to hand augers, stainless steel trowels/spoons, bowls, dredges, scoops, split spoons, Macro Core samplers, etc.

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- 1) Remove all soils to the extent possible.
- 2) Through a combination of scrubbing using soap and water and/or steam cleaning remove visible dirt/soils.
- 3) Rinse with tap water.
- 4) Rinse equipment with pesticide grade isopropanol
- 5) Rinse with deionized water
- 6) To the extent possible allow components to air dry.
- 7) If the device is to be used immediately, screen with a PID/FID to insure all solvents (if they were used) and trace contaminants have been adequately removed.
- 8) Once these devices have been dried wrap in aluminum foil for storage until it is time to be used.

5.3 Contact Waste/Materials

During the course of field investigations disposable/single use equipment becomes contaminated. These items include tubing, trowels, PPE (gloves, overboots, splash suits, etc.) broken sample containers.

With the exception of the broken glass, single use articles should be cleaned (washed and rinsed) of visible materials and disposed of as normal refuse. The exception to this rule is that extremely soiled materials that cannot be cleaned should be containerized for disposal in accordance with applicable federal state and local regulations.

5.3.1 Decontamination Solutions

All waste decontamination solutions and rinses must be assumed to contain the hazardous chemicals associated with the site unless there are analytical or other data to the contrary. The waste solution volumes could vary from a few gallons to several hundred gallons in cases where large equipment required cleaning.

Containerized waste rinse solutions are best stored in 55-gallon drums (or equivalent containers) that can be sealed until ultimate disposal at an approved facility. These containers must be appropriately labeled.

5.4 Decontamination Evaluation

Determining the effectiveness of the decontamination process will be accomplished in the following manner

- Visual Evaluation A visual evaluation will be conducted to insure the removal of particulate matter. This will be done to insure that the washing/rinsing process is working as intended.
- Instrument Screening A PID and/or an FID should be used to evaluate the presence of the contaminants or solvents used in the cleaning process. The air intake of the instrument should be passed over the article to be evaluated. A positive detection requires a repeat the decontamination process. It should be noted that the instrument scan is only viable if the contaminants are detectable within the instruments capabilities.

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- Rinsate Blanks It is recommended that Rinsate samples be collected to
 - Evaluate the decontamination procedure representing different equipment applications (pumps versus drilling equipment) and different decontamination applications.
 - Single use disposable equipment The number of samples should represent different types of equipment as well as different Lot Numbers of single use articles.

The collection and the frequency of collection of rinsate samples are as follows:

- Per decontamination method
- Per disposable article/Batch number of disposable articles

It is recommended that an initial rinsate sample be collected early in the project to ensure that the decontamination process is functioning properly and in an effort to avoid using a contaminated batch of single use articles. It is recommended that a follow up sample be collected during the execution of the project to insure those conditions do not change. Lastly, rinsate samples collection may be driven by types of and/or contaminant levels. Hard to remove contaminants, oils/greases, some PAHs/PCBs, etc. may also support the collection of additional rinsates due to the obvious challenges to the decontamination process. This is a field consideration to be determined by the FOL.

ATTACHMENT XIV DIVE CONTRACTOR HASP

OSHA POSTER



Job Safety and Health IT'S THE LAW!

All workers have the right to:

- A safe workplace.
- Raise a safety or health concern with your employer or OSHA, or report a workrelated injury or illness, without being retaliated against.
- Receive information and training on job hazards, including all hazardous substances in your workplace.
- Request an OSHA inspection of your workplace if you believe there are unsafe or unhealthy conditions. OSHA will keep your name confidential. You have the right to have a representative contact OSHA on your behalf.
- Participate (or have your representative participate) in an OSHA inspection and speak in private to the inspector.
- File a complaint with OSHA within 30 days (by phone, online or by mail) if you have been retaliated against for using your rights.
- See any OSHA citations issued to your employer.
- Request copies of your medical records, tests that measure hazards in the workplace, and the workplace injury and illness log.

This poster is available free from OSHA.

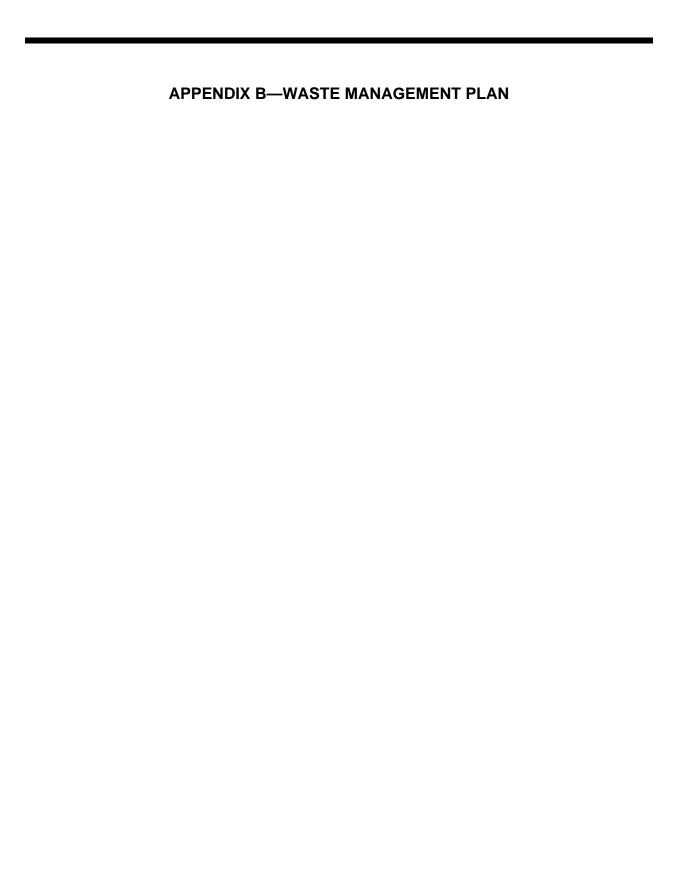
Contact OSHA. We can help.

Employers must:

- Provide employees a workplace free from recognized hazards. It is illegal to retaliate against an employee for using any of their rights under the law, including raising a health and safety concern with you or with OSHA, or reporting a work-related injury or illness.
- Comply with all applicable OSHA standards.
- Report to OSHA all work-related fatalities within 8 hours, and all inpatient hospitalizations, amputations and losses of an eye within 24 hours.
- Provide required training to all workers in a language and vocabulary they can understand.
- Prominently display this poster in the workplace.
- Post OSHA citations at or near the place of the alleged violations.

FREE ASSISTANCE to identify and correct hazards is available to small and mediumsized employers, without citation or penalty, through OSHA-supported consultation programs in every state.





Investigation-Derived Waste Management Plan Martin State Airport and Satellite Sites 701 Wilson Point Road Middle River, Maryland

Prepared for:

Lockheed Martin Corporation

Prepared by:

Tetra Tech, Inc.

July 2017

Michael Martin, P.G. Regional Manager

Michael Mark



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Martin State Airport Investigation Derived Waste Storage Areas, 2017......4-7

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ACRONYMS

CFR Code of Federal Regulations
COMAR Code of Maryland Regulations

EESH Energy, Environment, Safety, and Health

HAZMAT hazardous materials

HAZWOPER hazardous waste operations and emergency response

IDW investigation-derived waste

LMCPI LMC Properties, Inc.

Lockheed Martin Corporation

MAA Maryland Aviation Administration

MDANG Maryland Air National Guard

MDE Maryland Department of the Environment
MDOT Maryland Department of Transportation

MSA Martin State Airport

MT Main Terminal

OSHA Occupational Safety and Health Administration

PCB polychlorinated biphenyl

PPE personal protective equipment

RCRA Resource Conservation and Recovery Act
TCLP toxicity characteristic leaching procedure

Tetra Tech, Inc.

TSCA Toxic Substances Control Act
TSD treatment, storage, and disposal

USDOT United States Department of Transportation

USEPA United States Environmental Protection Agency

VOC volatile organic compound

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Section 1 Purpose

On behalf of Lockheed Martin Corporation (Lockheed Martin), Tetra Tech, Inc. (Tetra Tech) has prepared this *Investigation-Derived Waste Management Plan* due to the potentially contaminated nature of the waste that will be generated as part of the field investigations conducted at the Martin State Airport (MSA) Dump Road Area, Main Terminal (MT) area, Greater Strawberry Point, and adjacent creeks (Figure 1-1). Solid and liquid waste materials will be generated and handled as investigation-derived waste (IDW). Following proper investigation-derived waste management procedures, the investigation-derived wastes generated will be collected in United States Department of Transportation (USDOT)—approved containers, stored at a designated location, sampled for waste profiling and characterization, and once characterized, disposed of off-site at a Lockheed Martin-approved facility. Investigation-derived wastes generated during Martin State Airport field investigations will include, but will not be limited to, soil, sediment, water (surface water, groundwater, purge water, and/or decontamination water), personal protective equipment (PPE), and disposable sampling equipment (i.e., tubing, filters, and acetate liners from soil coring).

A Tetra Tech geologist or field technician will be on-site for all field activities performed by Lockheed Martin at Martin State Airport. All site investigation field work and related waste management activities conducted by a subcontractor will be performed under the direction of the Tetra Tech geologist or field technician and in full compliance with applicable local, state, and federal statutes and regulations, including Maryland Department of Transportation (MDOT) regulations, the federal Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), and Occupational Safety and Health Administration (OSHA), and with Lockheed Martin's Energy, Environment, Safety and Health (EESH) Remediation Operating Procedure EROP-03 (Appendix A). Investigation-derived wastes will be handled in accordance with the United States Environmental Protection Agency (USEPA) guidance *Management of Investigation Derived Wastes during Site Inspections*, OERR Directive 9345.3-02, May 1991.

This *Investigation-Derived Waste Management Plan* specifically covers investigation-derived waste resulting from field investigations conducted at the Martin State Airport Dump Road Area, Main Terminal area, Greater Strawberry Point, and adjacent creeks.

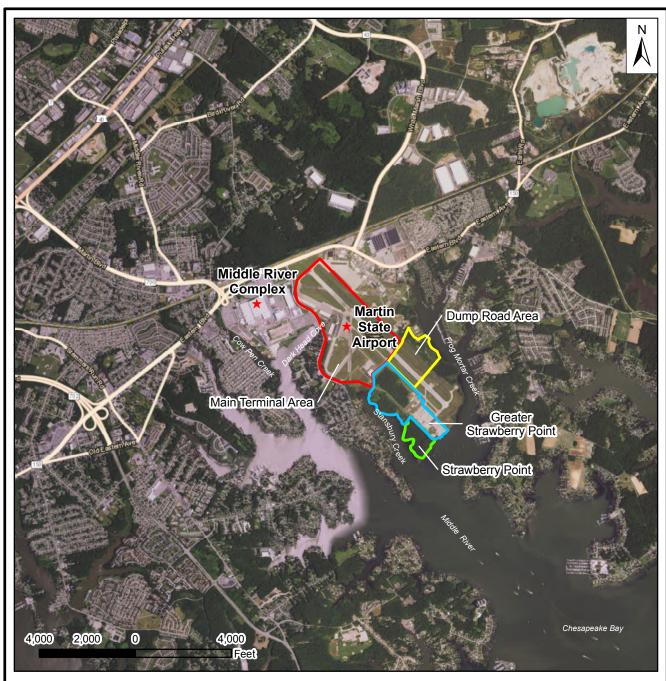
This plan is organized as follows:

<u>Section 2—Responsibilities and Training Requirements</u>: Presents the requirements and responsibilities of Tetra Tech and the subcontractors.

<u>Section 3—Hazardous Waste Determination and Process</u>: Presents how the waste characterization is completed.

<u>Section 4—Storage and Shipping Requirements</u>: Presents pre-shipment, shipping, and post-shipping requirements.

<u>Section 5—Reporting Requirements</u>: Presents statutory and regulatory reporting requirements.



Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2015 ESRI and its data suppliers).

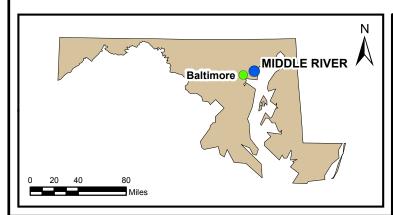


FIGURE 1-1 **2017 SITE LOCATION MAP**

Lockheed Martin, Martin State Airport Middle River, Maryland

DATE MODIFIED:

02/24/17

CREATED BY: JEE



Section 2

Responsibilities and Training Requirements

Training in accordance with all applicable state and federal protocols is required for all Tetra Tech, Inc. (Tetra Tech) personnel and subcontractors involved in hazardous waste operations at Martin State Airport (MSA). All personnel will complete appropriate federal Occupational Safety and Health Administration (OSHA) hazardous waste and emergency response operations (HAZWOPER) training and annual refresher training as specified in 29 *Code of Federal Regulations (CFR)* §1910.120. All subcontractor-training certifications will be provided electronically to the Lockheed Martin Corporation (Lockheed Martin) Project Lead or authorized delegates. Tetra Tech personnel certificates are maintained internally and can be provided to Lockheed Martin upon request. Training requirements are provided in Section 6 of the Energy, Environment, Safety and Health (EESH) Remediation Operating Procedure No: EROP-03 included in Appendix A.

United States Department of Transportation (USDOT) Hazardous Materials (HAZMAT) training is required for anyone involved in preparing hazardous waste for shipment and offering hazardous waste for transport, including signing of hazardous waste manifests (see 49 CFR 172, Subpart H). The waste management subcontractor must have completed HAZMAT employee training and will renew the training as necessary to meet USDOT requirements for hazardous waste transportation. Tetra Tech will verify subcontractor training compliance prior to initiating any waste removal activities. Lockheed Martin's presence at MSA is as a "large quantity generator" (MDR000518760) under regulations administered by the United States Environmental Protection Agency (USEPA). Large quantity generators must comply with the emergency preparedness and personnel training requirements outlined in 40 CFR §265.16 (see 40 CFR §262.34[a][4]). Tetra Tech personnel will receive this training, which will be provided by a person qualified in hazardous waste management and emergency response procedures.

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Section 3 Hazardous Waste Determination and Process

Hazardous waste determinations will be made in accordance with 40 *Code of Federal Regulations* (CFR) 262.11, using a combination of process knowledge and analytical evaluation of waste samples. Hazardous waste determinations will be reevaluated whenever any of the following occurs:

- the process that produces the waste changes (e.g. a new chemical constituent is discovered, the treatment process changes);
- the treatment media changes (e.g. new media vendor or media type);
- waste was tainted by inadvertent mixing with another waste; and
- a change occurs to the hazardous waste statutes or regulations governing that waste.

Investigation-derived waste (IDW) containing polychlorinated biphenyls (PCBs) may require disposal at facilities regulated under the Toxic Substances Control Act (TSCA). Regulations governing the management of IDW containing PCBs, which are generally based on *in situ* concentrations, are included in 40 CFR 761. PCB-contaminated material with concentrations less than 50 parts per million (ppm) are generally not regulated under TSCA, and may be disposed in approved Subtitle D facilities at their discretion.

Waste generated during field investigations will include (but is not limited to) soil, sediment, water (surface, groundwater, purge, and/or decontamination water), disposable personal protective equipment (PPE) and disposable sampling equipment. IDW such as disposable PPE and sampling equipment may be decontaminated and rendered nonhazardous according to the site manager's best professional judgment, placed in trash bags, and disposed of in a facility trash receptacle designated by Martin State Airport (MSA) personnel. Other IDW generated during field activities will be segregated based upon historical data (as applicable) into appropriate containers. Per the requirements presented in Section 4.1.2 of this plan, each container will be properly labeled to indicate the locations from which the waste was generated, and the generation date. IDW generated

during the field activities will be properly characterized as described below and disposed of in accordance with state regulations unless state requirements are less stringent than federal requirements, in which case federal requirements will apply. The handling of all IDW will comply with United States Department of Transportation (USDOT) protocols.

Tetra Tech will record each container on a master site-specific IDW tracking form (see Appendix B). The tracking form will be maintained electronically by Tetra Tech and will be sent out to the project team on a weekly basis. Information provided on the IDW tracking form will include:

- container type
- container contents
- project name
- first generation date
- waste characterization sample date
- hazardous or non-hazardous classification
- field inspection dates and field inspector name
- actions taken based on inspections
- date removed from the site
- removal deadline

Note that the removal deadline for hazardous IDW is 90 days from its generation date. However, every attempt will be made to remove all IDW (both hazardous and nonhazardous) within 75 days of its generation date.

The "Waste Listing Assessment Form" is provided in Appendix C. This form will be completed by the Tetra Tech project manager as the first step in the IDW classification/removal process. It serves as first notification and is presented to Lockheed Martin's remediation technical operations (RTO) contractor for review. The form presents pertinent information such as the project name, description of the waste, date generated, type and classification of waste.

A waste characterization sample for each waste stream will be collected from a representative amount of containers and sent to an offsite laboratory for analysis, including volatile organic compounds (VOCs), toxicity characteristic leaching procedure (TCLP) metals, PCBs, and ignitability.

All waste characterization data will be presented to the IDW subcontractor for classification. The IDW subcontractor will complete the waste profiles based on analytical data provided, and will classify the waste as nonhazardous or hazardous. Following receipt of the approved analytical data, the IDW subcontractor will develop a waste profile. Waste profiles are to be sent to the Tetra Tech project manager for initial review. The Tetra Tech project manager will review them and forward the waste profile forms to the appropriate site contact. All forms related to IDW from MSA will be signed and approved by Mr. Mike Musheno of LMC Properties, Inc. (LMCPI).

Lockheed Martin Corporation (Lockheed Martin) may choose to issue a Lockheed Martin "Hazardous-Waste-Manifest Signatory Authorization Form," presented in Appendix D. This form authorizes a Lockheed Martin subcontractor to sign for the IDW and certifies that the representative has taken the USDOT training delineated in 49 CFR Part 172, Subpart H and is in compliance with all state and federal requirements for hazardous waste manifesting. Lockheed Martin remains responsible for the hazardous waste being disposed.

Following signature of the waste profile forms by Lockheed Martin or an authorized representative, the IDW will be scheduled for removal from the site. The Tetra Tech project manager will coordinate the IDW removal with the appropriate Lockheed Martin site contact. The Lockheed Martin site contact or authorized representative will be on-site to sign the bills of lading for nonhazardous IDW or the waste manifests for hazardous IDW. Signed copies of the returned bills of lading and waste manifests will be kept on file for at least three years by Tetra Tech and LMCPI and be available for review if requested.

Before IDW leaves the site, the Lockheed Martin site contact or authorized representative will complete a waste shipment checklist. The "Hazardous Material/Waste Shipment Checklist" is presented in Appendix E for reference. Completion of this checklist ensures that all protocols, standards and requirements have been adhered to and that the waste can be removed from the site. The checklist includes such line-item prompts as ensuring that the truck is fitted with proper waste placards and that waste manifests and bills of lading have been properly completed. IDW will be removed from the site after the Lockheed Martin representative completes the checklist. Once the IDW is removed from the site, the Lockheed Martin representative and the Tetra Tech field technician will each be provided a copy of the associated documentation.

A site contact list (Appendix F) will be maintained listing who will be contacted in case of an emergency at the site or if questions arise about IDW disposal. An emergency action plan will be incorporated into the on-site health and safety plan and it will comply with all current and applicable regulations and requirements including, but not limited to 29 CFR 1903, 1904, 1910, and 1926. Lockheed Martin will be listed as the waste generator on all paperwork, including those waste profile sheets on which the generator was initially listed as Glenn L. Martin State Airport.

Section 4 Storage and Shipping Requirements

4.1 PRE-SHIPMENT REQUIREMENTS

Waste generated during the field investigation will include, but is not limited to soil, sediment, and water (groundwater, surface, purge, and/or decontamination water), personal protective equipment (PPE) and disposable sampling equipment. Investigation derived waste (IDW) generated during field investigations will be characterized as non-hazardous or hazardous waste. Pre-shipping requirements have been discussed in detail in Section 3.0.

4.1.1 Packing

All waste materials will be predominantly collected in new or properly reconditioned United States Department of Transportation-(USDOT-) approved 55-gallon steel drums that will be sealed at the end of daily sampling. Special consideration will be made to manage certain wastes (such as bentonite grout) separately from other IDW so as not to increase the volume of material that may be classified as hazardous due to elevated pH. Other approved containers may be used depending on the type and volume of waste generated including but not limited to plastic drums, tanks, and roll-off containers. Packing requirements will be determined and specified for the specific containers as necessary.

4.1.2 Labeling

As soon as the material is placed in each container, the container be marked with an appropriate label(s) containing the following information:

- **site** name of the site where waste was generated (i.e. Martin State Airport)
- **location** location where the waste was generated (i.e., well identification, soil boring, test pit, sediment, and surface water location number)
- **date** when waste materials accumulation began

- **container number** in the series of drums from this sampling event
- **contents** type of waste (e.g., sediment, soil cuttings, groundwater and surface water)
- **volume** an estimated volume not to exceed three quarters of drum capacity
- site contact and emergency contact information for the designated authorized Lockheed Martin Corporation (Lockheed Martin) representative for the site and the telephone number of the local fire department.

If the material in the container is classified as hazardous, as determined by analysis and subsequent profiling of a waste characterization sample, a label denoting its classification (i.e., a "hazardous" label) will be affixed to the container. Similar labels will be affixed to all containers used to store IDW (e.g., plastic drums, roll-offs, and tanks).

4.1.3 Storing

IDW storage areas (for smaller containers such as drums) will meet the following specifications to permit access to conduct spill/leak monitoring, sampling, and extraction once the disposal route is determined:

- Secondary containment will be placed under the containers to contain any spills or leaks, and may include a temporary spill containment system made of polyethylene sheeting and two-inch by six-inch wooden boards creating a bermed edge and/or a polyethylene spill containment pallet. The dimensions of the temporary spill-containment area will depend on the number of 55-gallon drums at the site. For most jobs, the spill containment area will likely be 10-feet by 20-feet. Drum capacity of the polyethylene spill containment pallets ranges between two and four drums. The integrity of the containment systems will be monitored weekly as described below. Secondary containment systems will be large enough to hold 55 gallons (the largest volume for a container stored in the system). Fifty-five-gallon drums will be stored on wooden pallets, with four or fewer drums per pallet. The wooden pallets will be stored on a hard, flat surface inside the spill containment system and will be covered with polyethylene sheeting.
- Drums containing IDW profiled as hazardous waste will be segregated from drums containing non-hazardous IDW and will be designated by proper fencing and hazardous waste signage.
- The drum-closure bolt and label will be readily visible.
- Approximately four feet of space will be left between each row of pallets/drums to allow access for sampling, drum removal, and spill response.
- Caution tape or temporary fencing will be placed around the drums to help identify and secure the area.

- Signs will be posted in front of the IDW storage area identifying the site, location, date of collection, number of drums, drum contents, volume of contents, site and emergency contact information, and the location of spill control materials for the wastes.
- Appropriate onsite personnel (Maryland Air National Guard [MDANG], Martin State Airport [MSA]/MDANG fire department, and MSA Operations) will be informed that hazardous waste materials are on-site and of emergency response procedures.
- A copy of work plans, waste management plans, and the IDW inventory list will be maintained inside a weatherproof lock box on-site at each IDW storage location.
- Spill response equipment including oil booms, absorbent pads, shovels, buckets of clean water, and an overpack drum, will be readily available.
- Appropriate equipment will be used to move containers whenever possible, to avoid injury.
 When not possible to apply appropriate equipment, personnel will obtain help to manipulate containers.
- All storage containers and secondary containment pads containing waste that is pending characterization or has been determined to be hazardous will be inspected weekly to ensure that they remain in good condition, and to ensure that no leaks or spills have occurred. The weekly inspections will be conducted starting the week of generation and will continue until the waste is removed from the site or determined to be non-hazardous. If the waste is deemed nonhazardous, weekly inspections will no longer be required. Observations from weekly inspections (including photographs) will be documented in a field logbook and on a tracking form dedicated to the site and will be stored in a weatherproof lock box at each IDW storage location.

Other containers such as roll-offs and tanks will be lined and double-walled as required based on the contents stored in each container (e.g., lined roll-offs will be used to store wet soils).

Three central IDW drum storage areas at MSA have been designated and approved by the Maryland Aviation Administration (MAA) and the MDANG: a flat concrete pad area inside Gate 12, a flat grass-covered area in the central portion of the DRA and a gravel lot located near the Maintenance Building in the Greater Strawberry Point portion of the site (Figure 4-1). Alternative areas may be used for certain projects to minimize drum transportation. Airport personnel will confirm satellite IDW storage areas at Dump Road Area and Greater Strawberry Point prior to the start of field activities. Main Terminal area IDW will be stored at the DRA location. Single drums will be temporarily staged on wooden pallets on a hard, flat surface overlain by a temporary, secondary spill-containment system made of polyethylene sheeting and wooden boards with sufficient capacity to contain the contents of one 55-gallon drum. All IDW drums will be stored within the secondary containment until they can be removed from the site. Other containers that may be used to store

IDW such as roll-offs and tanks will be also staged and maintained on flat surfaces in accordance with Resource Conservation and Recovery Act (RCRA) regulations.

Standard procedures include daily removal of all IDW from the point of generation and relocation to one of the designated and approved IDW storage areas. Satellite accumulation provisions under 40 CFR 262.34 (c) allow generators to accumulate up to 55 gallons of hazardous waste (or one quart of acute hazardous waste) in containers that are at or near any point of generation, and that are under the control of the operator with fewer requirements than for central accumulation areas, provided the generator complies with the requirements of 262.34(c). If hazardous waste is ever staged at the point of generation, all satellite accumulation protocols pursuant to 40 CFR 262.34 (c) will be followed.

Hazardous waste accumulation times discussed in 40 CFR 262.34 generally allow up to 90 days to remove the hazardous waste drums and other containers from the facility. Despite this 90 day allowance, every attempt will be made to expedite IDW removal within 75 days of its generation date. Access for the subcontractor's representative and IDW transport carrier will be coordinated by Tetra Tech.

4.1.4 Material Identification and Classification

All waste materials will be identified and classified per USDOT requirements (49 CFR Parts 100-185).

4.1.5 Waste Shipment

Tetra Tech will subcontract all IDW removal. Tetra Tech will ensure the use of Lockheed Martin purchasing agreements and associated Lockheed Martin-approved waste-management vendors and will ensure that hazardous waste is transported by an approved vendor to a treatment, storage, and disposal (TSD) facility on the Lockheed Martin Corporate Hazardous Waste Approved Vendors List. Non-hazardous waste is not required to be managed by Lockheed Martin approved waste management vendors but will be transported to a Lockheed Martin approved industrial waste disposal facility. The Lockheed Martin "Hazardous Waste Manifest Signatory Authorization" form (Appendix D) must be completed by the Lockheed Martin Project Lead in coordination with the Tetra Tech project manager if the IDW is hazardous.

4.1.6 Hazardous Waste Generator Identification Number

The Lockheed Martin USEPA identification number for hazardous waste generation at MSA is MDR000518760. All IDW will be removed from the site by a subcontractor adhering to the shipping requirements in Section 4.2.

4.2 SHIPPING REQUIREMENTS

USDOT hazardous materials (HAZMAT) employee training is required for anyone involved in shipment preparation and transportation of hazardous waste, including signing hazardous waste manifests (see 49 CFR 172, Subpart H). The manifest for shipped waste must be certified as accurate. Non-hazardous materials do not require the signature of a USDOT HAZMAT-trained individual. Waste manifests for all hazardous wastes, and bills of lading for all non-hazardous wastes will be signed by Mr. Mike Musheno (LMC Properties, Inc. [LMCPI]). Preparation and pre-transport review of non-hazardous and hazardous waste shipments will be documented using the Lockheed Martin "Hazardous Material/Waste Shipment Checklist" (Appendix D). A completed electronic copy will be provided to Tetra Tech and to the Lockheed Martin Project Lead, along with the shipping documentation.

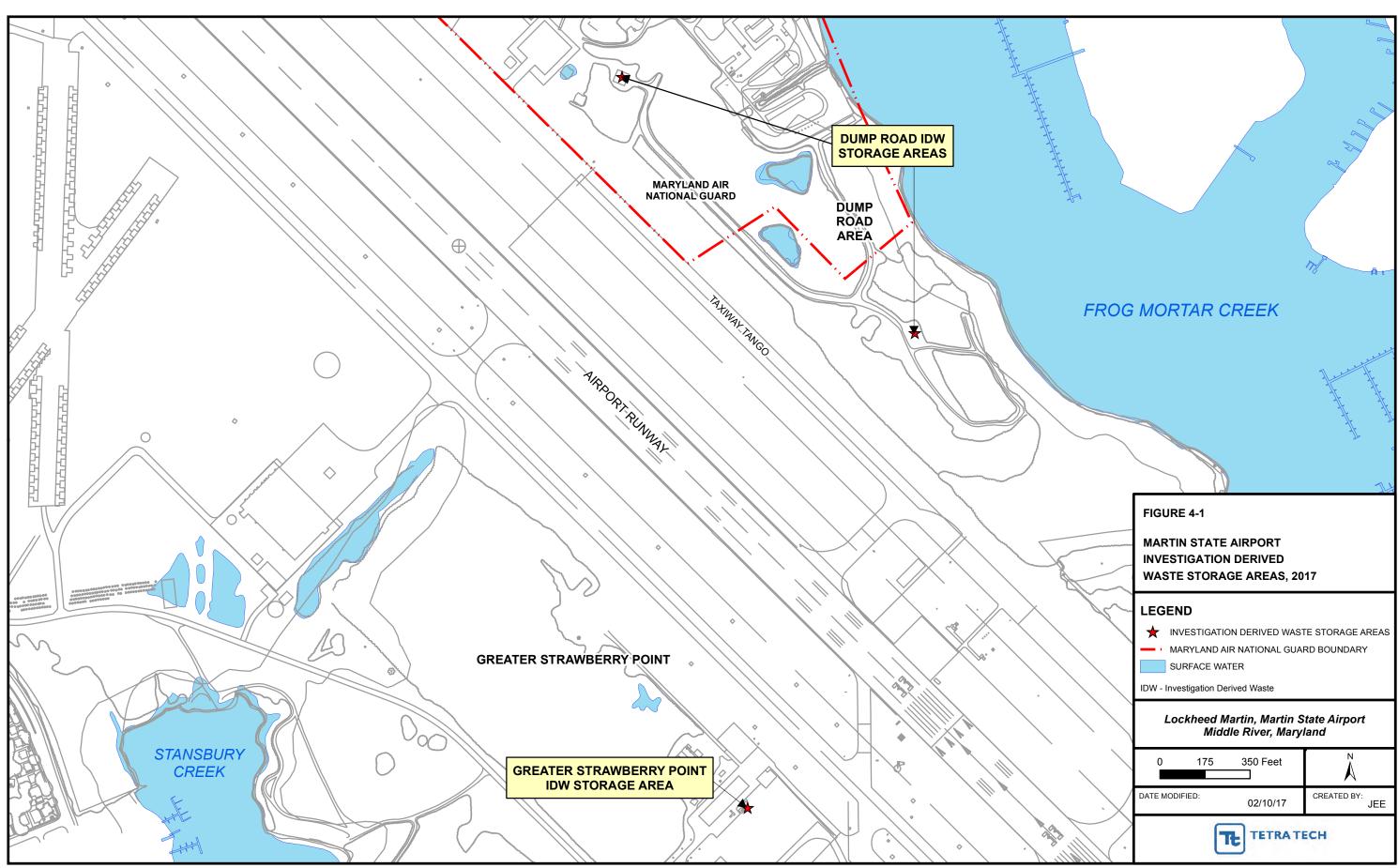
Detailed records of authorized work will be maintained by the subcontractor, and will include the following:

- all manifests of waste transported to the approved off-site disposal facility,
- receipt of waste acceptance by the approved treatment/disposal facility,
- certification that the waste has been disposed of at the approved facility,
- receipt of acceptance of waste containers by the approved disposal facility,
- certification of disposal of waste containers by the approved disposal facility,
- weighing slips, and
- any other documentation required by local, state, or federal requirements.

4.3 POST-SHIPMENT REQUIREMENTS

Records of waste characterization, chain of custody, transportation, and destruction will be maintained by both Tetra Tech and LMCPI. This includes profile sheets, the "Hazardous Material/Waste Checklist," the generator's copy of the waste manifest, a copy of the signed TSD manifest, Land

Disposal Restriction forms, and certificates of waste destruction (where applicable). Tetra Tech will submit all records associated with each year's waste generation activities to Lockheed Martin's remediation technical operations (RTO) contractor in the first quarter of the following year, or as directed by the Project Lead. The documentation noted above must be retained for three years. All documents should be properly stored and available for review upon request.



Section 5

Reporting Requirements

5.1 BIENNIAL REPORTING REQUIREMENTS

The Code of Maryland Regulations (COMAR) 26.13.03.06B requires facilities that manage hazardous waste to file a biennial hazardous waste report every two years that includes hazardous waste activity for the preceding calendar year. Facilities are required to submit the biennial report for a given site if:

- 1. The facility either (a) generates hazardous waste and ships it offsite to a facility in the United States, **or** (b) treats, stores, or disposes of hazardous waste on-site; and
- 2. The facility is regulated under Maryland's hazardous waste regulations because it (a) generates 220 pounds or more of hazardous waste (or more than 2.2 pounds of acute hazardous waste) in a calendar month, **or** (b) accumulates, at any time, more than 220 pounds of hazardous waste (or more than 2.2 pounds of acute hazardous waste).

Guidance for completing the biennial report form is available at the Maryland Department of the Environment's (MDE) Biennial Report web page, which is available at

http://www.mde.state.md.us/programs/Land/HazardousWaste/BiennialHazardousWasteReport/Pages/Programs/LandPrograms/HazardousWaste/biennialreport/index.aspx

The report must be completed, typically by March 1 of even numbered years (e.g. 2018, 2020), and filed with:

Maryland Department of the Environment Land Management Administration Operational Services Program 1800 Washington Boulevard, Suite 650 Baltimore, Maryland 21230-1719

Before each report is filed, the Maryland hazardous waste regulations must be consulted to confirm or update regulatory thresholds.

5.2 WASTE MINIMIZATION

Hazardous waste generators, when preparing a manifest, are required to certify they have taken steps to minimize the volume and toxicity of hazardous waste generated. Waste minimization efforts are required under COMAR 26.13.03.06B(1)(d)(vi) to be reported on the biennial report submittal.

Efforts should be taken, to the degree economically practicable, to reduce the volume and toxicity of hazardous waste generated and a reasonable method of treatment, storage, or disposal should be selected that will minimize the present and future threat to human health and the environment.

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APPENDIX A—"EESH REMEDIATION OPERATING PROCEDURE NO: EROP-03, "EESH REMEDIATION WASTE MANAGEMENT"	

Appendix A

Remediation Contractor's ESH Handbook Including:

Appendix A – Lockheed Martin Minimum Requirements for Intrusive Fieldwork Including:

Appendix A

Including:

Enterprise Operations Procedure EO-28

Dig Permit - Form E0-28-1

Risk Handling Checklist - Form EO-28-2

<u>Appendix B</u> – Utility/Underground Structure Clearance Chart

<u>Appendix C</u> – Lockheed Martin Invasive Fieldwork Authorization Form

Appendix B – EESH Remediation Operating Procedure No. EROP-03 (LMC Waste Management Procedure) Including:

Attachment #1- Waste Listing Assessment Form

Attachment #2-Hazardous Waste Manifest Signature Authorization Form

Attachment #3-Hazardous Material/Waste Shipment Checklist Attachment #4-Non-Specification Bulk Container Packing and Closing Instructions

Appendix C – LMC 6S Checklist

Appendix D - LMC ORR Process Documents

Including:

ORR Agenda

ORR Compliance Checklist

LOCKHEED MARTIN

REMEDIATION CONTRACTOR'S ESH HANDBOOK

May 1, 2014

Revision 2

Lockheed Martin Corporation Energy, Environment, Safety & Health

> A COPY OF THE JOB SPECIFIC HASP SHALL BE AVAILABE AT THE JOB SITE FOR THE DURATION OF THE PROJECT

REVISION STATUS

REVISION	DATE	COMMENTS
1	06/10/2009	
2	05/01/2014	Near miss, Operational Readiness Review, Housekeeping

CONTRACTOR'S ESH HANDBOOK

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CONTRACTOR'S ESH HANDBOOK

GENERAL

Lockheed Martin Corporation management at all levels is committed to conducting operations and activities in a manner that provides and maintains safe and healthful working conditions, protects the environment, and conserves natural resources.

This *Contractor's ESH Handbook* has been prepared to assist each project jobsite employer/contractor in satisfying its' contractual and legal accident prevention responsibilities, in such a manner that a safe, efficient operation is assured. All applicable requirements outlined in this handbook shall be incorporated into the contractor's site specific Safety and Health Plan The site specific Safety and Health plan shall be submitted to the Lockheed Martin Project Lead at least two weeks prior to starting work on any Lockheed Martin remediation projects.

This material must not be considered to be all inclusive as to the hazards that might be encountered, safe practices that should be performed, or safe conditions that should be maintained during the course of any project. Moreover, this handbook does not replace the contractor's legal obligation to its employees under all relevant environmental, safety and health requirements and laws. All legal standards not specifically referenced in this handbook shall apply when applicable.

1 CONTRACT RESPONSIBILITIES

The Contractor agrees to comply with all rules and procedures contained in this document, known as the *Remediation Contractor's ESH Handbook*, unless Lockheed Martin specifically agrees, in writing, to a modification or exemption. In addition, the Contractor and subcontractors, at any tier, shall:

- 1.1 Conduct an Operational Readiness Review (ORR) meeting prior to each phase of construction work, start-up of a new or modified treatment system or if major changes have occurred in how the O&M will take place at a site. An Operational Readiness Review Compliance Checklist shall be completed for each ORR meeting. See Appendix D. The Lockheed Martin Project Lead shall coordinate with the Lockheed Martin ESH manager at the early planning stages to determine need and schedule for an Operational Readiness Review meeting.
- 1.3 Maintain Lockheed Martin as a drug free-work workplace. This requirement extends to contractors working on Lockheed Martin remediation projects. Additionally, the use of tobacco is not permitted on Lockheed Martin owned property.
- Take all prudent and proper environmental, safety and health (ESH) precautions to protect Lockheed Martin employees, all other workers, and the public from ESH hazards associated with contractor activities.

1.2

- 1.5 Comply with all applicable Federal, State, municipal, local, and any other applicable occupational safety and health statutes, rules, ordinances, regulations, and requirements issued or imposed by any governmental authority (including, but not limited to *Title 29*, *Code of Federal Regulations Parts 1903, 1904, 1910* and *1926*).
- 1.6 Comply with all applicable Federal, State, municipal, local, and any other applicable air pollution statutes, rules, ordinances, regulations, and requirements issued or imposed by any governmental authority.
- 1.7 Comply with all Federal, State, municipal, local and Lockheed Martin hazardous materials, hazardous waste, and non-hazardous waste statutes, rules, ordinances, regulations, and requirements (including, but not limited to *Title 40, Code of Federal Regulations*).
- 1.8 Obtain the applicable ESH permits to conduct the work in compliance with local, state, federal ESH regulations and site requirements (including, but not limiting to *Title 29*, *Code of Federal Regulations*, 1910 and 1926).
- 1.9 Ensure that all employees and subcontractors have received the appropriate level of ESH training in accordance with applicable ESH regulations necessary for the performance of the work requested by Lockheed Martin.
- Instruct, prior to commencement of operations, all employees on the jobsite about relevant governmental laws and regulations, specific hazards expected to be encountered and proper safety precautions to be observed. In addition, jobsite employees shall read and certify that they have read and understand the job specific health and safety plan (HASP). The certification forms provided by the contractor within the HASP shall be electronically sent to the Lockheed Martin Project Lead.
- 1.11 Provide all jobsite visitors with a safety orientation prior to commencing work or touring the site. A visitor log shall be kept to document the orientation.
- 1.12 Ensure Contractor's job specific health and safety plan (HASP) encompasses Federal, State, municipal, local and the Lockheed Martin requirements found within this document the HASP should contain a section on crisis management / emergency response. A copy of the job specific HASP shall be maintained at the job site where jobsite employees have access to a copy. All Contractor Project Managers shall be provided a copy of the *Contractor's ESH Handbook* found within the Lockheed Martin Request for Proposal or as an appendix of the Key National Contractor Agreement. Contractors shall flow these requirements down to their subcontractors.
- 1.13 Contractor understands that Lockheed Martin may immediately stop Contractor's work if Contractor violates any applicable Federal, State, municipal, local, or any other rules, regulations, and requirements, *Remediation Contractor's ESH Handbook* provisions, or other contract terms and conditions regarding environmental, safety and health compliance. Lockheed Martin shall not incur work stoppage charges unless the contractor demonstrates that the work stoppage

was unwarranted for any of the reasons stated above. Any dispute regarding work stoppage charges must be resolved through binding arbitration.

- 1.14 Contractor is advised that the Project may be inspected from time to time by Lockheed Martin or a representative of Lockheed Martin. Periodic Lockheed Martin inspections in no way relieve the Contractor of their obligation to maintain its own inspection program to identify unsafe conditions or acts. ESH violations will be considered in evaluation of Contractor's performance.
- 1.15 Lockheed Martin is not responsible for training or supervising Contractor employees or abating workplace hazards created by the Contractor or to which the Contractor's employees are exposed.
- 1.16 Contractor agrees to maintain copies of all pertinent ESH records <u>at the job site</u>. Pertinent records include, but is not limited to, personnel training documentation, evidence of enrollment in a medical surveillance program, accident/injury reporting, work area inspections, periodic safety meetings, MSDS's, air monitoring data, waste container inspections, etc. These records shall also be provided electronically to the Lockheed Martin Project Lead.
- 1.17 Contractor shall contact the Lockheed Martin Project Lead immediately in the event of a fatal or serious injury, an unpermitted environmental release, or any ESH incident that is likely to generate significant publicity or an adverse situation for Lockheed Martin (e.g., alleged releases of contaminants beyond property boundaries, purported fish or wildlife impacts, allegations of adverse community health or property impacts, etc.)

2 DEFINITION

- 2.1 <u>Contractor</u>: any agent/agency engaged by Lockheed Martin through written contract (or other written agreement) to perform work on Lockheed Martin Remediation Sites. For the purposes of this *Remediation Contractor's ESH Handbook*, "Contractor" shall also include Contractor's subcontractors at any tier.
- 2.2 <u>EPA</u>: the Environmental Protection Agency.
- 2.3 <u>Fed/OSHA</u>: the Federal Occupational Safety and Health Administration
- 2.4 <u>Hazard Communication Program</u>: a written program meeting the requirements of Title 29, Code of Federal Regulations, Section 1910.1200 Hazard Communication.
- 2.5 <u>Lockheed Martin</u>: Lockheed Martin Corporation, Corporate Energy, Environment, Safety & Health
- 2.6 <u>Lockheed Martin Project Lead</u>: the Lockheed Martin Corporate Environment, Safety & Health individual that has been designated to manage a specific project.
- 2.7 <u>Lockheed Martin Contract Representative</u>: the Lockheed Martin Corporate Environment, Safety & Health contract representative (Contract Administrator/Buyer) for the project.

2.8 <u>R</u>	<u>CRA</u> : the Federal Resource Conservation and Recovery Act and all americans.	ndments or
Lockheed Martin Rem Contractor's ESH Han		RESH-05A

3 SAFETY & HEALTH

Contractor shall comply with applicable provisions of Federal, State, municipal, local, and any other applicable occupational safety and health statutes, rules, ordinances, regulations and requirements. Contractor shall take all precautions for the protection of the safety and health of Contractor employees, subcontractor employees, and Lockheed Martin employees to prevent accidents or injury to them or to other persons on, about, or adjacent to site of work performance. Notwithstanding this handbook, Contractor will hold harmless Lockheed Martin for any incident, violation, regulatory agency inspection resulting in a finding, or any other ESH issue that occurs to a Contractor employee.

Within Section 3.0, Lockheed Martin is identifying specific requirements within the Federal regulations that need extra attention. These are not all encompassing and adherence to the all rules and regulations must be followed.

3.1 PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

1926 Subpart E or 1910 Subpart I 1910.139 / 1926.103 ANSI Z87.1 ANSI Z41 Standard ANSI Z89.1 Standard

- 3.1.1 Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.
 - <u>Eye Protection</u>. Safety eyewear meeting ANSI Z87.1 shall be worn in areas designated as "Eye Protection Required" and on all jobs where a potential injury to the eyes is possible whether or not the area is posted.
 - Foot Protection. Affected employee(s) shall wear protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and where such employee's feet are exposed to electrical hazards. Safety shoes and boots which meet the ANSI Z41 Standard shall be provided when impact and/or compression hazards exist. Soft-shoes, including but not limited to, tennis shoes, athletic shoes, moccasins, sandals, and open-toed or open-heeled shoes shall not be worn.
 - Respiratory Protection Devices. Appropriate, MSHA/NIOSH-approved respiratory protective devices must be worn when applicable state and/or federal action levels or OSHA permissible exposure levels (PELs) are exceeded. Contractor must have fully implemented a respiratory protection program meeting the requirements of *Title 29*, *Code of Federal Regulations*, *Section 1910.139 / 1926.103* or applicable state OSHA regulations prior to issuing and using respiratory equipment. Contractor shall supply and maintain

- appropriate air monitoring and respiratory protection equipment if inhalation hazards are anticipated.
- <u>Protective Clothing</u> such as suits, aprons, boots, or gloves shall be worn where there is a hazard to the body through dermal contact with chemicals, dusts, heat or other harmful agents or conditions.
- <u>Hearing Protection</u> (muffs and/or plugs) must be worn in all areas posted to indicate high noise level or where Contractor employees are exposed to noise levels in excess of the OSHA action level (85 dBA over a 8-hour time-weighted average or a dose of fifty percent).
- <u>Hard Hats</u> will be worn in all areas where there is a danger of impact to the head or hazard from falling or moving objects. Hard hats must meet the ANSI Z89.1 Standard.
- 3.1.2 Contractor will issue or cause to be issued prior to commencing the job all necessary personal protective equipment and air monitoring equipment to all its agents and employees, together with full instructions and training on the use of said equipment.
- 3.1.3 Contractor will meet all applicable Federal, Sate, municipal, local, and Lockheed Martin requirements for protective clothing and equipment. Contractor will properly supervise all its agents and employees to ensure protective clothing and equipment are used in conformance with applicable rules and regulations.

3.2 <u>HAZARD COMMUNICATION - USE OF HAZARDOUS MATERIALS</u>

Title 29, Code of Federal Regulations, Section 1926.59 Hazard Communication Title 29, Code of Federal Regulations, Section 1910.1200 Hazard Communication

- 3.2.1 Contractor personnel shall not bring any hazardous substances (as defined by OSHA) onto Lockheed Martin remediation sites unless accompanied by a Material Safety Data Sheet (MSDS) and the containers are appropriately labeled. MSDS's must be maintained at the job site.
- 3.2.2 Contractor shall notify the Lockheed Martin Project Lead <u>prior</u> to bringing onto Lockheed Martin remediation sites any quantity of hazardous materials.
- 3.2.3 Contractor shall ensure all containers of hazardous materials are labeled in accordance with the Fed OSHA Hazard Communication Standard, 29 CFR 1910.1200 or applicable state OSHA standard.
- 3.2.4 Do not handle or use any hazardous material that does not have adequate safety warning labels.
- 3.2.5 Do not dump, drain or discharge any hazardous materials or wastes into any sink, drain or sewer
- 3.2.6 The Lockheed Martin Project Lead shall inform the Contractor(s) of the identity of hazardous chemicals to which Contractor's employees may be exposed from

Lockheed Martin operations, if applicable. The Lockheed Martin Project Lead shall provide the following information:

- Where to obtain information concerning any hazardous substances used in Lockheed Martin operations that the Contractor's employees may come in contact with while performing their work;
- If Lockheed Martin owns or uses chemicals on a remediation site for any
 process where contractors could be exposed, Lockheed Martin shall make
 available to the Contractor Material Safety Data Sheets (MSDS) and sufficient
 information to permit the Contractor to train its employees on the hazards of the
 chemical Appropriate protective measure Contractor employees may take to
 protect themselves from exposure to known hazards from Lockheed Martin
 operations; and
- Appropriate work practice procedures (safety rules) for the location where work is to be performed.
- 3.2.7 Contractor shall ensure its employees are trained in the safe handling and use of hazardous materials in accordance with 29 CFR 1910.1200 Hazard Communication or the applicable state-OSHA hazard communication standard.
- 3.2.8 Contractor shall ensure that all applicable employees are medically qualified (as defined by OSHA) to perform the work assigned.
- 3.2.9 Hazardous materials shall be stored in designated areas and all containers effectively closed. Spill equipment/supplies shall be readily available to contain and/or mitigate accidental spills of hazardous materials.

3.3 <u>CONFINED SPACE ENTRY</u>

Title 29, Code of Federal Regulations, Section 1910.146 Permit-Required Confined Spaces

- 3.3.1 If Contractor or any other employee must enter a confined space (tank, vat, pit, sewer, etc.), the entry must be performed in accordance with the applicable state OSHA or federal OSHA regulations.
- 3.3.2 Before Contractor's employees are permitted entry into any confined space, the internal atmosphere shall be tested with a calibrated direct-reading instrument for the following conditions in the order given: 1) Oxygen content, 2) Flammable gases & vapors, and 3) Potential toxic air contaminants. Contractor shall furnish the air testing equipment and a person competent in the use of the testing equipment.
- 3.3.3 When possible, the Contractor shall notify the Lockheed Martin Project Lead prior to entering a permit required confined space. A permit shall be issued by the contractor prior to entry and electronically submit a copy to the Lockheed Martin Project Lead.

- 3.3.4 To ensure the safety of Contractor personnel during entry into confined spaces, the Contractor shall have a written confined space entry program.
- 3.4 HOT WORK REQUIREMENTS (i.e., welding, torch cutting, brazing, etc.)
 - Title 29, Code of Federal Regulations, Section 1910 Subpart Q Title 29, Code of Federal Regulations, Section 1926 Subpart J
 - 3.4.1 All hot work activities shall be conducted in accordance with the hot work permit requirements outlined in the site specific HASP (i.e., fire suppression equipment availability, removal of combustibles, fire watch, etc.).
 - 3.4.2 Contractor personnel must secure all oxygen and acetylene cylinders in a manner that will prevent them from falling or tipping over. Oxygen and acetylene cylinders must be stored separately. Oxygen cylinders in storage must be separated from fuel gas cylinders a distance of 20 feet or by a noncombustible barrier 5 feet high. Acetylene cylinders shall not be stored horizontally, lying on their side.
 - 3.4.3 When welding, Contractor personnel shall use welding curtains and/or suitable protective devices to protect persons from indirect exposure to welding flashes.
- 3.5 LOCKOUT / TAGOUT Control of Hazardous Energy
 - Title 29, Code of Federal Regulations, Section 1910.147
 - 3.5.1 Contractors are required to establish a written program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energization, start-up or release of stored energy in order to prevent injury to employee.
 - 3.5.2 Contractor shall not service and/or maintain machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees. Servicing and/or maintaining such equipment shall not be conducted until appropriate energy control methods have been initiated.
 - The Contractor shall provide training to ensure that the purpose and function of the energy control program are understood by their employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by the employees.
 - 3.5.3 If Contractor needs to service or maintain Lockheed Martin equipment, Contractor(s) shall notify the Lockheed Martin Project Lead and/or on-site facility operator (if applicable) of the intended equipment service for any unscheduled maintenance.
 - 3.5.4 Upon completion of the job, Contractor is to notify the Lockheed Martin Project

Lead and/or on-site facility operator (if applicable) so power can be resumed to the equipment after the lock-outs and tags have been removed.

3.6 USE OF LOCKHEED MARTIN MATERIALS AND EQUIPMENT

- 3.6.1 Contractor's employees shall not use Lockheed Martin tools, equipment, materials, or personal protective equipment unless otherwise authorized by Lockheed Martin.
- 3.6.2 Contractor shall not start or stop any production equipment without the approval of the Lockheed Martin Project Lead.
- 3.6.3 Contractor shall not adjust or relocate any Lockheed Martin process equipment without the approval of the Lockheed Martin Project Lead.

3.7 <u>DANGEROUS OPERATIONS - WARNINGS AND BARRICADES</u>

Title 29, Code of Federal Regulations, Section 1926, Subpart G-Signs, signals and barricades

- 3.7.1 Contractor shall isolate their work areas from Lockheed Martin operations, employees, and the public by using barricades or other effective means of isolation. Signs, signals and barricades shall be visible at all times where a hazard exists.
- 3.7.2 Contractor personnel shall erect and properly maintain, at all times, all necessary safeguards for the protection of Contractor personnel, Lockheed Martin employees and the public. This includes:
 - If doing any overhead work, Contractor must utilize warning signs and barricades, or station someone on the ground to prevent passers-by from entering the area below the overhead work;
 - Contractor must effectively barricade excavations, floor openings, etc., as required by OSHA regulations;
 - Contractor must construct and maintain all scaffolds and working platforms in accordance with OSHA regulations; and
 - If Contractor's equipment, barricades or other safeguards restrict fire lanes or fire equipment access, the Contractor shall notify the Lockheed Martin Project Lead about its notification to the local fire department.
- 3.7.3 Prior to commencing work, Contractor must inform Lockheed Martin Project Lead of any work posing a potential danger to personnel.

3.8 <u>EXCAVATIONS, TRENCHES, EARTHWORK</u>

Title 29, Code of Federal Regulations, Section 1926 Subpart P

3.8.1 Review the Lockheed Martin intrusive fieldwork requirements in Appendix A.

- 3.8.2 If workers are to enter excavations, a competent person must be designated and trained in soil classification and the recognition of trenching and excavation hazards.
- Excavations and trenches shall be inspected by a competent person daily and after every rainstorm, earthquake, or other hazard-increasing occurrence.
- 3.8.4 Inspect the face, banks, and top daily when workers are exposed to falling or rolling materials.
- 3.8.5 Shore, bench, slope, or use equivalent methods to protect workers in excavations four feet deep or more.
- 3.8.6 Locate soil at least two feet from the edge of the excavation, or one foot from the edge when the excavation is less than five feet deep.
- 3.8.7 Ladders or steps shall be provided and secured in all trenches four feet or more in depth. Ladders shall be located to require no more than twenty-five feet of lateral travel before having access or egress and shall extend three feet above the top of the trench bank.
- Install crossings with standard guardrails and toeboards when the excavation is more than $7\frac{1}{2}$ feet deep.
- 3.8.9 All open trenches and other excavations shall be provided with suitable barriers, signs, and lights to the extent that adequate protection is provided to the public.
- 3.8.10 Do not excavate beneath the level of adjacent foundations, retaining walls, or other structures until a qualified person has determined that the work will not be hazardous. Support undermined sidewalks.

3.9 ELECTRICAL SAFETY

Title 29, Code of Federal Regulations, Section 1926 Subpart K-Electrical Title 29, Code of Federal Regulations, Section 1910.269 Electrical Power Generation, Transmission and Distribution

- 3.9.1 Only qualified persons are permitted to work on electrical systems, as defined by *Title 29, Code of Federal Regulations Section 1910.269(a)(2)*. Qualified persons shall be trained and competent in:
 - The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment;
 - The skills and techniques necessary to determine the nominal voltage of exposed live parts;
 - The minimum approach distances specified by OSHA corresponding to the voltages to which the qualified employee will be exposed; and

- The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment.
- 3.9.2 Contractor personnel shall properly ground all electrical tools, mechanical digging or concrete breaking equipment and all other electrical equipment while in use.
- 3.9.3 All electrical work, installation and wire capacities shall be in accordance with the pertinent provisions of the National Electrical Code, ANSI and OSHA.
- 3.9.4 Covers or barriers must be installed on boxes, fittings, and enclosures to prevent accidental contact with live parts.
- 3.9.5 Temporary wiring installations must be grounded.
- 3.9.6 Electrical systems shall be de-energized utilizing appropriate lockout/tagout procedures prior to conducting work.

3.10 <u>ELEVATED LOCATIONS / FALL PROTECT</u>

Cal/OSHA General Industry Safety Orders, 8 CCR 3210 Title 29, Code of Federal Regulations, Section 1926 Subpart M – Fall Protection

- 3.10.1 <u>California employers</u>: Guardrails shall be provided on all open sides of unenclosed room openings, open and glazed sides of landings, balconies or porches, platforms, runways, ramps, or working levels more than 30 inches above the floor, ground, or other working areas. The railing must be provided with a toeboard where the platform, runway, or ramp is 6 feet or more above places where employees normally work or pass and the lack of a toeboard could create a hazard from falling tools, material, or equipment.
- 3.10.2 Contractor must provide fall protection systems whenever a worker is exposed to a fall of four feet or more (in construction the threshold is six feet). Guardrails are the most common forms of fall protection systems. If guardrail systems are not feasible, safety nets, personal fall arrest systems, positioning device systems, warning line systems, or some other demonstrated, effective means of fall protection shall be used. Fall protection systems and devices shall be inspected prior to each use Title 29, Code of Federal Regulations, Section 1926 Subpart M.

3.11 LADDERS

Title 29, Code of Federal Regulations, Section 1910 Subpart D – Walking and Working Surfaces

Title 29, Code of Federal Regulations, Section 1926 Subpart X - Ladders

- 3.11.1 The use of ladders with broken or missing rungs or steps, broken or split rails or other defective construction is prohibited.
- 3.11.2 Ladders shall extend no less than 36 inches above landing and be secured to

prevent displacement.

- 3.11.3 Portable ladders must be equipped with safety shoes.
- 3.11.4 Wooden ladders shall not be painted.
- 3.11.5 Do not use metal ladders for electrical work or near live electrical parts.

3.12 SCAFFOLDS

Title 29, Code of Federal Regulations, Section 1910.28 – Safety Requirements for Scaffolding

Title 29, Code of Federal Regulations, Section 1926 Subpart L - Scaffolds

- 3.12.1 Scaffolds must be provided for all work that cannot be done safely by employees standing on solid construction at least 20 inches wide, except where such work can be safely done from ladders.
- 3.12.2 Erection and dismantling of scaffolds shall be performed in accordance with good engineering practice.
- Footings or anchorage for any scaffold shall be sound, rigid and capable of carrying the maximum intended load without settling or displacement.
- 3.12.4 No unstable objects such as concrete blocks shall be used to support scaffolds or planks.
- 3.12.5 Any part of a scaffold weakened or damaged shall be repaired or replaced immediately.
- 3.12.6 All scaffold planking shall be free of knots and cracks (Class A number) and shall completely cover the work platform.
- 3.12.7 Scaffold planks shall be laid tight, cleated at both ends or overlapped a minimum of 12 inches and nailed or bolted to prevent movement. Overlaps to occur directly above scaffold supports.
- 3.12.8 A safe and unobstructed means of access, such as a walkway, stair, or ladder shall be provided to all scaffold platforms.

3.13 <u>HEAVY EQUIPMENT, INDUSTRIAL VEHICLES, AND CRANES</u>

Title 29, Code of Federal Regulations, Section 1926 Subparts N, O and W

- 3.13.1 Only trained and authorized workers may operate heavy equipment, industrial vehicles, and/or cranes.
- 3.13.2 The Contractor shall designate a competent person who shall inspect all machinery and equipment prior to each use to make sure it is in safe operating condition.

- 3.13.3 The Contractor shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all heavy equipment, industrial vehicles, and cranes.
- 3.13.4 Seatbelts are required to be worn if the vehicle has Roll-Over Protection Structures (ROPS).
- 3.13.5 The swing radius of cranes shall be barricaded.
- 3.13.6 Equipment shall not be lubricated while in use.
- 3.13.7 Rated load capabilities, recommended operating speeds, special hazard warning, specific hand signal diagrams and special instructions shall be visible to the operator while he is at the control station.
- 3.13.8 Contractor's employees shall not be allowed to work under the load of cranes. Tag lines shall be used on all loads.

3.14 OVERHEAD POWER LINES

Title 29, Code of Federal Regulations, Section 1926.550 (a) (15)

- 3.14.1 If work is to be performed near overhead power lines, the lines must be deenergized and grounded by the owner or operator of the lines, or other protective measures must be provided before work is started. Protective measures (such as guarding or insulating the lines) must be designed to prevent employees from contacting the lines.
- 3.14.2 Unqualified employees and mechanical equipment must stay at least 10 feet away from overhead power lines. If the voltage is over 50,000 volts, the clearance should be increased by four inches for each additional 10,000 volts.
- 3.14.3 When mechanical equipment is being operated near overhead lines, employees standing on the ground may not contact the equipment unless it is located so that the required clearance cannot be violated even at the maximum reach of the equipment.
- 3.14.4 A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means.
- 3.14.5 Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicates that it is not energized.

3.15 FIRE PREVENTION / FLAMMABLE LIQUIDS

Title 29, Code of Federal Regulations, Section 1926 Subpart F or 1910 Subpart E

3.15.1 Contractor shall be responsible for fire protection in its work and operational areas,

including offices, tool rooms, and storage areas 24 hours per day, seven days per week through the duration of this Contract. Approved fire-fighting equipment, in adequate quantities, must be provided.

- 3.15.2 Contractor shall familiarize Contractor's employees with the locations of fire extinguishers in their respective work areas and ensure they are prepared to use them safely if necessary. In certain remote field locations or within abandoned (discontinued) facilities where fire extinguishers may not exist in the immediate work area, contractor shall provide and locate fire extinguisher(s) in close proximity to the active work area(s).
- 3.15.3 In case of fire, Contractor shall call 9-1-1. Contractor shall also inform all Contractor and Lockheed Martin employees in the area to evacuate to a safe place and direct arriving fire response personnel to the fire. Notify the Lockheed Martin Project Lead as soon as reasonably possible.
- 3.15.4 Contractor employees shall only attempt to put out a fire when such action can be performed safely.
- 3.15.5 If a Contractor employee uses a Lockheed Martin fire extinguisher, Contractor shall report its use to the Lockheed Martin Project Lead.
- 3.15.6 Contractor shall report all fires extinguished by the Contractor to the Lockheed Martin Project Lead.
- 3.15.7 Contractors are to store, dispense, and use flammable and combustible liquids in accordance with OSHA regulations and the Uniform Fire Code. Bonding and grounding of containers containing flammable liquids will be required.
- 3.15.8 Open flames and smoking shall not be permitted in flammable or combustible liquid storage areas.
- 3.15.9 Contractor shall provide sufficient fire extinguishers necessary for their work activities.

3.16 HAND AND POWER TOOLS

Title 29, Code of Federal Regulations, Section 1910 Subpart P – Hand and Portable Powered Tools and Other Hand-Held Equipment

Title 29, Code of Federal Regulations, section 1926 Subpart I – Tools Hand and Power

- 3.16.1 All hand and power tools, whether furnished by Contractor, or by Contractor's employee, shall be maintained in a safe condition.
- 3.16.2 Electrical power tools shall be grounded or double insulated with proper assured equipment grounding inspections or Ground Fault Interrupter (GFI) circuit protection provided.

- 3.16.3 Pneumatic power tools shall be secured to the hose or whip by some positive means.
- 3.16.4 Only properly trained Contractor employees shall operate power-actuated tools.
- 3.16.5 All grinding machines shall conform to OSHA and ANSI requirements.

3.17 COMPRESSED GAS CYLINDERS

Title 29, Code of Federal Regulations, Section 1910.101 – Compressed Gases Title 29, Code of Federal Regulations, Section 1926.350 – Gas Welding and Cutting

- 3.17.1 Compressed gas cylinders shall be secured in an upright position at all times.
- 3.17.2 When transporting, moving and storing cylinders, valve protection caps shall be in place and secured.
- 3.17.3 Compressed gas cylinders shall be kept away from excessive heat, shall not be stored where they might be damaged or knocked over by passing or falling objects, and shall be stored at least 20 feet away from highly combustible materials.
- 3.17.4 Cylinders shall be labeled as to the nature of their contents.
- 3.17.5 Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials a minimum of 20 feet or by a noncombustible barrier at least five feet high having a fire-resistant rating of at least one-half hour.
- 3.17.6 Acetylene cylinders shall be stored and used in a vertical, valve-end-up position only.
- 3.17.7 Anti-flashback arrestors shall be installed on all oxygen and acetylene cylinders.

3.18 <u>INCIDENTAL CONTACT WITH ASBESTOS</u>

- 3.18.1 This section applies to all contractors who incidentally disrupt the matrix of asbestos containing material (ACM) or presumed asbestos containing material (PACM); i.e., contractors who have <u>not</u> been specifically hired to perform ACM abatement.
- 3.18.2 Contractor shall <u>immediately</u> report to the Lockheed Martin Project Lead and to other employers of employees working at the job site any discovery, disturbance, and/or spill of ACM and/or PACM. Contractor(s) is to cease all operations in the immediate area of the suspect ACM and/or PACM and demarcate the area. The approval of the Lockheed Martin Project Lead is required before resuming operations.

- 3.18.3 Contractor shall not disturb any pipe insulation, boiler insulation, or any other material reasonably suspected of containing asbestos until the Contractor notifies the Lockheed Martin Project Lead. Lockheed Martin approval is required before operations may commence.
- 3.18.4 Abatement of asbestos can be performed only by persons properly trained and licensed to perform such activities

3.19 ASBESTOS ABATEMENT CONTRACTORS

- 3.19.1 This section applies to Contractors performing maintenance, construction, repair, renovation, demolition, salvage, or any other operation in which any material containing more than 1% asbestos is sanded, abrasive blasted, sawed, shoveled, removed, or otherwise handled in a manner that would generate airborne asbestos fibers. These requirements are in addition to any requirements contained in Contractor's scope of work.
- 3.19.2 All Contractors working with asbestos shall comply with applicable federal and state OSHA, EPA, local air district, and other applicable Federal, State, municipal, and local statutes, regulations, rules, and ordinances; and specific contract terms and conditions regarding the handling of, use of, and work involving asbestos.
- 3.19.3 The contractor shall ensure that a competent person, as defined by OSHA supervises all asbestos work performed within regulated areas.
- 3.19.4 Before commencing work, all asbestos abatement contractors shall supply to Lockheed Martin proof of:
 - Asbestos abatement contractor certification by the state Contractor's License Board
 - Liability insurance for Contractor employees engaged in asbestos work operations
 - Copies of asbestos work notification letters to state OSHA
 - Local air district Asbestos Demolition/Renovation Notification
- 3.19.5 Contractors shall minimize the creation and spread of airborne asbestos fibers by using appropriate work practices, engineering controls, and established procedures (i.e., wet methods, HEPA filter vacuums, negative pressure enclosure, local exhaust ventilation equipped with HEPA filter dust collection system, etc.).
- 3.19.6 All Class I, II and III asbestos work shall be conducted within regulated areas. The regulated area shall be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pressure enclosures are used, they may demarcate the regulated area. Signs shall be provided and displayed at each location where a regulated area is required to be established. Signs shall be posted at such a distance from such a location that an employee may read the signs

and take necessary protective steps before entering the area marked by the signs. Warning signs shall bear the following information:

DANGER ASBESTOS CANCER AND LUNG DISEASE HAZARD AUTHORIZED PERSONNEL ONLY

- 3.19.7 On multiple employer worksites requiring the establishment of a regulated area, the asbestos Contractor shall inform other employers on the site of the nature of the work with asbestos and/or PACM, of the existence of and requirements pertaining to regulated areas, and the measures taken to ensure that employees of such other employers are not exposed to asbestos.
- 3.19.8 Contractors shall package and label asbestos waste in accordance with federal and or applicable state OSHA requirements and federal or applicable state hazardous waste regulations. Labels shall be affixed to all products containing asbestos and to all containers containing such products, including waste containers. Labels shall be printed in large, bold letters on a contrasting background and shall contain the following information:

DANGER CONTAINS ASBESTOS FIBERS AVOID CREATING DUST CANCER AND LUNG DISEASE HAZARD

- 3.19.9 Contractors shall properly dispose of all asbestos waste. Proper disposal includes the use of hazardous waste manifests and Lockheed Martin approved and licensed waste haulers, and disposal facilities according to federal RCRA law and applicable state hazardous waste regulations. Contractor shall contact the Lockheed Martin Project Lead before transporting or disposing of any hazardous waste. Lockheed Martin must review all hazardous waste manifests prior to shipment.
- 3.19.10 Contractors shall ensure that employee exposure air monitoring is conducted as required by federal or applicable state OSHA regulations. All other air monitoring (i.e. clearance sampling) shall be conducted by a third-party contracted air monitoring firm not affiliated with the Contractor.
- 3.19.11 Contractor shall, at no cost to the employee, institute a training program for and ensure the participation of all employees engaged in asbestos-related work who may reasonably be expected to be exposed to asbestos fibers from asbestos containing construction materials.
- 3.19.12 Contractor shall institute a medical surveillance program for all employees who are or will be exposed to airborne concentrations of fibers of asbestos at or above the TWA and/or excursion limit.

3.20 <u>HAZARDOUS WASTE OPERATIONS and EMERGENCY RESPONSE</u>

(HAZWOPER)

Title 29, Code of Federal Regulations, Section 1910.120 - Hazardous Waste Operations and Emergency Response

Title 29, Code of Federal Regulations, Section 1926.65 – Hazardous Waste Operations and Emergency Response

This section applies to Contractors performing hazardous waste-type activities. This includes operations that pose a potential or reasonable possibility for employee exposure to hazardous waste/chemical contaminants during site investigations, clean-up operations, abatement, or hazardous substance removal work (remedial actions). These requirements are in addition to any requirements contained in Contractor's scope of work.

3.20.1 Contractor shall provide a **site-specific safety and health plan** at least two (2) weeks prior to field mobilization to the Lockheed Martin Project Lead (global statement – move to the beginning).

Contractor shall provide a **safety and health plan** in accordance with *Title 29*, *Code of Federal Regulations*, *Section 1910.120 - Hazardous Waste Operations and Emergency Response* or the applicable state OSHA standard and, at a minimum, shall contain the following elements:

- Safety and health risk or hazard analysis for each anticipated site task
- Employee training requirements
- Personal protective equipment to be used by employees for each of the site tasks and operations
- Medical surveillance requirements
- Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used
- Site control measures
- Decontamination requirements and procedures
- Emergency response plan
- Confined space procedures (if applicable)
- Emergency response plan
- Confined space procedures (if applicable)
- Spill containment program
- Periodic documented safety meetings
- Periodic documented work area safety inspections and corrective actions
- 3.20.2 Contractors performing hazardous waste-type operations shall adhere to the requirements specified in 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response or the applicable state OSHA standard.
- 3.20.3 <u>Training</u>: All Contractor and subcontractor employees working on site who are potentially exposed to hazardous substances shall receive initial and annual

refresher training in accordance with 29 CFR 1910.120(e) – Hazardous Waste Operations and Emergency Response or the applicable state OSHA standard. Lockheed Martin shall be provided with electronic copies of the training certificates.

- 3.20.4 <u>Medical Surveillance</u>: Contractor employees must be enrolled in a medical surveillance program prior to performing hazardous waste operations. Upon Lockheed Martin request, Contractor shall provide evidence of employee enrollment in a medical surveillance program. Lockheed Martin does not provide medical surveillance examinations to Contractor employees.
- 3.20.5 <u>Periodic work area inspections</u>: Contractor agrees to perform periodic work area inspections to determine the effectiveness of the site safety and health plan and to identify and correct unsafe conditions in contractor's responsible work area. These inspections shall be documented and available to Lockheed Martin upon request for review.

3.21 <u>MANAGEMENT OF NANOTECHNOLOGY</u>

- 3.21.1 The Lockheed Martin Project Lead shall work with the designated contractor responsible for nanotechnology to implement this procedure and ensure areas where nanomaterials (materials incorporating engineered nanoparticles or nanoscale features that exhibit unique physical and chemical properties as a result of the nanoparticles or nanoscale features) will be used meet engineering control requirements of this procedure.
- 3.21.2 The contractor shall ensure that the safety and environmental hazards of nanomaterials are managed as described in the requirements of this section.
- 3.21.3 A plan must be developed and executed that addresses the following requirements:
 - 3.21.3.1 **Hazard Analysis:** Identify potential adverse health effects and environmental impacts that could result from the chemical and physical properties exhibited by the nanomaterials and/or nanoparticles in use, to be used, under development, or to be developed at the site.
 - 3.21.3.2 **Exposure Assessment**: Evaluate all tasks involving nanomaterials and identify where exposures could occur. The evaluation must include at a minimum, an evaluation of materials; chemical intermediates; by-products; end-products; waste products; processes; process equipment; the amount of material used; material form; degree of containment; duration of use; and work space including laboratory and manufacturing space.

3.21.3.3 Exposure Control

• Implement appropriate controls to mitigate worker exposure and environmental emissions identified in sections 3.21.2.1 and 3.21.2.2 of this procedure.

Implement Control Bands as indicated on the Control Band Matrix below.

Exposure	Bound	Potential	Free /		
Duration	Materials	Release	Unbound		
Hazard	Group A (K	nown to be i	nert)		
Short	1	1	2		
Medium	1	1	2		
Long	1	2	2		
Haz	Hazard Group B (Understand				
	reactivity/function)				
Short	1	2	2		
Medium	1	2	3		
Long	1	3	3		
Hazard Group C (Unknown Properties)					
Short	2	2	3		
Medium	2	3	4		
Long	2	4	4		

Duration Key:

Short - Less than 4 hrs/day; 2 days/week

Medium - Between 4 to 6 hrs/day; 3 to 5 days/week

Long - 6 to > 8 hrs/day; 3 to 5 days/week

Release Key:

Bound Materials: Nanoparticles in a solid matix e.g. polycarbonate Potential Release: Nanoparticles in friable or solgel matrix

Free / Unbound: Nanoparticles unbound, not aggregated

Control Band:

- 1. General Ventilation and PPE
- 2. Engineering Controls and/or Respirators and additional PPE
- 3. Containment e.g. glove box
- 4. Specialist Advise
- Establish designated areas for Control Banding. The designated area shall, at a minimum, include warning signs informing employees that they are entering a nanomaterial work area as well as signs specifying administrative controls and personal protective equipment (PPE) required for entry.
- Identify appropriate administrative controls (e.g. good housekeeping methods, HEPA vacuums, wet wipe methods, employee training, safe work practices), engineering controls (e.g. containment, exhaust ventilation) and Personal Protective Equipment (e.g. respiratory protection, protective coveralls, gloves, goggles) based on Control Band and best industry practices.
- Develop and execute procedures for housekeeping, including clean-asyou-go practices that do not re-suspend particles.
- Develop and execute procedures for management of nanomaterialassociated waste.

4 ENVIRONMENTAL

Contractors shall comply with all applicable provisions of Federal, State, municipal, local, and other environmental statutes, rules, and regulations. Contractor shall take all necessary precautions to protect the environment. Contractor shall also store, transport, dispose, or otherwise handle hazardous wastes and non-hazardous wastes to prevent discharges of materials into the environment except in accordance with applicable governmental regulations.

4.1 HAZARDOUS WASTE DISPOSAL

- 4.1.1 Contractor shall develop a Waste Management Plan in accordance with the requirements outlined in the LMC Remediation Waste Management Procedure in Appendix B. Lockheed Martin shall approve the Waste Management Plan prior to work commencement.
- 4.1.2 Contractor must segregate hazardous from non-hazardous waste; all hazardous waste generated by its operations must be labeled in accordance with all governmental regulations.
- 4.1.3 Contractor shall dispose of all hazardous waste within the time frame stipulated by local, state, or federal regulations. Contractor shall not leave behind on Lockheed Martin remediation sites any containers of hazardous materials or waste (including drums, roll-offs, maintenance chemicals, etc.), empty or not, after the termination of operations.
- 4.1.4 In case of a spill or release of hazardous materials or waste, Contractor shall immediately notify the Lockheed Martin Project Lead and if the severity of the spill warrants, notify the local fire department (Call 9-1-1). The Contractor shall be liable for the costs of any spill resulting from Contractor's actions, including, but not limited to, costs of containment, cleanup, and disposal.

4.2 NON-HAZARDOUS WASTE DISPOSAL

4.2.1 Contractor shall develop a Waste Management Plan in accordance with the requirements outlined in the LMC Remediation Waste Management Procedure in Appendix B. This plan must be approved by the Lockheed Martin Project Lead.

4.3 WORK INVOLVING AIR EMISSIONS

- 4.3.1 Contractor shall work with the Lockheed Martin Project Lead to identify applicable Federal, state, and/or local permit application requirements for air emission sources (i.e., stationary point source, fugitive emissions, etc.) associated with the anticipated project.
- 4.3.2 Contractor shall submit permit applications and/or notifications to the Lockheed Martin Project Lead for review prior to submittal to the applicable regulatory agency.
- 4.3.3 Contractor shall abide by the requirements of the permit(s) and gather emissions data (as applicable) to document compliance. This data shall be electronically submitted to the Lockheed Martin Project Lead.
- 4.3.4 Contractor shall immediately contact the Lockheed Martin Project Lead in the event permit conditions are not met.

4.3.5 Ensure permits are posted on permitted equipment (or in close proximity) as required by the respective permit.

4.4 WORK INVOLVING WATER DISCHARGES

- 4.4.1 At no time is an unauthorized, unpermitted release allowed. Contractor shall notify the Lockheed Martin Project Lead in the event of a release and obtain the approval of Lockheed Martin before discharging any material into storm drains or sewers.
- 4.4.2 Contractor shall work with the Lockheed Martin Project Lead to identify applicable National Pollutant Discharge Elimination System (NPDES), Stormwater Pollution Prevention Plans (SWPPP), and POTW requirements associated with the anticipated project.
- 4.4.3 Contractor shall submit permit applications and/or Notice of Intent forms to the Lockheed Martin Project Lead for review prior to submittal to the applicable regulatory agency.
- 4.4.4 Contractor shall abide by the requirements of the discharge permit(s) and maintain discharge monitoring information and inspection data to document compliance. This documentation shall be electronically provided to the Lockheed Martin Project Lead.
- 4.4.5 Contractor shall immediately contact the Lockheed Martin Project Lead in the event permit conditions are not met.
- 4.4.6 Ensure discharge permits and/or SWPPP plans (as applicable) are available at the project job site.

5 HOUSEKEEPING / CLEANUP

- 5.1 Contractor shall continuously clean up its respective work area(s). Contractor shall maintain its work areas free from all slip, trip, and fall hazards at all times.
- Debris shall be kept cleared from work areas, passageways, stairs, and in and around buildings or other structures. The work area must be left free from accumulation of waste and rubbish at the end of each work shift.
- 5.3 Combustible scrap and debris shall be removed at regular intervals during the course of work performed by Contractor. Safe means shall be provided to facilitate such removal.
- 5.4 At the end of each working day and/or the conclusion of work being performed, Contractor shall restore the work area to the same degree of neatness as when work commenced.

- 5.5 Contractor shall furnish necessary equipment and/or receptacles to remove waste and rubbish from the job site unless otherwise specified by the Lockheed Martin.
- 5.6 A 6S (Sort, Straighten, Shine, Standardize, Safety and Sustain) or similar program shall be implemented at each site where work is being performed. Refer to Appendix C for the 6S Checklist.

6 CHANGE MANAGEMENT

If deviations are encountered from the field work plan, the contractor shall A) notify to the Lockheed Martin Project Lead and B) suspend work to assess changes to the work plan(s) and the HASP. Changes to the work plan(s) and the HASP shall be reviewed by the PL.

7 REQUIREMENT TO PERFORM & DOCUMENT SELF-AUDITS

- 7.1 Contractor agrees to perform periodic work area/project field inspections to monitor compliance with project environmental, safety and health (ESH) requirements. The name of Contractor's jobsite ESH representative will be provided to Lockheed Martin prior to the Contractor starting work at the jobsite.
- 7.2 For jobs that are ongoing, an annual ESH audit shall be conducted and for jobs with a duration of less than one year at least one audit shall occur. A competent ESH representative designated by the Contractor shall perform the audit. Unsafe acts and/or non-compliance conditions noted during inspections shall be corrected immediately.
- 7.3 The documentation related to the audits and inspections shall be submitted electronically to the Lockheed Martin Project Lead.

8 ACCIDENT, INJURY, ILLNESS, INCIDENT and SPILL REPORTING

- 8.1 Contractor shall immediately contact the Lockheed Martin Project Lead and/or Lockheed Martin Safety & Health Manager in the event of a fatality, injury, environmental release (spill), near-miss incident, or any ESH incident that is likely to generate significant publicity. A written report of the incident/injury/spill/near miss and corrective action(s) taken shall be submitted to the Lockheed Martin Project Lead within one (1) day of the incident. Representatives from Lockheed Martin may conduct joint investigations with the contractor if deemed necessary.
- In case of a spill or release of hazardous chemicals, Contractor shall immediately notify the Lockheed Martin Project Lead, and/or if the severity of the spill warrants, the local fire department by calling 9-1-1. Contractor shall take all necessary steps to control the spread of the release and to provide site control to prevent unauthorized personnel from entering the affected area. The Contractor shall be liable for the costs of any spill resulting from Contractor's actions, including, but not limited to, costs of containment, cleanup, and disposal.

9 FINES, PENALTIES AND COSTS

Ontractor shall indemnify and hold Lockheed Martin harmless from any and all liability (including but not limited to fines and penalties), loss, cost, damage, or expense (including attorney's fees) suffered or incurred by Lockheed Martin by reason of Contractor's failure to comply with Federal, State, municipal, local or other laws, rules, regulations, ordinances and requirements, or failure to comply with generally accepted environmental safety and health practices.

10 LOCKHEED MARTIN ESH MANAGER

The Lockheed Martin ESH Manager is Jimmy Yeager. Contact Jimmy regarding any questions or concerns at (301) 873-1444 or via email at james.l.yeager@lmco.com.

Appendix A – LMC Requirements for Invasive Fieldwork



LMC Minimum Requirements for Inv

Appendix B – LMC Waste Management Procedure



LMC Waste Mgmt Procedure Rev 4

Appendix C – LMC 6S Checklist



6S Checklist Contractor Handbook

Appendix D – LMC ORR Process Documents



ORR Agenda .docx



ORR Checklist Hanbook.xlsx



CONTRACTOR'S ESH HANDBOOK

COMPLIANCE AGREEMENT

The Key National Contractor Program Manager has read and understands the contents of the *Contractor's ESH Handbook*. Contractor agrees while performing work on Lockheed Martinowned or Lockheed Martin-controlled premises, that the Contractor shall require its employees and subcontractors at any tier to comply with the contents of this *Contractor's ESH Handbook* and the job specific HASP. A copy of the HASP shall be maintained at the job site and made readily available to contractor and subcontractor employees for their information. All contractor employees and subcontractors shall read and certify that they have read and understand the job specific health and safety plan (HASP). The certification forms shall be electronically sent to the Lockheed Martin Project Lead.

I further understand that this handbook and the rules and regulations it contains do not in any way relieve the Contractor (employer) of its responsibility to comply with the applicable environmental safety and health (ESH) regulations and its obligation to implement and enforce its own written ESH programs while working on this project.

Company:		
Name:		
Signature:		
Title:		
Date:		

COMPLETE, SIGN AND RETURN THIS CERTIFICATE TO THE LOCKHEED MARTIN ESH MANAGER.

Appendix A

Lockheed Martin Minimum Requirements for Intrusive Fieldwork

Lockheed Martin Minimum Requirements for Intrusive Fieldwork Work Plans

PURPOSE

The purpose of this requirements document is to prevent damage to subsurface and overhead utilities and structures and unexpected chemical releases during ground disturbance activities such as drilling, augering, direct-push technologies, excavation, trenching, chemical injection, grading or other similar operations.

SCOPE

This document provides minimum requirements for subsurface clearance activities, which must be followed prior to and during ground disturbance activities at any Lockheed Martin remediation project sites. Even after completing the subsurface clearance activities identified in this procedure, all ground disturbance activities shall proceed with caution.

This document also provides requirements on implementing in situ chemical injection programs, on managing significant field changes in field work plans and worksite housekeeping.

The Lockheed Martin Project Lead (PL), the managing contractor, and the performing contractor will be responsible for fulfilling the objectives of this document by ensuring that these requirements are carried out by the performing contractor's employees, sub-contractors and their employees and any other persons involved in the intrusive activity. The work requirements outlined below shall be incorporated into the work plan.

WORK REQUIREMENTS

General

The performing contractor's project manager and the supervisor of the intrusive field work subcontractor must review and sign the Risk Handling Checklist and complete Dig Permit found within the Corporate Staff Procedure EO-28, Digging Projects. Requirements and questions within the Risk Handling Checklist including identification of potential failure modes and hazards, traffic control, and excavation requirements shall be addressed in the work plan. In addition to the provisions of CS-28, relevant state, local and facility requirements must be identified in the work plan and in place before initiating any work. CS-28, the Risk Handling Checklist and the Dig Permit are included in Appendix A of this document.

The permit and the checklist shall be completed and approved by the PL before initiating any ground disturbance activities. The PL shall forward these items to the Environment, Safety and Health (ESH) professional, the performing contractor responsible for oversight, and the facility manager, as necessary, for their review.

Utility and Underground Structure Clearance

A utility and underground structure location survey which includes, but is not limited to records research, consultation with site facilities personnel, site inspection to locate physical evidence of underground or overhead utilities or structures and geophysical or other appropriate remote sensing techniques must be performed by a qualified utility location firm at least two weeks prior to initiating any intrusive activities. The survey shall include the appropriate equipment necessary to detect buried foundations and slabs, piping, direct-bury cables and other buried conduits and structures using the technologies appropriate to the anticipated utilities such as electromagnetic detector; ground penetrating radar; acoustic plastic pipe locator; probe, beacon, or trace wire; or cesium magnetometer. A table summarizing applicability of technologies for detecting various utilities is presented in Appendix B.

Because undocumented or inactive utilities can result in problems as severe as or more severe than documented utilities, utility location work must include, at minimum, ground penetrating radar as a screening tool to identify objects that may not be documented on utility record plans and other records.

The utility location/survey firm operators shall have at least 2 years of experience on industrial sites and preferably direct experience on the site under review. The utility survey firm shall be approved by the Lockheed Martin PL.

In addition to the utility survey, the state or other legally-mandated utility clearing organization ("Dig Safe," "U-Dig" or other such organization) having jurisdiction over the region in which the work is to occur, shall be notified within the time period required by that organization, state and local regulations. Even if all of the work is conducted entirely on Lockheed Martin or other private property, the utility clearing organization shall be contacted.

All aboveground indicators of subsurface and overhead utilities/services that may be leading to or from buildings and structures within the planned intrusive work area must be located and marked out in the field. Locations of utilities and structures detected by remote sensing equipment shall also be marked out in the field. Public utility mark-outs by for all exterior locations must be identified within required time period. Physical evidence of underground or overhead utilities may include, but is not limited to lights, signs, telephone systems, drains, electrical junction boxes, manhole covers, valve boxes, hand holes, pavement patching or other evidence of prior excavations, and natural gas meters.

The contractor shall make all efforts to avoid known or observed utilities in planning the work. If, however, subsurface structures are known or observed by geophysical survey within five feet of the work area and the work area cannot be moved, the performing contractor and/or its subcontractor shall carefully excavate to within two vertical feet of the expected top of the utility, then hand dig, air lance or otherwise gently remove the remaining soil to expose the utility. Additional precautions shall be described in the work plan if the intrusive work is to be performed in frozen soils.

The performing contractor must witness the utility clearance work to verify that the expected scope is performed and be available to work with the utility location contractor to answer questions and facilitate additional research or discussions with site facilities personnel.

The utility clearance contractor's report must include details concerning the methods used to locate utilities and documentation of how specific utilities were located in plan and depth, including a copy of instrument output when instruments producing output are used. It is not sufficient for the report to merely state that the utilities on the site plan were verified or that no utilities were found without providing supporting documentation.

Pre-Planning for Soil Fracturing and In Situ Injection Work

If subsurface disturbance activities such as soil fracturing or geophysical techniques that significantly alter the natural soil conditions are to be employed, the utility location survey shall be conducted at least one month prior to any chemical injection. Attention must be given not only to the locations of utilities and underground structures but also to the fact that utilities, structures and earth bedding can provide short-circuit pathways for the injected substance to travel significant distance to be intercepted by other utilities (sewers and drains), to be accumulated in undesirable locations (manholes or handholes) or to be discharged to surface waters.

Additionally, an aquifer assessment should be conducted to determine the nature of the aquifer receiving the chemical injections before and after any subsurface disturbance is conducted. Calculations and chemical injection volumes shall be determined as to what volume of chemical would be expected to fill the opened up pore space. An evaluation must be made of the quality and quantity of the data and assumptions that form the basis for design. Examples of typical data requirements that form the basis for design include aquifer

transmissivity, soil type, effective porosity, contaminated thickness, presence of confining layers, potentiometric surface configuration, and ambient groundwater flow velocity.

Upon completion of soil fracturing, the field data collected shall be thoroughly reviewed and assessed relative to the types and sizes of the resultant fractures and potential connection of fractures to short circuit migration pathways. Injection can proceed only after this review is completed and appropriate monitoring and contingency measures are in place to detect and prevent unwanted migration of injected medium.

A technical expert in the injection technique shall be employed and fully integrated in the project team. The PL will have responsibility for engaging the technical expert. This expert will be part of the managing contractor staff and shall have responsibilities including reviewing and approving the technical and functional requirements, the design, the work plan, and the injection procedures. This expert will engage with the PL to ensure that all potential failure modes and effects have been identified and mitigation strategies employed as necessary. The failure modes and mitigation strategies shall be documented and submitted to the PL for records retention.

Field Implementation Activities

All field personnel must review the approved work plan, subsurface utility location survey data, and related information prior to becoming involved in subsurface disturbance/intrusive activities. The field personnel must sign the authorization form in Appendix C indicating their review. This form shall be scanned and electronically submitted to the PL once all personnel have signed the form.

Change Management

Significant changes made during the field implementation should be avoided as much as possible. If such changes are required to the field work plan, the program should be temporarily suspended as long as is necessary so that effectiveness and unintended consequences can be thoroughly evaluated by the project manager, PL and performing contractors (including specialty subcontractors) and the necessary equipment and procedural changes can be developed, communicated, approved and implemented. The PL should be contacted immediately and the performing contractor overseeing the work shall be included in any decisions to modify the approved work plan.

In Situ Injection Implementation

If soil fracturing is required before chemical injection, injection can proceed only after review of the fracture patterns is completed, as stipulated in the "Pre-Planning" section and appropriate monitoring and contingency measures are in place to detect and prevent unwanted migration of injected medium. The contingency measure shall be outlined in the work plan. If monitoring shows that the injected compound is detected in unwanted locations (such as a storm drain or sewer), injection shall be halted and measures taken to prevent further unwanted migration.

The chemical injection method should be thoroughly defined in the work plan and followed during the field implementation program. If chemical daylighting (surface leaks from subsurface injections) or seeps are observed the injection should be immediately stopped. The surface leaks should then be properly contained to prevent runoff and allowed, if feasible, to percolate back into the subsurface. As a result of this condition, subsequent injection rates should be reduced by at least 20% or until chemical daylighting is no longer observed.

In most cases, low pressure methods should be employed whereby gravity or low flow recirculation systems are established to let the chemical slowly percolate into the subsurface. In no case should the injection pressures at or near the surface be greater than the available water table elevation distance to the ground surface unless approved by the PL or the PL's designated representative. Water table elevation changes as a result of chemical injections must be monitored and kept to a minimum as much as practicable.

Spill Prevention, Containment, Cleanup and Reporting

Chemicals stored onsite, including oil and fuels, reagents, injection medium, shall be placed in vessels within 110% volume secondary containment. Good housekeeping procedures must be practiced. Even benign reagents are contaminants if they migrate to a sensitive receptor. In no case should incidental spills or transfer leaks be tolerated on the site. All spills must be contained, cleaned and reported immediately to the site's spill response coordinator and the Lockheed Martin PL. Local storm drains should be temporarily plugged or booms or berms be placed to divert storm water flow from the storage area away from active storm drains.

DEVIATIONS

All deviations from this procedure must have prior approval by the Director of Environmental Remediation. The approval shall be documented and uploaded to the Lockheed Martin Document Management System.

APPENDIX A









APPENDIX B



Utility / Underground Structure Clearance 7

APPENDIX C



Invasive Fieldwork Authorization

Appendix A

Enterprise Operations Procedure EO-28

Dig Permit - Form EO-28-01

Risk Handling Checklist – Form EO-28-2



Enterprise Operations Procedure EO-28
Revision No: Original
Effective: January 26, 2009
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Current policies and procedures are on the Lockheed Martin Intranet

Digging Projects

Form EO-28-1, Dig Permit | Form EO-28-2, Risk Handling Checklist

1.0 Applicability

This procedure applies to digging projects at facilities operated by Corporate Headquarters or Enterprise Business Services (collectively, "Enterprise Operations"). A "digging project" or "dig" is any subsurface excavation, including trenching. Small areas of hand excavation (less than four inches deep), where the excavated material is put back in the same location, are not considered digs and are excluded from this procedure.

2.0 Purpose

To prevent facility damage, minimize disruptions to operations, provide for the proper handling of environmental issues, and ensure that digs are properly coordinated and safely performed.

3.0 Implementation

- 3.1 The Project Manager (the Lockheed Martin employee responsible for the dig) will complete the activities below before the dig begins:
 - Coordinate with Enterprise Operations Environment, Safety & Health (ESH), who will review the project plans for environmental risk and develop handling plans as required, obtain any environmental permits required by law or regulation, and determine the method of soil disposal when part of the project.
 - Have the local utility identification service and Lockheed Martin organizations such as Telecommunications identify and mark underground utilities/obstacles within 10 feet of the dig area.
 - Prepare and sign form EO-28-1, Dig Permit. Obtain signatures from the Building Facility Manager, local internal customers, Telecommunications, and ESH.
 - Review and sign form EO-28-2, Risk Handling Checklist.
 - Meet with the contractor or Lockheed Martin organization that will perform the dig to communicate the location of underground utilities/obstacles; ensure that appropriate safety
 precautions such as those in EO-20, Contractor Requirements, have been taken; and identify any state or local requirements, customer direction such as launch lock-down
 periods, or other conditions that will affect the dig.
 - Inform Industrial Security of the dig and support requirements such as traffic control.
 - Put barricades around the excavation site to prevent unauthorized persons from approaching. Put warning lights around the site if the excavation will remain uncovered at night, unless the dig location does not warrant warning lights.
- 3.2 Lockheed Martin employees must not dig or enter any excavation that is more than four feet deep.
- 3.3 As applicable, ESH will monitor the dig for environmental compliance, and oversee the implementation of risk handling plans, and disposal of soil
- 3.4 When the dig is complete, the Project Manager will inform the individuals who signed the Dig Permit.

4.0 Responsibilities

Building/Facility Manager

4.1 Have overall approval authority and responsibility for dig projects.

Project Manager

- 4.2 Ensure that the dig complies with this procedure.
- 4.3 Retain the Dig Permit and Risk Handling Checklist until the project is complete. Any other permits related to the dig must be retained in accordance with RM-001, Corporate Records Retention Schedule.

Contractors

4.4 Are responsible for ensuring that their work complies with OSHA regulations.

5.0 Deviation

Any deviation from this procedure requires the prior approval of the Vice President Human Resources Enterprise Operations or designee.

//s// Kimberly S. Adams

Vice President Human Resources Enterprise Operations



Dig Permit

See Enterprise Operations Procedure EO-28, Digging Projects, for instructions.

Date	Projec	t Manager				
Building/Location						
Purpose of excavation						
a a possible of one a value.						
Company/LM organization perform	nina dia					
	99					
Planned dig date		Duration		Start time		
Trainied dig date		Duration		Otari timo		
Expected depth		Width		Length		
Ехрестеа аертп		vvidin		Lengin		
					-	
Underground utilities identified?	Overhead		Electrical lines?		Gas lines?	
☐ Yes ☐ No		No □ N/A	☐ Yes ☐ No		☐ Yes ☐ No	
Sewer?	Water?		Telecommunications?		Other? Specify:	
☐ Yes ☐ No	☐ Yes ☐	No	☐ Yes ☐ No		☐ Yes ☐ No	
Site-specific or customer utility loc	ating require	ements completed?	1			
☐ Yes ☐ No ☐ N/A						
Sketch of dig project (or attach dra	wing)					
		1	I a .			Ι = .
Project Manager		Date	Customer			Date
Telecommunications		Date	Customer			Date
ESH		Date	Customer			Date
Building/Facility Manager		1	<u>I</u>			Date
						•



Risk Handling Checklist

Project Manager: Use this checklist to develop risk handling plans before the dig starts. You must also review Enterprise Operations Procedure EO-28, Digging Projects.

	What Lockheed Martin processes could be affected by the dig?				
v	What are the safety hazards?				
tion	☐ What could fail?				
nes	How could it fail?				
General Questions	Does the area need to be returned to its normal state when the work is complete?				
ene	How could the dig affect operations/test/production?				
0	Have potential risks been addressed with area management?				
		Am I comfortable with any risk handling plans, understanding the potential impact?			
_		Ensure proper signage and communication.			
Traffic Control		Coordinate road or access closures through Industrial Security before starting the dig.			
ပ္ပို		Ensure the work area is isolated from foot traffic by placing barriers and warning lights as required by EO-28	3.		
raffi		Ensure that vehicle traffic will be safe.			
-		Ensure that product transport will be safe.			
		Review facility drawings to identify utilities. Research old drawings as necessary.			
		Discuss the project with Facility Engineering/Maintenance staff who may have unique knowledge about the documented in facility drawings.	construction area not		
		Process form EO-28-1, Dig Permit. Use this opportunity to explain the process and relate expectations to the organization that will perform the dig.	e contractor/LM		
	Have LM Telecommunications and the local utility identification service locate and mark utilities/underground obstacles.				
	Coordinate with other ongoing projects in the affected area.				
	Make every effort not to excavate around live utilities in service. Schedule an outage in advance or have Maintenance temporarily shut down and isolate the utilities while excavating.				
	If live utilities cannot be shut down while excavating, know where to isolate or shut them down if they are damaged while excavating.				
ation	Have a spotter(s) work with the equipment operator. Hand dig when necessary.				
Excavation	Excavate along the side of the utility; not on top.				
Ä	Weather may affect the dig. Ensure water pipes are protected during freezing weather, especially if the trench will be left open over night. Rain may cause the side of the trench to slough, which can undermine and break pipes/conduit.				
	Ensure care when moving trench boxes in and out of trenches so pipes/conduit aren't damaged by the boxes.				
	Ensure surface drainage is controlled so that water doesn't get into the excavation and undermine soil supporting utilities.				
	Ensure stocked material is kept far enough back (minimum 2 feet) so that material and rocks don't fall on utilities in the open hole.				
	Ensure backfilling is done carefully: Re-bed utilities with proper material, filling all voids below. Keep inappropriate material from falling on or being placed in the trench. Be careful when compacting backfill in the two feet directly above the utility.				
	Keep the as-built utility drawing in the field while the excavation site is open. Take pictures if possible (horizontal alignment and elevations), if known utilities deviate from facility drawings or if utilities are found that are not on facility drawings. Give the modified asbuilt drawings to the Building/Facility Manager, who will update the drawing database.				
•		Ensure that the equipment operator digs slowly and remains in control.			
nal ty		Ensure that trenching and shoring methods comply with the applicable OSHA regulations and are overseen as defined in those regulations.	by a "Competent Person,"		
Personal Safety	Regularly inspect methods to prevent violations.				
٠. ت	Ensure LM employees do not dig or enter any excavation that is more than four feet deep.				
Proje	ct Ma	nager signature indicating completion of checklist review	Date		

<u>Appendix B</u>

Utility/Underground Structure Clearance Chart

NOTE: Each project may have unique conditions, therefore do not use this chart as the sole decision criteria for technology selection. Use the chart as a starting point to assess available technology(s) applicable.

KEY	Description
Green	Generally and applicable technology
Yellow	May or may not be applicable
Red	Not generally applicable
*	Indicates best technology for given object. Site structures, rebar in concrete, etc. can significantly affect performance and reliability of any electromagnetic method.
	Metallic lines that have power running through them or can be connected to a tracer signal generator.
•	Natural gas pipeline locating technicians must be trained/certified. US requires DOT, Office of Pipeline Safety Standards.
∇	Most sensitive to interpretation; the skill, training, and experience of the operator are critical.
=	Emerging technology with limited availability.
+	Access: induce unique electronic signature, apply acoustical impulse, or insert probe/beacon/sonde.

Subsurface Mark-out Technology Application Chart

Technology →	Electro-	Ground Pentrating	Acoustic Plastic	Probe, Beacon	Cesium
	Magnetic	Radar	Pile Locator	Sonde, or Trace	Magnetometer ≡
Object ↓	Detector	(GPR) ∇		Wire	-
Power/Instrument Line	*				
(Energized/Signaled □)	G	Υ	R	R	Υ
Power Line		*			
(Non-energized)	Y	Υ	R	R	Y
Sewer/Water Line	*	> 12" diameter G			
(Metalllic)	G	< 12" diameter Y	Y	G	Y
Sewer/Water Line		> 12" diameter G		*	
(Non-metallic)	R	< 12" diameter Y	G	G	Y
Instrument/Telecomm					
Lines (non-energized)	R	R	R	R	R
Natural Gas Line	*	> 12" diameter G			
(Pipeline) ♦	G	< 12" diameter Y	R	R	G
Metallic/Non-metallic	*	> 12" diameter G			
Line (w/ Tracer Wire)	G	< 12" diameter Y	Y	Y	Y
Metallic/Non-metallic		> 12" * diameter G			
Line (w/o Tracer Wire)	R	< 12" * diameter Y	Y	Y	R
Metal UST	*	*			
	G	G	R	R	G
Fiberglass UST		*			
	R	G	R	R	Y

Additional Considerations

Technology →	Electro-	Ground Pentrating	Acoustic Plastic	Probe, Beacon	Cesium
	Magnetic	Radar	Pile Locator	Sonde, or Trace	Magnetometer ≡
Variable ↓	Detector	(GPR) ∇		Wire	
Moist Soil	G	Y	G	G	Y
Dry Soil	Y	G	Y	G	G
Clay	Y	R	G	G	Y
Concrete w/Rebar	R	Υ	G	G	R
Long Horizontal Profile	G	G	G	G	G
Short Horizontal but					
Deep Vertical Profile	Υ	G	R	R	G
Access to Line +	G	N/A	G	G	N/A
No Access to Line +	Y	G	R	R	G
Ferrous Metal	G	G	G	G	G
Non-Ferrous Metal	Y	G	G	G	Y

Appendix C

Lockheed Martin Invasive Fieldwork Authorization Form

Lockheed Martin Invasive Fieldwork

Fieldwork Description:				
By signing this form, you are indicting that you have reviewed the field work plan, utility location survey data, and Health and Safety Plan relevant to the project listed above.				
Name:	Date:			
1				
2				
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15				
16				

This form shall be scanned and electronically submitted to the Lockheed Martin Project Lead.

Appendix B

EESH Remediation Operating Procedure No:

EROP-03, (also included in the Middle River Complex Waste Management Plan in Appendix F)

Corporate Energy, Environment, Safety, & Health EESH Remediation Operating Procedure No: EROP-03

Effective: 04/17/2009 Revision No.: 4

Subject: EESH Remediation Waste Management

Ref: 1. Code of Federal Regulations, Title 40, Parts 260, 261, 262, 264, 265, 268, 761, and 763

- 2. Code Federal Regulations, Title 49, Parts 100 through 180
- 3. Corporate Functional Procedure No: ESH-06
- 4. Corporate Functional Procedure No: ESH-08
- 4. Corporate Policy Statement 527

1.0 Purpose

This procedure establishes practices for management and transportation of solid and hazardous waste (waste in this context also refers to DOT hazardous materials) generated at remediation project sites in a manner that complies with Subtitle C of the. Resource Conservation and Recovery Act (RCRA), Department of Transportation (DOT) regulations, and similar state and/or host country waste regulations. Additionally, this procedure ensures waste disposal is managed in accordance with Corporate Functional Procedure ESH-06 and ESH-08, and records retained in accordance with Corporate Policy Statement 527.

2.0 Applicability

This procedure applies to the Energy, Environment, Safety and Health (EESH) Remediation Organization (the Organization) and to the remediation projects for which the Organization has waste management responsibility. Each member of the Organization, including IWTA, contractor staff and, where applicable, support organizations (e.g. Global Supply Chain Management), is responsible for execution of this procedure.

The materials to which this practice applies are solid wastes generated as a result of remediation project activities, including such things as investigation derived waste, environmental sampling, treatment of contaminated media, and routine operations and maintenance, unless such solid waste is exempt under applicable regulations.

3.0 Key National Agreement

Waste management requirements shall be included within the EESH Key National Agreements (KNA). The KNA establishes the requirements under which Remediation Contractors perform work for Lockheed Martin.

The KNA will stipulate that the Remediation Contractor shall comply with Lockheed Martin waste management, transportation, and disposal requirements and all applicable state, federal, and/or host country laws and regulations.

4.0 Statement of Work Requirements

4.1 Waste Management Plan

All remediation project statements of work that include the generation of solid waste, excluding office trash (e.g. food wastes, consumer packaging) that may be disposed of at a municipal solid waste facility, shall include a requirement for the waste management contractors (i.e. Remediation Contractors and/or Corporate Approved Waste Management Vendors) to submit a waste management plan to Lockheed Martin. A site specific waste management plan shall be prepared that identifies all potential solid waste streams that may reasonably be expected to be generated or discovered during project activities. The plan will address the required elements listed below; however, if the waste is determined to be non-hazardous following completion of Element A, then only the additions of Elements D and E are required.

Element A) Hazardous Waste Determination

- i) Listing assessment (See Attachment #1 Waste Listing Assessment Form)
- ii) Characteristic determination

Hazardous waste determinations shall be made in accordance with 40 CFR 262.11 using a combination of process knowledge and/or analytical evaluation of waste sampling. Hazardous waste determinations shall be reevaluated whenever any of the following circumstances occur:

- A change in the process that produces the waste (e.g. a new chemical constituent is discovered, the treatment process changes);
- A change in the treatment media is made (e.g. new media vendor or media type);
- A waste was tainted by inadvertent mixing with another waste; or
- A change occurred to the hazardous waste regulations that apply to that waste.

Characteristic waste determinations based on analytical sampling shall be reevaluated at some reasonable frequency to verify the accuracy of the initial waste determination. The waste determination reevaluation frequency for ongoing remediation or treatment operations should be specified in the waste management plan and be profiled at least once a year.

Element B) Responsibilities and Training Requirements

i) Contractor staff responsibilities with regard to waste management and training requirements necessary to comply with Section 6.0 and all state, federal, and/or host country laws and regulations. Contractor training certifications shall be provided electronically to the Lockheed Martin Project Lead.

Element C) Pre-Shipment Requirements

- i) Material identification and classification per DOT requirements
- ii) Packaging, storage, segregation, marking, labeling, and accumulation of waste
- iii) Waste shipment documentation
 - (1) Hazardous Waste Generator Identification Number

- iv) Hazardous Material Transportation Plan
 - (1) Hazardous material transportation risk identification, prioritization, and mitigation plan
 - (2) Emergency Response (material information to be provided with shipments, actions to be taken in the event of an incident, staffing the emergency response phone number)
 - (3) Hazmat Security Plan (as required based on thresholds outlined in 49 CFR §172.800)
 - (4) Transportation and disposal logistics

Lockheed Martin Project Leads shall ensure the use of the Lockheed Martin Corporate Purchasing Agreements and the associated <u>Corporate Approved Waste Management Vendors</u> (WMV) for hazardous waste management and ensure that waste is transported to a treatment, storage, and disposal (TSD) facility on the <u>Lockheed Martin Corporate Hazardous Waste Approved Vendors List</u> as outlined in the ESH-06. Remediation contractors can contract directly with the WMV.

Additionally, hazardous waste manifests shall be signed only by a DOT trained and qualified Lockheed Martin employee or authorized designee (See Attachment #2 – Hazardous Waste Manifest Authorization Form). In addition to completing the Authorization Form, Project Leads shall verify that the designee is DOT trained and qualified to sign manifests and has adequate DOT experience. It is preferable to have contractors designated to sign that are involved in the waste characterization and oversight. For contractor personnel handling hazardous waste, appropriate hazardous waste handling training shall be provided by the contractor as outlined in Section 6.0 and complying with all state, federal, and/or host country laws and regulations.

Non-hazardous waste is not required to be managed by Corporate Approved Waste Management Vendors but shall be transported to an <u>approved industrial waste disposal</u> facility as outlined in ESH-06.

Within the United States, waste shall be characterized and disposed in accordance with the state regulations where it was generated unless the state requirements are less stringent than the federal requirements. For instance, California non-RCRA hazardous waste cannot be disposed of in a non-hazardous waste facility. Within a host country, waste shall be managed in accordance with the host country regulations; however, if the host country standards are less stringent than those of the US Environmental Protection Agency (EPA), than the EPA standards shall apply.

Element D) Shipping Requirements

- i) Manifest certification and accuracy verification of physical waste shipment against manifested waste shipment (for non-hazardous waste this may not be applicable)
 - (1) For hazardous waste, the contractor responsible for waste shipment shall utilize the Lockheed Martin Hazardous Material/Waste Shipment Checklist (see Attachment #3) during the preparation and pre-transport review of waste shipments and submit a completed electronic copy to the Lockheed Martin Project Lead with the shipping documentation.

ii) For non-specification bulk containers (e.g. dump trucks and roll-offs), the contractor responsible for waste shipment shall adhere to the Lockheed Martin requirements for packing and closing (see Attachment #4). These requirements are meant to supplement the applicable regulations.

Element E) Post Shipment Requirements - Records

i) Waste characterization, chain of custody, transportation, and destruction records shall be scanned and electronically submitted to the Lockheed Martin Project Lead for records retention. This shall include profile sheets, the Hazardous Material/Waste Checklist, the generator copy of the waste manifest, a copy of the TSD signed waste manifest, Land Disposal Restriction forms, and certificates of waste destruction where applicable. For finite-duration remediation projects, waste transportation and disposal records shall be submitted to the project lead at the completion of the project unless submittals are required by regulatory agencies on a more frequent basis. For recurring remediation project activities such as annual groundwater monitoring or groundwater treatment, these records shall be submitted for each year's waste generation activities in the first quarter of the following year or per the Project Lead's direction.

The waste management plan shall be submitted in a phased approach. The first section of the waste management plan will provide the hazardous listing assessment and the characteristic determination methodology (addressing Element A). This section of the plan shall be submitted in a timeframe that allows for Lockheed Martin's review prior to waste generation. Upon approval to proceed, the second section will document the waste profiling results and must be signed off on by a Lockheed Martin Project Lead. Additionally, it shall outline the logistics for waste handling, transportation and disposal (addressing Elements B through E). This section of the plan shall specify a reevaluation frequency for waste generated as a result of ongoing remediation or treatment operations.

Following the approval of the second section by the Lockheed Martin Project Lead, the waste management contractor shall implement the waste management plan. This plan shall be updated when the remedial treatment system process, waste stream, media, or regulations change.

4.2 Health and Safety Plan

For remediation sites managing waste, a section shall be included in the site Safety and Health Plan to address the safety and health requirements for managing the site specific waste.

4.3 Electronics and Scrap Metal Recycling

Where applicable and feasible, electronics and scrap metals shall be recycled or refurbished to the extent possible in accordance with ESH-06.

5.0 Responsibilities

5.1 Project Lead

The Project Lead shall:

- Ensure that all remediation projects for which they have responsibility have a waste management plan as outlined in Section 4.0. Review and ensure updates are completed as necessary. Plans must also be submitted to the Records Manager for upload to the Document Management System (DMS).
- Consult with Corporate EESH Legal as needed to verify the listing determination.
- Ensure that the Contractor has outlined the applicable training requirements and provided a training plan or statement of completion within the waste management plan.
- Verify that the site has a Hazardous Waste Generator Identification Number prior to hazardous waste shipments, where applicable.
- Ensure that all hazardous waste manifests are signed and certified by a Lockheed Martin employee or authorized designee. For non-hazardous waste, there are no signatory requirements for waste manifests.
- Ensure that non-hazardous or hazardous waste is shipped to an approved facility per ESH-06 and that the Corporate Approved Waste Management Vendors are being used for hazardous waste transportation, storage, and/or disposal services.
- Ensure receipt of the waste characterization, chain of custody, transportation, and destruction records, where applicable, and submit them to the Records Manager for upload to the DMS.
- Ensure that the required regulatory and state hazardous waste reports are submitted (e.g. biennial waste reports).

5.2 Remediation Global Supply Chain Management Representative

The Global Supply Chain Representative shall:

- Ensure that the KNA includes the requirements defined in Section 3.0.
- Send the Remediation Contractors an updated version of the approved non-hazardous facility list quarterly.
- Send the Corporate Approved Waste Management Vendors an updated version of the Lockheed Martin Corporate Hazardous Waste Approved Vendors List quarterly.

5.3 Corporate EESH Legal

The Corporate EESH Legal Counsel shall:

- Provide the Project Lead with support when making listed waste determinations.
- Notify the Project Leads of regulation changes that would affect prior listing determinations.

6.0 Training Requirements

The EESH remediation staff training requirements are summarized in Table 1.

6.1 RCRA Hazardous Waste Handling and Emergency Procedures

RCRA Generator Status Facilities

Generators who generate more than 1,000 kg/month of hazardous waste (or more than 1 kg/month of acutely hazardous waste) must comply with the emergency preparedness and personnel training requirements outlined in 40 CFR §265.16 (see 40 CFR §262.34(a)(4)). This training is intended for all facility personnel including the generator's contractors and includes training by a qualified person on hazardous waste management and emergency response procedures. Personnel shall receive an annual refresher. Project Leads are responsible for ensuring this training is provided to contractor staff on remediation projects that meet this generator criterion. Contractor personnel training records must also be maintained by the Project Lead.

"Small quantity generators" who generate greater than 100 kg but less than 1000 kg/month of hazardous waste, must comply with the emergency preparedness and personnel training requirements at 40 CFR §262.34(d)(5). These generators "must ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures, relevant to their responsibilities during normal facility operations and emergencies" (40 CFR §262.34 (d)(5)(iii)). Project Leads shall ensure that all contractor staff has had the appropriate hazardous waste handling and emergency procedure training on remediation projects that meet this generator criterion.

Federal training requirements do not apply to remediation projects that generate less than 100 kg/month of hazardous waste. However, Project Leads shall ensure that the contractor staff is familiar with hazardous waste handling and emergency procedure training appropriate for waste management.

RCRA Permitted or Interim Status Facilities

Permitted or interim status facilities must follow training requirements in accordance with 40 CFR §264.16 and 40 CFR §265.16, respectively (the same requirements apply as outlined in the first paragraph under Section 6.1).

Additional training may be required by state and/or host country hazardous waste regulations. Any such additional training shall be verified and implemented by the Project Lead.

6.2 Department of Transportation Training

Department of Transportation (DOT) Hazmat Employee training is required for a person involved in shipment preparation, offering for transport and transportation of hazardous waste, including signing of hazardous waste manifests (see 49 CFR 172, Subpart H). All Lockheed Martin Remediation representatives, designees, and/or waste management contractors shall complete the hazmat employee training and renew the training as necessary to meet DOT requirements for hazardous waste transportation.

6.3 OSHA HAZWOPER Training

All contractors working on Lockheed Martin remediation sites shall complete the appropriate OSHA hazardous waste operations (HAZWOPER) training and annual refresher training specified in 29 CFR §1910.120. Lockheed Martin employees managing projects where hazardous waste is generated shall complete the 24 hour OSHA HAZWOPER training and annual refresher training.

7.0 Deviations

All deviations from this procedure must have prior approval by the Director of Environmental Remediation. The approval shall be documented and uploaded to the DMS.

Table 1

EESH Remediation Staff Waste Management Training Matrix Function Task Training Required Required Required

Function	Task	Training Required	Requirements
EESH Remediation Employees	Completing / Approving Waste Determinations	RCRA Generator Training	Refresher every 5 years
(including IWTA and managing contractor staff (where the task description matches responsibilities))	Managing Remediation Sites where Hazardous Waste is Generated	OSHA HAZWOPER 24 HR	8 hr refresher annually
	Managing Hazardous Waste Shipments	DOT HazMat Certification (see Table 2)	Refresher every 3 years

The Lockheed Martin Project Lead shall update the Remediation Waste Management Training Matrix located on the <u>Remediation Process Asset Library</u> once training has occurred. All training and certification documentation will reside on the Remediation DMS under Training Records.

Table 2

EESH Remediation Staff DOT Requirements for Hazmat Employees Requirement Completion N

	- · · · · · · · · · · · · · · · · · · ·
Requirement	Completion Method
General Awareness [49 CFR 172.704(a)(1)]	 Vendor (e.g. Lions) provided Hazardous Materials Transportation Workshop DOT OJT (taught by EESH DOT SME)
Function-Specific [49 CFR 172.704(a)(2)]	 Vendor (e.g. Lions) provided Hazardous Materials Transportation Workshop DOT OJT (taught by EESH DOT SME)
Safety [49 CFR 172.704(a)(3)]	 Vendor (e.g. Lions) provided Hazardous Materials Transportation Workshop DOT OJT (taught by EESH DOT SME) Hazwoper 24 Hour Training Site specific safety training [NOTE: This element of safety training may be fulfilled through completing any one (1) of the following three (3) options which provides the required site specific safety information: 1) Site Safety Plan Review, 2) Site HazCom/ General Employee Training or 3) Site Visitor Safety Briefing/Training. The source of the training must be entered as part of the information on the test which is administered for site specific safety training.]
Security Awareness [49 CFR 172.704(a)(4)]	 Vendor (e.g. Lions) provided Hazardous Materials Transportation Workshop DOT OJT (taught by EESH DOT SME) Site specific security awareness training [NOTE: This element of security awareness training may be fulfilled through completing any one (1) of the following three (3) options which provides the required site specific security information: 1) Site Security Plan Review, 2) Site HazCom/General Employee Training or 3) Site Visitor Security Briefing/Training. The source of the training must be entered as part of the information on the test which is administered for site specific security training.]
In-Depth Security (Hazmat Security Plan) Only applicable when haz material/waste meets certain class and volume thresholds (reference Section 4.1, Element C, iv, 4) [49 CFR 172.704(a)(5)]	Site Hazmat Transportation Security Plan Training

The EESH DOT SME will certify EESH Remediation staff members as DOT Hazmat Employees on behalf of Lockheed Martin once training and safety and security tests have been completed.

Waste Listing Assessment Form



Attachment #2

Hazardous Waste Manifest Signature Authorization Form



Attachment #3

Hazardous Material/Waste Shipment Checklist



Attachment #4

Non-Specification Bulk Container Packing and Closing Instructions



Waste Listing Assessment Form

Waste Listing Assessment Form					
LMC Remediation Project Description of Waste Generic Name		State Generated Solid, Liquid, Gas Additional Info.			
Date of Waste Generation		Ongoing (Y/N)?			
Description of Process Generating Wast	e				
Listed Waste ? (Y/N)	F,K, P or U Codes				
Justification for Waste Classification (at	tached supporting documentation)				
Completed Compa D					

Hazardous Waste Manifest Signature Authorization Form

Lockheed Martin Hazardous Waste Manifest Signatory Authorization

This Authorization Agreement, effective for the remediation site and period of performance written below, is entered into by and between:

LOCKHEED MARTIN CORPORATION (hereinafter "Lockheed Martin"), having a business office at 6801 Rockledge Drive, Bethesda, Maryland 20817

(hereinafter "	")
having a business office at	
	(company representative) of
	Hazardous Waste Manifests on behalf of and hazardous waste, as defined at 40 CFR Pt.
Remediation Site:	
Site Address:	
Period of Performance: Hazardous Waste Description:	
	ity and Location:

This Authorization Agreement certifies that the representative signing on behalf of Lockheed Martin has taken the appropriate Department of Transportation training, as delineated at 49 CFR Part 172 *t seq.* to sign Hazardous Waste Manifests and is in compliance with all state and federal requirements for hazardous waste manifesting.

Lockheed Martin shall remain responsible and liable for the hazardous waste being disposed regardless of the Signatory Authorization provided herein.

LOCKHEED MARTIN CORPORATION	
By:	Ву:
Name:	Name:
Title:	Title:
Date:	Date:

Attachment #3 Hazardous Mat

Hazardous Material/Waste Shipment Checklist

	CKITEEU Martin Hazardous Material/Waste Oripinent Orieckiist
Pr	ite: oject Site Name: ipping Document No.:
A.	DESCRIPTION A1. UN/NA Identification Number, Proper Shipping Name, Hazard Class/Division Number, Packing Group A2. Subsidiary hazard class(es) or division number(s), if any, in parenthesis A3. Total Quantity of Material A4. 24-Hour Emergency Phone Number and Response Information ERG No.: A5. Page of Pages, for multiple shipping papers/EPA Manifest/Air Decs. A6. Shipper's Certification, as applicable A7. Small Quantity Exception/Dangerous Goods In Excepted Quantities/Diagnostic Specimen/Sample
B.	ADDITIONAL DESCRIPTIONS - GENERAL B1.
C.	MARKING FOR NON-BULK PACKAGINGS C1. Proper Shipping Name, UN/NA Identification Number C2. (technical name) C3. (EPA waste identification number) C4. "RQ" C5. Exemption Packagings "DOT-E-ex.#" C6. Consignee's Name & Address C7. Net or Gross quantity for non-rad Dangerous Goods (adjacent to PSN & UN#) C8. Ltd. Qty - PSN only per 172.301(a)(1) or UN ID# placed in square-on-point border per 172.315 C9. Package Orientation Arrows, for liquids in inner packagings C10. "Inhalation Hazard", unless these words appear on the label prescribed in 172.416 or 172.429 C11. "Overpack" adjacent to proper shipping name marking [see 173.25(a)(4)] C12. TSCA PCB Marking (for actual or source concentration greater than or equal to 50 ppm *) (* Note Potential Vehicle Marking Requirements in 40 CFR 761.40)
D.	MARKING FOR BULK PACKAGINGS (DUMP TRUCKS OR ROLL-OFFS) D1 UN/NA Identification Number on orange panel or placard or white square-on-point display configuration as prescribed by 172.302 and 172.332
E.	LABELING E1 Primary Hazard Label(s): E2 Subsidiary Hazard Label(s) with class/division: E3 Hazardous Wastes Label(s)
F.	PLACARDING F1. 172.504 Table 1 Materials - Any Amount F1.1 Dangerous When Wet (4.3) F1.2 Poison (6.1, Inhalation Hazard, Zone A or B)* (Primary or Subsidiary (*Materials subject to the "Poison-Inhalation Hazard" notation must be placarded with a POISON INHALATION HAZARD or POISON GAS placard, as appropriate, and also placarded for any other hazard class required for that material in 172.504) F1.3 Radioactive (7, LSA/SCO Exclusive Use Shipments) F2. 172.504 Table 2 Materials - 1,001 lb:
G.	PACKAGING
	G1 Container Type: (Inner Pkg)

Page 1 of 2 March 2009

Lockheed Martin Hazardous Material/Waste Shipment Checklist

G2	Container Type: (Outer Pkg)	
G3.	Container Type: (Bulk Pkg)	
G4	Loaded and Closed As Required	_

Co	mpl	eted By:	Company:	Date:
	I2. I3. I4. I5.	I2.2. "Radioactive"; "Radio I2.3. Package Certification I2.4. IP-1, IP-2, IP-3 markir I2.5. "USA" on all IP and Ty I2.6. Packaging manufactur LABELING I3.1. Radioactive Labels I3.2. "EMPTY" Label I3.3. "Radioactive Material, PLACARDING (172.504 TABLE I4.1. Radioactive (7, LSA/S PAPERWORK AND MISCELLA H1. Instructions for Mainte H2. Radioactive Excepted H3. Limited Quantity Radio H4. Health Physics Informa H5. NRC Manifest #540 for	s), per 173.435 Form, if not special form plicable ent" CKAGINGS pactive material packages in excess of 110 lb active – LSA"; "Radioactive – SCO" Number, for radioactive material packages, as ags ape A packagings arer marking on Type A Excepted Package" handling label 1 MATERIALS - ANY AMOUNT) CO Exclusive Use Shipments) NEOUS ITEMS anance of Exclusive Use Shipments Package statement per 10.8.8.3.3 on Airway Beactive Material for multiple hazard limited qualation are radioactive waste shipment for land disposal.	Bill antity Class 7.
	H1. H2. H3. H4. H5. H6. H7. H8.	Instructions for Maintenan Small Quantity/Excepted (noted on Airway Bill Photograph, if applicable Vehicle Inspection Check Driver's Qualification Emergency Telephone Nu LMC Notification Instruction	s Waste Manifest/Bill of Lading/Airway Bill/Shi ce of Exclusive Use Shipments Quantity Statement on Package, for 173.4 shipmens Imber Notification, if required, see 172.604(b) ons	

Non-Specification Bulk Container Packing and Closing Instructions

PACKING AND CLOSING INSTRUCTIONS FOR NON-SPECIFICATION BULK CONTAINERS (DUMP TRUCKS AND ROLL-OFFS) 04/10/2009

PRELIMINARY TASKS

- Select the transport container based on the Department of Transportation hazard classification and the packaging requirements specified in the Hazardous Materials Table.
- Perform moisture evaluation of waste material to be loaded into transport containers to determine the potential for releasing liquid.

PREPARATION OF BULK CONTAINERS FOR LOADING

- Transport containers must be inspected for any condition that may affect their safety or performance prior to each use.
- Dump trucks and roll-offs with doors must have gaskets installed at the tailgate or doors that when the tailgate or doors are closed the gasket is compressed sealing the tailgate or doors to assure package integrity and containment of materials. The gasket must be inspected prior to each use for overall integrity including positioning, damage such as holes or tears or debris which could prevent tight closure. Any deficiencies shall require replacement prior to use.
- An absorption pad shall be placed in the truck or roll-off bed. The pad specification shall be determined utilizing the data determined in the waste material moisture evaluation and must be capable of absorbing the liquid which could be released.
- An absorption log at the rear of the transport container along the bottom of the tailgate or rear doors.
- A minimum 6 mil poly liner shall be placed over the absorption pad and absorption log prior to loading.
- Determine the amount of waste that can be loaded into the transport container. (Subtract the unladen weight of the transport vehicle from the maximum licensed weight of the transport vehicle. NOTE: Do not load the maximum permissible load determined in the mathematical calculation to allow for variance in scales that may be utilized to weigh the loaded vehicle.)

LOADING AND CLOSING BULK CONTAINERS

- Waste material shall be loaded into the transport container in such a manner that does not compromise either the liner or container integrity.
- Do not load material above the height of the sides of the transport container.
- Close the poly liner over of the waste material prior to tarping the load.
- Close the transport container by putting a heavy roll tarp over the top of the transport container and secure the tarp by utilizing tie downs on all four sides.

Appendix C

LMC 6S Checklist

6S Checklist



Area: <u>R</u>	emediation Area 6S	Lead: Location:
Date	Reviewer	Grade (RYG) Green: All areas meet checklist standards Yellow: No more then 2 issues Red: Greater then 2 issues
	fice –	
	 Are all the unnecess removed from area Yes Are the desks or gen Yes Are the floors and wayes Are all equipment, on Yes 	sary items in aisle ways, corners, walls, etc. (offices and cubicles)? No neral areas orderly and straightened? No valls tidy? No cabinets, and desks tidy? No falling hazards eliminated? No
		s, containers and supplies neat and
	 Have safety issues I hazards, electrical, Yes 	been reported or corrected? (e.g. trip clear aisles, etc) No
	Yes	nts and binders are neat and orderly? No
	 Only necessary wor 	k documents stored on desks?

If No was marked for any of the above, what will be the corrective actions?

No

Yes

Purpose of Form: The 6S Checklist documents the inspection of the specified work area. Inspection insures that work area complies with the basic 6S requirements.

Safety and Health –Construction/O&M

Hazardous Materials Have all expired chemicals been properly disposed of? No Are all chemicals labeled appropriately (including warnings)? No Is there appropriate ventilation? Yes No • Is the storage cabinet/container for hazardous materials labeled (including warnings)? Yes No • Is there an appropriate container for disposal of these materials? Yes No Are chemicals stored properly? Yes No **Machines & Material Handling** • Are all lockout points labeled? Yes No Are lockout procedures posted? No • Is material handling equipment in good condition and working properly? Yes No • Are powered industrial trucks (forklifts) inspected daily? Yes No • Do machines and equipment appear to be adequately guarded? Yes No Have any machine guards been removed or modified? Yes No

No

Exits

•	Are all exits	marked properly?
	Yes	No

Are sharp edges padded?

Yes

•	Are emergency evacuatio Yes	n routes mapped and displayed? No
•	Do emergency lights work Yes	properly? No
Obstruc	cted passageways	
•	Are all walkways free from pallets, garbage, etc)?	n obstructions (cords, hoses,
	Yes	No
•	Are all exits free from obs	tructions?
	Yes	No
Protect	ion/Emergency	
•	Are emergency phone null Yes	mbers clearly visible? No
•	Are junction boxes / electronswitches accessible?	rical panels covered - Main on/off
	Yes	No
•	Is the area free of frayed a wires?	and piggy backed extension cords /
	Yes	No
•		essible; is other emergency
•	Is there a First Aid kit local Yes	ited in the area? No
If No wa	s marked for any of the ab	ove, what will be the corrective

actions?

Appendix D

LMC ORR Process Documents

Including:

ORR Agenda
ORR Compliance Checklist

ORR Agenda

- A. For planning purposes, the CONTRACTOR shall assume that each readiness review session will take a minimum of 2 hours. The session shall be attended by the following CONTRACTOR and subcontractor staff:
 - 1. CONTRACTOR: The CONTRACTOR shall have the following staff in attendance:
 - a. Project Manager
 - b. Superintendent
 - c. Field ENGINEERs
 - d. Quality Control personnel
 - e. H&S personnel
 - f. Plant operators
 - 2. Subcontractors: All Subcontractors that will be involved in that particular phase of work. Each subcontractor shall have the following staff in attendance:
 - a. Project Manager
 - b. Superintendent
 - c. Working Foreman
- B. The following is the agenda for each readiness review session:
 - 1. Introductions (sign-in sheet)
 - 2. Purpose (to confirm and document the readiness of project team)
 - 3. Roles and Responsibilities
 - 4. Communication Protocol
 - a. OWNER and CONTRACTOR (primary points of contact)
 - b. Weekly Progress Updates at Weekly Job Meetings
 - c. Communication with Regulatory and Public Agencies
 - d. Communication with the Public/Community
 - 5. Weather Protocols
 - a. Earth Quake Procedures
 - b. Flood & Evacuation Procedures
 - 6. Lockheed Martin Rules
 - a. Lockheed Martin Required Site Safety Orientation
 - b. Site Access Control
 - c. Health and Safety
 - d. No tobacco use onsite, professional attire and behavior

- e. Minimum PPE requirements (reflective vest, steel toe boots, safety glasses, long pants, hard hat, hearing protection when near noisy machinery)
- f. Daily Tailgate Safety Meetings
- g. Permitted Work Hours and Days
- h. Noise and Traffic Requirements
- i. Deliveries (including MSDS pre-approval for all chemicals)
- j. Equipment and Material Storage Requirements
- 7. Review Scope of Construction Work/Operations (discuss in detail sequence of work, Subcontractors involved, equipment, materials, etc.)
 - a. Site Preparation Activities (temporary offices/facilities, erosion control and temporary stormwater controls, site access and haul routes, material and equipment staging areas, test labs in place, surveying, etc.)
 - b. Construction Activities
 - c. Startup and Testing
 - d. Operations
 - e. QA/QC
 - f. Health and Safety
 - g. Special Environmental Requirements (transportation and disposal procedures, air monitoring, soil disposal, water disposal, waste management, sampling & analysis, storage of fuel onsite, etc.)
 - h. Interfacing with Existing Facilities and Contractors
 - i. Cleanup and Demobilization
 - j. Record Keeping
 - k. Inspections
- 8. Documentation Readiness
 - a. OM&M Manual
 - b. Work Plans
 - c. Permits and Notices
 - d. Test Reports
 - e. Calibration Records
 - f. Product Data/Cut Sheets
 - g. Photographs/Videos
 - h. Well Logs & Other Construction Reports
 - i. Operator Exams
 - j. Maintenance Tool Inventory
 - k. Startup and Testing Procedures
 - I. Other Pre-Work or Startup and Operations Procedures
 - m. Certificates (OSHA Hazwoper, state licenses, certificates of disposal, etc.)
 - n. Bill of Materials
 - o. As-Built Drawings
- 9. Equipment Readiness
 - a. Review Checklist

- b. Physical Inspection and Positive Verification that Installed Equipment Meets Project Requirements
- c. Check As-Builts
- d. Testing and Acceptance of Piping, Equipment, and Systems (check inspection records, test results, local/state agency certificates in place to occupy or operate, etc.)
- e. Construction Equipment Readiness (no leaking hoses, etc.)
- f. Inspect Systems (electrical, mechanical, HVAC, I&C, and structural)

10. Material Readiness

- a. Positive Verification that Materials Received Onsite Match Project Requirements
- b. Type and Quantity of Materials Onsite
- c. Materials Laydown and Storage
- d. Security
- 11. Construction/Operation Worker Readiness (are workers qualified and ready to perform their duties?)
 - a. Walkthrough of Equipment, Systems, and Controls
 - b. Mimic SOPs and DOPs in the Field
 - c. Review Regular System Checks

Lockheed Martin Corporation
Operations Readiness Review Compliance Checklist

	Location/Project Name:				
	Type of Work:				
	Date:				
	Completed by:				
No.	Item	Yes	No	N/A	Comments
	Permits and Notifications				
1	Verify all regulatory permits are in hand and copies are at the site				
	Safety Systems				
2	Do all workers have the required PPE available? Review the required PPE.				
3	Are any special PPE required for hazardous conditions at the site (carbon/chemical handling, electrical arc flash, etc.)				
4	Has an arc flash study been performed, and are arc flash labels present on ALL electrical panels?				
5	Is a current, complete and signed HASP readily available to all working at the site?				
	Hazardous Material Summary Correct and up to date?				
7	Are MSDSs available and have they been reviewed for all on-site chemicals? Verify location of MSDS's.				
8	Has a joint Lockheed Martin and contractor safety walkthrough been performed?				
9	Are obstacles such as low overheads, step-ups, and step-downs clearly marked?				
10	Is work area lighting adequate?				
11	Are escape routes/emergency exits provided and identified?				
12	Have signs requiring hearing protection, no smoking, warning for presence of any hazards, load rating of elevated walkways, exclusion zones, emergency contact numbers, etc. been prominently displayed?				
13	Do the workers know who to call in the case of a life or death emergency?				
14	Do the workers know who to call in the case of a chemical spill greater than 5 gallons?				
15	Are fire extinguishers present?				
16	Have all workers been trained on the use of the fire extinguishers?				
17	Are personal injury hazards (e.g. protruding bolts, sharp edges) identified and mitigated?				

18 Have site tripping hazards or "head knockers" been identified and addressed? 19 Have emergency shutdown devices been verified to be operating properly? 8 Building/Facility/Grounds 20 Are all applicable utilities in working order (water, sewer, power, phone, internet, compressed air) 21 Verify the work area is in a neat condition and clear of all obstructions and debris. Verify the floors are swept clean and work areas are neat and organized. 22 Has Lockheed Martin conducted a housekeeping inspection of all working areas including offices? 23 Verify that all hoses and electrical cords are rolled up and stored appropriately (not left out for trip hazard). 24 Is all waste being stored and labeled per regulatory requirements? 25 Will wastes generated be disposed of at a facility on the Lockheed Martin approved list? 26 Are secondary containment structures and drum pads in place? 27 Are trash and recycling receptacles in place? 28 Are restroom facilities available to workers? 29 Is all equipment properly grounded? 30 Have all interior and exterior facility lighting systems been checked and functioning properly? Workers 31 Have all on-site personnel properly trained by individual equipment vendors to operate specific pieces of equipment? 32 Are all on-site personnel properly trained by individual equipment vendors to operate specific pieces of equipment? 33 Verify that the workers know their chain of command and who to call in the case of an emergency.	No.	Item	Yes	No	N/A	Comments
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call in the case of an emergency.	33					
1 34 IDO WOINGIS KIIOW WHAT TO GO ITI THE EVENT OF A CHEMICAL SPILE.	34	Do workers know what to do in the event of a chemical spill?				
35 Do workers know what to do in the event of a severe weather	<u> </u>	'				
event (tornado, flood, hurricane)?		event (tornado, flood, hurricane)?				

APPENDIX B—IDW TRACKING FORM					

Drum	Contents	Project	First generation date	Waste characterization sample collected (date)	Profile (nonhaz or haz)	Date removed from the site	75 day deadline for removal	90 day deadline for removal (only applies to haz waste)	Field Inspection Date	Field Inspector	Action/Repairs from inspection
					•				·	•	

APPENDIX C—WASTE LISTING ASSESSMENT FORM

Waste Listing Assessment Form				
LMC Remediation Project Description of Waste Generic Name		State Generated Solid, Liquid, Gas Additional Info.		
Date of Waste Generation		Ongoing (Y/N)?		
Description of Process Generating Waste	e			
Listed Waste ? (Y/N)	F,K, P or U Codes			
Justification for Waste Classification (att	ached supporting documentation)			
Completed Completed Compa				

APPENDIX D—HAZARDOUS WASTE MANIFEST SIGNATURE AUTHORIZATION FORM

Lockheed Martin Hazardous Waste Manifest Signatory Authorization

This Authorization Agreement, effective for the remediation site and period of performance written below, is entered into by and between:

LOCKHEED MARTIN CORPORATION (hereinafter "Lockheed Martin"), having a business office at 6801 Rockledge Drive, Bethesda, Maryland 20817

(hereinafter "	")
having a business office at	
WHEREAS	(company representative) of
	n Hazardous Waste Manifests on behalf of
1 ,	ct and hazardous waste, as defined at 40 CFR Pt.
261 et seq. indicated below.	
Remediation Site:	
Period of Performance:	
Hazardous Waste Description:	
II 1 II (D' 1E	cility and Location:
	aulubus asa at I a a a bi asa.

This Authorization Agreement certifies that the representative signing on behalf of Lockheed Martin has taken the appropriate Department of Transportation training, as delineated at 49 CFR Part 172 *t seq.* to sign Hazardous Waste Manifests and is in compliance with all state and federal requirements for hazardous waste manifesting.

Lockheed Martin shall remain responsible and liable for the hazardous waste being disposed regardless of the Signatory Authorization provided herein.

LOCKHEED MARTIN CORPORATION			
By:	Ву:		
Name:	Name:		
Title:	Title:		
Date:	Date [.]		

APPENDIX E—	HAZARDOUS MATE	ERIAL/WASTE SH	HIPMENT CHEC	KLIST

Lockheed Martin Hazardous Material/Waste Shipment Checklist

P	ate: roject Site Name: hipping Document No.:
A	A1UN/NA Identification Number, Proper Shipping Name, Hazard Class/Division Number, Packing Group A2Subsidiary hazard class(es) or division number(s), if any, in parenthesis A3Total Quantity of Material A424-Hour Emergency Phone Number and Response Information ERG No.: A5Page of Pages, for multiple shipping papers/EPA Manifest/Air Decs. A6Shipper's Certification, as applicable A7Small Quantity Exception/Dangerous Goods In Excepted Quantities/Diagnostic Specimen/Sample
В.	ADDITIONAL DESCRIPTIONS - GENERAL B1 Exemptions "DOT-E-ex.#" B2 "Limited Quantity" (not to exceed 66 lb gross weight) B3 "X" or "RQ" (if RQ, Hazardous Substance Contact @ 1-800-424-8802) B4 "Waste" for RCRA regulated material B5 "Mixture" or "Solution" - as appropriate. B6 (technical names), for poisons/mixtures/n.o.s./generic proper shipping names B7 "Marine Pollutant" and constituent in (), for bulk shipments only B8 (hazardous substance names) per 172.101 appendix if not contained in proper shipping name B9 (EPA waste identification numbers)- used to identify the hazardous substance B10 "Poison" - if not identified in proper shipping name or hazard class B11 "Poison-Inhalation Hazard" & Zone A, Zone B, Zone C, or Zone D, as appropriate* (*Note Special Provisions 1-6 and 13 in Column 7 of 172.101)
	MARKING FOR NON-BULK PACKAGINGS C1. Proper Shipping Name, UN/NA Identification Number C2. (technical name) C3. (EPA waste identification number) C4. "RQ" C5. Exemption Packagings "DOT-E-ex.#' C6. Consignee's Name & Address C7. Net or Gross quantity for non-rad Dangerous Goods (adjacent to PSN & UN#) C8. Ltd. Qty - PSN only per 172.301(a)(1) or UN ID# placed in square-on-point border per 172.315 C9. Package Orientation Arrows, for liquids in inner packagings C10. "Inhalation Hazard", unless these words appear on the label prescribed in 172.416 or 172.429 C11. "Overpack" adjacent to proper shipping name marking [see 173.25(a)(4)] C12. TSCA PCB Marking (for actual or source concentration greater than or equal to 50 ppm *) (* Note Potential Vehicle Marking Requirements in 40 CFR 761.40)
D.	MARKING FOR BULK PACKAGINGS (DUMP TRUCKS OR ROLL-OFFS) D1 UN/NA Identification Number on orange panel or placard or white square-on-point display configuration as prescribed by 172.302 and 172.332
E.	LABELING E1. Primary Hazard Label(s): Subsidiary Hazard Label(s) with class/division: Hazardous Wastes Label(s)
F.	PLACARDING F1. 172.504 Table 1 Materials - Any Amount F1.1 Dangerous When Wet (4.3) F1.2 Poison (6.1, Inhalation Hazard, Zone A or B)* (Primary or Subsidiary (*Materials subject to the "Poison-Inhalation Hazard" notation must be placarded with a POISON INHALATION HAZARD or POISON GAS placard, as appropriate, and also placarded for any other hazard class required for that material in 172.504) F1.3 Radioactive (7, LSA/SCO Exclusive Use Shipments) F2. 172.504 Table 2 Materials - 1,001 lb:

Page 1 of 2 March 2009

Lockheed Martin Hazardous Material/Waste Shipment Checklist

ompleted By:		Company:	Date:
15. PAPERWC H1 Ir H2 F H3 L H4 H	ealth Physics Information	ITEMS	•
13.3"1 14. PLACARDI	Radioactive Material, Excepte NG (172.504 TABLE 1 MATE	RIALS - ANY AMOUNT)	
I3. LABELING	JSA" on all IP and Type A pa ackaging manufacturer mark adioactive Labels EMPTY" Label	ing on Type A	
I2.4 II	P-1, IP-2, IP-3 markings	LSA"; "Radioactive – SCO" , for radioactive material package	es, as appropriate
12. MARKING 12.1G	FOR NON-BULK PACKAGIN ross Weight, <i>for radioactive i</i>	IGS material packages in excess of 1:	10 lb
I1.4 F	ladioactive Labels issile Excepted, <i>if applicable</i> Exclusive Use Shipment"		
11.2 F 11.3 A	hysical & Chemical Form, <i>if</i> a ctivity per Package	not special form	
SHIPPING	EQUREMENTS FOR RADIC PAPER DESCRIPTIONS Radionuclide Symbol(s), <i>per</i> 1	DACTIVE MATERIAL SHIPMENT	rs .
H8 LMC	Notification Instructions	otification, if required, see 172.60	
H5 Vehi	ograph, <i>if applicable</i> cle Inspection ck Driver's Qualifications		
H3 Sma	ll Quantity/Excepted Quantity d on Airway Bill	v Statement on Package, for 173.	4 shipments / DGEQ statement per 2.7.7
H1 Ship	AND MISCELLANEOUS ITE ping Paper/Hazardous Waste uctions for Maintenance of E.	e Manifest/Bill of Lading/Airway B	ill/Shipper's Declaration
G4Load	ed and Closed As Required_		
G2Con	ainer Type: (Outer Pkg)		
00			

APPENDIX F—SITE CONTACT SHEET

SITE CONTACT SHEET

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Martin State Airport Director	Al Pollard
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MDANG Site Supervisor	Capt DeJuan Saunders
Office Telephone	410-918-6486
Emergency	y Response
A&A Environmental/Spill Response	1-800-404-8037
Baltimore County Police & Fire Department	911
State of Maryland Emergency Response Center	410-974-3551