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FINAL SITE CHARACTERIZATION FOR SITE 1159 WITH TRANSMITTAL FORM NAS PENSACOLA FL
7/9/2003
CH2MHILL

CH2MHILL Constructors, Inc.

TRANSMITTAL

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Date: July 9, 2003

Contract: Navy Contract # N62467-98-D-0995

CTO: Contract Task Order No. 0071
Naval Air Station (NAS) Pensacola – Pensacola, Florida

Re: *Site Characterization for Site 1159 Outlying Landing Field Bronson*

Quantity	Description
1	*Site Characterization for Site 1159 Outlying Landing Field Bronson*

If material received is not as listed, please notify us at once

CC: Greg Wilfley/ATL
CCI Project File No. 166690

Work Plan Addendum No. 06
Site Characterization for Site 1159
Outlying Landing Field Bronson

Naval Air Station Pensacola
Pensacola, Florida

Revision 00

Contract No. N62467-98-D-0995
Contract Task Order No. 0071

Submitted to:

U.S. Naval Facilities
Engineering Command
Southern Division

Prepared by:

CH2MHILL
Constructors, Inc.

115 Perimeter Center Place, N.E.
Suite 700
Atlanta, GA 30346

July 2003

Work Plan Addendum No. 06
Site Characterization for Site 1159
Outlying Landing Field Bronson
Naval Air Station Pensacola
Pensacola, Florida

Revision 00

Contract No. N62467-98-D-0995
Contract Task Order No. 0071

Submitted to:

Department of the Navy, Southern Division
U.S. Naval Facilities Engineering Command

Prepared by:

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July 2003

Prepared/Approved By:

Greg Wilfley, Project Manager — Date

Approved By:

R. Scott Newman, Program Manager — Date

Client Acceptance:

U.S. Navy, Responsible Authority — Date

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Acronyms

µg/L	micrograms per liter
AALA	American Association for Laboratory Accreditation
AASHTO	Association of State Highway and Transportation Officials
ACO	Administrative Contracting Officer
AFCEE	Air Force Center for Environmental Excellence
ASTM	American Society for Testing and Materials
AVGAS	aviation gas
bls	below land surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CA	Contamination Assessment
CAH	chlorinated aliphatic hydrocarbon
CAR	Contamination Assessment Report
CCI	CH2M HILL Constructors, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Recovery Act
CFR	Code of Federal Regulation
CO	Contracting Officer
COC	chain-of-custody
COC	chemical of concern
COPC	compound of potential concern
COTR	Contracting Officer's Technical Representative
CTO	Contract Task Order
^{o}C	degrees Celsius
^{o}F	degrees Fahrenheit
DO	dissolved oxygen
DPT	direct-push technology
DRMO	Defense Reutilization and Marketing Office
EISOPQAM	Environmental Investigations Standard Operating Procedures and Quality Assurance Manual
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FFWCC	Florida Fish and Wildlife Conservation Commission
FL-PRO	Florida Petroleum Residual Organic
gpm	gallons per minute
GPS	Global Positioning System
HSA	hollow stem auger
HSP	Health and Safety Plan

Acronyms (continued)

ID	inside diameter
IDW	investigation-derived waste
IR CDQM	Installation Restoration Chemical Data Quality Manual
LDR	Land Disposal Restriction
LEL	lower explosive limit
LNAPL	light non-aqueous phase liquid
MCL	Maximum Contaminant Level
MCLs	maximum contaminant levels
MNA	monitored natural attenuation
MRW	Morale, Recreation, and Welfare
MS/MSD	matrix spike/matrix spike duplicate
MSDS	Material Safety Data Sheet
msl	mean sea level
MTBE	methyl tert-butyl ether
NAD	North American Datum
NAS	Naval Air Station
NAVD	North American Vertical Datum
NAVFAC	Naval Facilities Engineering Command
NIST	National Institute of Standards and Technology
NPWC	Navy Public Works Center
NRC	National Response Center
NVLAP	National Voluntary Laboratory Accreditation Program
NWFWMD	Northwest Florida Water Management District
OLF	Outlying Landing Field
ORP	oxidation-reduction potential
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
OWS	oil/water separator
PAHs	polycyclic aromatic hydrocarbons
PCB	polychloride biphenyl
POTW	publicly owned treatment works
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RAC	Response Action Contract
RAO	Remedial Action Objective
RAP	Remedial Action Plan
RCI	reactivity/corrosivity/ignitability
RCRA	Resource Conservation and Recovery Act
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SVOC	semi-volatile organic compound

Acronyms (continued)

TAT	turnaround time
TCE	trichloroethene
TCL	target compound list
TCLP	Toxicity Characteristic Leachate Procedure
TPH	total petroleum hyddrocarbons
TRPH	total recoverable petroleum hydrocarbons
TSD	Treatment, Storage, and Disposal
TVA	toxic vapor analyzer
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
UST	underground storage tank
VC	vinyl chloride
VOAs	volatile organic aromatics
VOC	volatile organic compound

1.0 Introduction

CH2M HILL Constructors, Inc. (CCI) was contracted by the Department of the Navy, Southern Division Naval Facilities Engineering Command (NAVFAC), to prepare this Work Plan Addendum to implement a site characterization of Site 1159 at the Outlying Landing Field (OLF) Bronson at Naval Air Station (NAS) Pensacola, Pensacola, Florida. This work is being performed under Response Action Contract (RAC) No. N62467-98-D-0995, Contract Task Order (CTO) No. 0071.

The Remedial Action Plan (RAP) for Site 1159 recommended free-product recovery with bioslurping, groundwater remediation by pump and treat, and discharge to the publicly owned treatment works (POTW) as the remedial alternative for contaminated groundwater and free-phase hydrocarbons (Tetra Tech NUS, Inc. [TtNUS], 2002). A site characterization will be conducted at Site 1159 in order to complete the design of the remedial alternative. The purpose of this Work Plan Addendum is to describe the procedures that will be used to implement the following site investigation activities:

- Assess impact on gopher tortoise habitats
- Baseline groundwater and free product level evaluation
- Light non-aqueous phase liquid (LNAPL) delineation
- Baseline groundwater sampling event
- Aquifer testing
- Bioslurping pilot test

The full scope of site activities is included in Section 2. This Work Plan Addendum is a supplement to the Basewide Work Plan (CCI, 2000), prepared by CCI for use as the master document for RAC work at NAS Pensacola. CCI will use the procedures outlined in this Work Plan Addendum, in conjunction with the Basewide Work Plan, to complete field activities at Site 1159.

1.1 Work Plan Addendum Organization

This Work Plan Addendum is organized into sections of text and appendices as follows:

Section 1.0 Introduction describes how this Work Plan Addendum is organized and includes the site description and history.

Section 2.0 Project Execution Plan includes the scope of work activities, project objectives, project schedule, and communications plan.

Section 3.0 Sampling and Analysis Plan. The Basewide Work Plan addresses project specific sampling and analysis issues for the activities to be completed at OLF Bronson. Additional specific information for the sampling and analysis of groundwater and screening of LNAPL in soil is provided in this Work Plan Addendum.

Section 4.0 Waste Management Plan. The Basewide Work Plan discusses the characterization, disposal, handling, and transportation of wastes encountered or generated during work at NAS Pensacola. Additional information specific to OLF Bronson for handling wastes is provided in this Work Plan Addendum.

Section 5.0 Environmental Protection Plan. The Basewide Work Plan addresses the Environmental Protection Plan to be implemented at OLF Bronson.

Section 6.0 Quality Control Plan. Task-specific quality control information, including project organization, for this CTO is included in this Work Plan Addendum. All other quality control information is contained in the Basewide Work Plan.

Section 7.0 References lists the references used in developing this Work Plan Addendum.

The following support documents are presented as appendices to this Work Plan Addendum:

- Appendix A, Baildown Data Sheet
- Appendix B, Health and Safety Plan
- Appendix C, Project Schedule
- Appendix D, Submittal Register
- Appendix E, Testing Plan and Log
- Appendix F, Project QC Manager Resume and Appointment Letter

1.2 Project Objectives

The objective of the remedial action at Site 1159 of Bronson Field is to protect human health and the environment, reduce petroleum concentrations in source area groundwater, and prevent further migration of contaminated groundwater. The chemicals of concern (COCs) in groundwater identified in the RAP were benzene, toluene, ethylbenzene, and total xylenes (BTEX), total recoverable petroleum hydrocarbons (TRPH), methyl tert-butyl ether (MTBE), and lead (TtNUS, 2002). The applicable cleanup target levels for COCs dissolved in groundwater are the Florida maximum contaminant levels (MCLs) specified in Chapter 62-550, Florida Administrative Code (FAC), and the Florida Cleanup Target Levels specified in Chapter 62-777, FAC. Table 1-1 lists the applicable cleanup levels for groundwater at Site 1159.

Active remediation at the site includes free product recovery via bioslurping and groundwater pump and treat. Free-product recovery will be performed in accordance with Chapter 67-770.300, FAC and will be terminated when recovery rates fall below 0.1 percent of co-extracted groundwater or when the free product thickness in individual wells falls below 0.01 feet. Hydrocarbon vapor emissions will be monitored and treated until emission rates fall below 13.7 pounds per day for two consecutive monitoring periods, as outlined in Rule 62-770.700 FAC. Groundwater pump and treat of lead-contaminated groundwater will be conducted concurrently with the free product recovery. Once free product recovery is complete, groundwater pump and treat for petroleum-contaminated groundwater will be initiated. If and when groundwater concentrations fall to the natural attenuation criteria outlined in Chapter 67-770 FAC, the groundwater pump and treat remedial system will be

shut down and monitored natural attenuation (MNA) will be initiated at the site. The applicable natural attenuation default criteria are listed in Table 1-1.

TABLE 1-1
Groundwater Cleanup Levels

Analytes	Groundwater Cleanup Target Level (μg/L)	Groundwater Natural Attenuation Default Concentration (μg/L)
Benzene	1	100
Toluene	40	400
Ethylbenzene	30	300
Total Xylenes	20	200
MTBE	50	500
TRPH	5,000	50,000
Lead	15	510

Source: Florida Department of Environmental Protection (FDEP), Chapters 62-550 and 62-777, FAC
MTBE methyl tert-butyl ether
μg/L micrograms per liter
TRPH total recoverable petroleum hydrocarbons

1.3 Site Description and History

Site 1159 is located at OLF Bronson, approximately 5 miles west of Pensacola, Florida, and approximately 1 mile east of the Alabama state line. OLF Bronson is located in Escambia County in northwest Florida and is primarily surrounded by forest, wetlands, and Perdido Bay. The site location is shown on the U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle of Lillian, Alabama-Florida (Figure 1-1).

OLF Bronson resides on the western portion of the Florida panhandle, within the Coastal Plain province. The site resides in the Coastal lowland topographic subdivision of the coastal plain. The climate at OLF Bronson is humid and subtropical with long, warm summers and relatively mild winters. Conditions are affected by the Gulf of Mexico, which tends to moderate temperature extremes. The average annual temperature is 68.1 degrees Fahrenheit (°F) and the average annual rainfall is 62.9 inches.

1.3.1 Site History

OLF Bronson was used as an active airfield from 1942 through 1950, consisting of a paved airfield and seaplane ramp. During that time, large amounts of aviation gasoline (AVGAS), oil products, and solvents were used at the field. The Navy demolished most of the temporary wartime buildings constructed during World War II at OLF Bronson in the 1950s but continued to use the hangers for parts storage for the next 10 years. After the airfield was closed, helicopters from Combat Support Squadron 16 used the land for occasional training until 1995.

Source: USGS Quadrangle, Lillian, FL-AL, 1987.

APPROXIMATE SCALE 1 Inch = 2000 Feet

0 2000 4000

Feet

North

Figure 1-1
Site Location Map
Site 1159
OLF Bronson

CH2MHILL

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Based on historic site maps, Building 1159 was used as a boiler house [Navy Public Works Center (NPWC), 1997] when the airfield was active. A 500-gallon underground storage tank (UST), which was used to store diesel fuel for an emergency generator, was located on the east side of the building. In addition, six 25,000-gallon USTs and a fuel distribution line were located to the northeast of Building 1159, upgradient of the site. These tanks were used to store AVGAS for refueling. The source of contamination at the site is assumed to be from leaks from the USTs and associated pipeline.

Presently, Bronson Field is known as Blue Angel Recreation Park and is maintained by the Morale, Recreation, and Welfare (MRW) department of NAS Pensacola. All runways are inactive and all buildings have been dismantled. The old seaplane ramp serves as a parking and storage area for campers. There are dense woods to the north, a dirt road to the south, woods and a camp ground to the east , and a concrete parking area for campers to the west of Site 1159. A site plan is shown on Figure 1-2.

1.3.2 Regulatory History

A closure assessment under the Florida Petroleum Cleanup Program (Chapter 62-770 FAC) was performed in 1994 during the removal of the 500-gallon diesel UST. The closure assessment identified benzene, total xylenes, and total volatile aromatics (VOAs) concentrations in groundwater above the Florida Department of Environmental Protection (FDEP) regulatory levels. Concentrations of volatile organic compounds (VOCs) in soil were all reported below laboratory detection limits. No free product was observed during the diesel tank removal.

A contamination assessment (CA) was conducted at the site from 1996 through 2000 to determine the presence and extent of soil and groundwater contamination at the site. During this investigation, the six former AVGAS USTs were identified from an old field diagram. It was determined that these tanks were removed in the 1980s by E. C. Jordan (NPWC, 1997). The CA Report (CAR) determined that VOC and lead concentrations in groundwater were in exceedance of the Florida groundwater criteria. In addition, free product was identified in site wells. Soil samples were analyzed for compounds in the Gasoline and Kerosene analytical groups; all parameters were below the Florida direct exposure and leachability criteria. The CAR suggested that the primary source of groundwater contamination at Site 1159 was the AVGAS USTs and associated distribution line due to the lack of polycyclic aromatic hydrocarbons (PAHs) found in groundwater around the former diesel UST. The CAR Addendum, completed by TtNUS in May 2001, estimated that an AVGAS free-product plume was present over approximately 107,000 square feet of the site up to a measured thickness of 2.74 feet. The estimated free-product mass was 1,560,000 pounds. The CAR Addendum recommended that a RAP be completed for free product and contaminated groundwater at Site 1159.

TtNUS completed the RAP in September 2002. Based on the remedial technology screening, the remedial alternative selected was free-product recovery with bioslurping, groundwater remediation by pump and treat, and discharge the water fraction to the publicly owned treatment works (POTW). The RAP provided a preliminary design of the treatment system. CCI was contracted to complete the design and implement the remedial alternative.

SOURCE:

LOCATIONS OF ROADS AND FORMER LOCATIONS OF BUILDINGS, TANKS, AND DISTRIBUTION LINES ARE TAKEN FROM N.A.S. DRAWING NO. 23032 DATED JUNE 24, 1944 AND FIELD OBSERVATIONS. WELL LOCATIONS ARE APPROXIMATE.

LEGEND

- MW-23 — MONITORING WELL LOCATION AND DESIGNATION
- DMW-60 — DEEP MONITORING WELL LOCATION AND DESIGNATION
- P-4 — PIEZOMETER LOCATION AND DESIGNATION
- (NF) — INDICATES WELL NOT FOUND DURING SAR ADDENDUM FIELD EVENT
- FREE PRODUCT AREA (DASHED WHERE APPROX.)
- (2.74) — FREE PRODUCT THICKNESS [1]
- DPT MONITORING WELL AND DESIGNATION
- RECOVERY WELL AND DESIGNATION
- BIOSLURP PILOT TEST WELL AND DESIGNATION

NOTE: LATERAL DISTRIBUTION OF FREE PRODUCT BASED ON JULY 25, 2000

MW-34, MW-36, MW-35, MW-53, MW-48, MW-54 (NF), MW-44, MW-33, MW-63, MW-64 (1.39), MW-32, MW-59, MW-68, MW-55, MW-46 (2.62), MW-52, MW-28, MW-31, DMW-69, MW-27, MW-26, MW-67, MW-25, MW-1, MW-16, MW-30, MW-24, MW-17, MW-5, MW-3, MW-15, MW-18, MW-6, MW-23, MW-4, MW-14, MW-22, MW-13, MW-29, MW-7, MW-8, MW-9, MW-19, MW-21, MW-20, MW-2, MW-50, MW-10, MW-11, MW-12, MW-43 (NF), MW-66, MW-51, MW-42, MW-58, MW-39, MW-57, MW-38, MW-56, MW-37, MW-40 (NF), MW-41 (NF), MW-62 (1.93), MW-65 (1.32 MINIMUM), MW-45 (2.53), MW-47 (2.74), P-1, P-2, P-3, P-4, P-5, P-6, DMW-60, DMW-61, DP-1, DP-2, DP-3, DP-4, DP-5, DP-6, DP-7, DP-8, DP-9, DP-10, DP-11, DP-12, BS-1, RW-1

1136, 1135, 1134, 1133, 1132, 1131

FORMER LOCATION OF 25000 GALLON GASOLINE STORAGE TANK (TYP. 1 OF 6)

SERVICE PIT (TYP.)

FORMER FUEL DISTRIBUTION LINE

BUILDING 1159

DIESEL UST

WOODED AREA

WOODED AREA

-N-

60 0 60

SCALE IN FEET

FIGURE 2-1

PROPOSED DPT, GROUNDWATER RECOVERY, AND BIOSLURPING RECOVERY WELL LOCATIONS

UST SITE NO. 1159
REMEDIAL ACTION PLAN

OUTLYING FIELD BRONSON
PENSACOLA, FLORIDA

n11x17b.dgn A052003002ATL1101.ai

CAD FILE NO./DATE: k:\dgn\navy\pensacol\bronson\ 0401c\ 0401c006.dgn /10-22-01 Source: Remedial Action Plan for Site1159, Tetra Tech NUS, Inc. September 2002

1.3.3 Site Geology and Hydrogeology

A detailed description of regional geology and hydrogeology is included in the CAR (NPWC, 1997). Based on lithologic data collected during the CA, Site 1159 is generally characterized by a fine sand from 0 to 17 feet below land surface (bls), a silty, fine sand with some clay from 17 to 30 feet bls, and coarse to medium sand from 30 to 40 feet bls. Site soils have a moderate to high permeability and increase in density and stiffness with depth. All site wells are screened in the Sand and Gravel Aquifer. The maximum depth explored during the CA was 40 feet bls.

Site 1159 is located approximately 900 feet to the northeast of Perdido Bay, an impaired surface water body. The general groundwater flow direction across Site 1159 is to the west, toward Perdido Bay; however, the flow direction changes slightly to the southwest as it approaches the bay. willow groundwater of the Sand and Gravel Aquifer is unconfined and likely discharges into the bay.

The groundwater table at the site is relatively flat. During the July 2000 groundwater monitoring event, the groundwater elevation in site wells ranged from 16.8 to 26.8 feet mean sea level (msl). The horizontal hydraulic gradient was measured at 0.00096 feet per foot (feet/foot). Vertical gradients were inconclusive. Figure 1-3 presents the potentiometric surface observed during the June 2000 event.

Aquifer slug tests were performed as part of the CA on two willow wells (MW-4 and –63) and one deep well (DMW-60) located at the site. The average hydraulic conductivity estimated from the slug tests was 3.86E-04 feet/second. This is greater than results from slug tests performed in wells located at other sites on Bronson Field (an average of 7.09E-06 feet/sec). Assuming an effective porosity of 0.30 and the above hydraulic gradient, the calculated groundwater seepage velocity is 39 feet/year. The hydraulic conductivity and groundwater velocity at the site will be re-evaluated during this site investigation.

N

FORMER LOCATION OF 25000 GALLON GASOLINE STORAGE TANK (TYP. 1 OF 6)

1136

1135

1134

1133

1132

1131

SERVICE PIT (TYP.)

FORMER FUEL DISTRIBUTION LINE

JEEP/FOOT TRAIL

DIRT ROAD

WOODED AREA

DRAINAGE BASIN

BUILDING 1159

DIESEL UST

PAVED ROAD

WOODED AREA

60 0 60

SCALE IN FEET

FIGURE 1-2

SITE PLAN
UST SITE NO.1159
REMEDIAL ACTION PLAN

OUTLYING FIELD BRONSON
PENSACOLA, FLORIDA

n11x17b.dgn A052003002ATL1102.ai

CAD FILE NO./DATE:k:\dgn\navy\pensacol\bronson\ 0401c\ 0401c002.dgn /10-22-01

Source: Remedial Action Plan for Site1159, Tetra Tech NUS, Inc. September 2002

2.0 Project Execution Plan

This section provides an overview of the scope of work activities, general project operations, project schedule, and communications. In addition, brief descriptions of the tasks and associated subtasks that will be performed under this Work Plan Addendum are also presented.

2.1 Scope of Work Activities

The scope of work that will be conducted at Site 1159 will be used to support the design of the selected remedial alternative, free phase product recovery via bioslurping and groundwater pump and treat, establish a current data set, and define the limits of the groundwater and free product plume, fulfilling regulatory requirements. The scope of work includes the following tasks:

- Assess Impact on Natural Resources (Gopher Tortoise and Live Oak Trees)
  - Mobilize and prepare site.
  - Conduct field survey.
  - Demobilize from site.
  - Submit Field Report (Letter/Memorandum).
  - Coordinate with NAS Pensacola personnel and support the coordination with Florida Fish and Wildlife Conservation Commission (FFWCC) to determine the preferred course of action.
  - Obtain Incidental Take Permit (if required).
- Baseline Groundwater and Free Product Levels Evaluation
  - Mobilize and prepare site.
  - Measure depth to water and depth to product in all existing monitoring wells.
  - Decontaminate equipment and personnel and demobilize from site.
  - Develop potentiometric map for willow groundwater.
  - Re-evaluate locations of proposed direct-push technology (DPT) piezometers for LNAPL delineation.
- LNAPL Delineation and Well Installations
  - Obtain dig permit (minimum 3-week process).
  - Mobilize and prepare site.
  - Install 12 piezometers at the estimated extents of the free product plume using DPT.

  - Collect continuous lithologic soil samples at four piezometer locations (DP-5, -7, -8, and –10) using DPT. Lithologic samples at piezometers DP-5 and –7 will be screened for total hydrocarbons using an organic vapor analyzer (OVA) to define the vertical extent of free product in the subsurface.
  - Install one bioslurping pilot study extraction well in the vicinity of existing wells MW-47 and DMW-60 using hollow stem auger (HSA).
  - Install one groundwater extraction well in the vicinity of existing wells MW-2 and DMW-61 using HSA.
  - Collect continuous lithologic soil samples at the bioslurping pilot study extraction well location and at the groundwater extraction well location using DPT. Lithologic samples will be screened for TRPH using an OVA to define the vertical extent of the LNAPL.
  - Collect geotechnical soil samples from the screened intervals of both the bioslurping extraction well and the groundwater recovery well.
  - Collect, contain, characterize, store, and dispose of all soil, debris, and water generated during the performance of this work.
  - Decontaminate equipment and personnel, conduct site restoration, and demobilization.
  - Conduct field survey of new piezometer and extraction well locations.
  - Calculate free product mass.
- Baseline Groundwater Sampling Event
  - Mobilize and prepare site.
  - Conduct sampling and analysis of groundwater for selected newly installed and existing wells for VOCs, PAHs, TRPH, and total lead to establish baseline conditions.
  - Collect, contain, characterize, store, and dispose of all soil, debris, and water generated during the performance of this work.
  - Decontaminate equipment and personnel, conduct site restoration, and demobilization.
- Aquifer Testing
  - Obtain approval from the POTW for disposal of extracted groundwater.
  - Mobilize and prepare site.
  - Perform an aquifer step-test and 72-hour constant rate pump test on the newly installed groundwater extraction well.
  - Collect grab water samples during the aquifer pump test for analysis of VOCs, PAHs, TRPH, and total lead.

  - Measure drawdown in the groundwater extraction well and adjacent monitoring wells to determine the radius of influence for the recovery well.
  - Conduct sampling and analysis for selected newly installed and existing wells for VOCs, PAHs, TRPH, and lead after the aquifer pump test to evaluate impact on groundwater quality.
  - Treat extracted groundwater with portable treatment system prior to disposal.
  - Perform aquifer parameter analysis on aquifer test data.
  - Collect, contain, characterize, store, and dispose of all soil, debris, and water generated during the performance of this work.
  - Decontaminate equipment and personnel, conduct site restoration, and demobilization.

- Bioslurping Pilot Test
  - Conduct mobilization and site preparation.
  - Collect baseline round of water and free-product levels.
  - Perform bail-down tests for wells containing free product.
  - Measure baseline soil gas concentrations (hydrocarbons and oxygen) and pressures on monitoring points adjacent to pilot test well.
  - Conduct Bioslurper Vacuum-Enhanced Extraction Test.
  - Conduct Soil Gas Permeability/Radius of Influence Test.
  - Collect and analyze aqueous effluent from the oil/water separator (OWS).
  - Collect and analyze vapor emissions.
  - Treat soil vapor emissions if necessary with portable treatment system.
  - Collect, contain, characterize, store, and dispose of all soil, debris, and water generated during the performance of this work.
  - Decontaminate equipment and personnel, conduct site restoration, and demobilization.
  - Provide remedial action plan addendum with results and final design.

2.2 Mobilization and Site Setup

Site preparation activities will be performed as necessary to prepare the site for implementing the work. This work includes, but is not limited to:

- Planning and documenting activities.
- Assisting with any required permits.

- Clearing the site
- Removal of designated structures and debris
- Stockpile areas
- Waste accumulation areas
- Removal of hidden obstacles
- Implementation of erosion control measures (i.e., silt fence, haybales, sand bags along edges of work areas)
- Other stormwater diversion measures, placement of appropriate signage, and construction of temporary access and erecting/maintaining security fencing/gates for the duration of the work, and the preparation of foundations for equipment.

CCI will mobilize all resources necessary to perform the scope of work. These resources will include personnel, equipment, materials, supplies, lower tier subcontractors, and support facilities. CCI will stage its equipment and temporary facilities within the areas designated by NAS Pensacola personnel. As part of the mobilization effort, a pre-construction meeting will be held at OLF Bronson. The purpose of this meeting is to fully understand the project and communicate how it will proceed among the Navy, CCI and its subcontractors, and any other involved parties. CCI will also obtain and coordinate all necessary badging requirements for its personnel and subcontractors on base. Mobilization and site setup activities will occur at the beginning of each project task.

CCI will be responsible for proper decontamination of all equipment prior to mobilization at the Site. CCI will furnish all equipment to safely and legally collect and store waste encountered during performance of the scope of work described herein for offsite disposal. Approval will be obtained from the Escambia County Utilities Authority before disposal of any water to the POTW.

Prior to commencement of any subsurface work, CCI will obtain digging permits, as required, from NAS Pensacola personnel, and will coordinate to locate and verify subsurface utilities present in the work area and to determine whether the utility is active or inactive. Utilities that are identified and located at the site by the Navy will be marked with a point or stakes, as appropriate. Based on the current site plan, utilities such as power and phone may not be available in the vicinity of the site characterization activities. A portable generator will be brought onsite to establish electricity for aquifer and bioslurping testing. Additionally, a source of water will be identified for drilling activities.

CCI will be responsible for maintaining appropriate security, work zones and access controls (i.e., orange safety fencing) and erosion control measures around all drilling stockpiles or other areas disturbed by their operations. CCI will be responsible for keeping trees around the open area undisturbed.

2.3 Assess Impact of Field Activities on Natural Resources

There are two known resource issues at the site: gopher tortoise habitats and the high density of live oak trees. A field survey will be conducted by a trained biologist to evaluate

the habitat and general resources at the site. This assessment will be performed in conjunction with NAS Pensacola resource staff.

The habitat type and quality for the gopher tortoise, a state-listed Species of Special Concern, will be assessed during the field survey. Since this site is less than 50 acres, the field survey may consist of walking transects that allow for a visual inspection of the whole site. Other methods that may be used in combination with walking transects include driving transects and focused survey efforts in representative areas with the highest probability of locating the target wildlife species.

All gopher tortoise burrows that are observed will be mapped using Global Positioning System (GPS), when possible, and classified as *active*, *inactive*, or *abandoned*, based on evidence of recent use by the tortoise. As defined by the FFWCC, an active burrow is represented by tortoise tracks or shell scrapings that are evident at the burrow mouth; an inactive burrow is characterized by signs of recent use but show no tracks or scrapings; and an abandoned burrow is covered with debris, dilapidated or partially collapsed. A brief field memorandum will be prepared that includes a general site description (vegetation, soils, existing and proposed land uses), survey methodology, survey findings, and options and recommendations.

Prior to commencement of site characterization activities, an Incidental Take Permit may be obtained, if necessary, from the FFWCC for the gopher tortoise, which inhabit the work area. A take permit is a general term used to indicate approval by the regulatory agency to displace, or destroy habitat being used by a protected wildlife species. In the case of tortoises, take permits are issued for activities that may entomb or kill tortoises and then mitigate for the taking by providing fees used to purchase suitable tortoise habitat elsewhere in the region. The permit is for a specified number of individuals in a specific location.

2.4 Baseline Groundwater and Free Product Level Evaluation

Water levels and the thickness of LNAPL will be recorded at all existing monitoring wells. Figure 1-3 presents existing monitoring well locations. The data will be used to generate a current groundwater potentiometric map for the willow zone and assess the extent of LNAPL at the site. Water levels will be measured using an oil/water interface probe with tape graduated in 0.01-foot increments. Measurements will be recorded as depth to water from a mark on the top of the well casing. Well number, date and time of measurement, and depth to water will be recorded in the field logbook.

These data will be used to re-evaluate the proposed locations for the piezometers to be installed as part of the LNAPL delineation, to select wells for the groundwater sampling event, and to select wells for the free-product baildown tests.

2.5 LNAPL Delineation and Well Installations

All piezometers, the groundwater extraction well, and the bioslurping extraction well will be installed by a State of Florida licensed driller. Well permits will be obtained prior to installation of all piezometer and wells from the Northwest Florida Water Management

District (NWFWMD) by the driller. All wells and piezometers will be constructed and installed in accordance with the American Society for Testing and Materials (ASTM) Method D-5092, Design and Installation of Groundwater Monitoring Wells in Aquifers and Florida Well Regulations.

2.5.1 Piezometer Installation

To define the mass and extent of the LNAPL plume at Site 1159, 12 piezometers will be installed to supplement the exiting monitoring well network. Proposed piezometer locations are shown on Figure 2-1. However, all drilling locations will be subject to relocation, based on conditions encountered in the field (i.e., accessibility to the area, overhead obstructions, etc.).

The piezometer boreholes will be advanced using DPT to approximately 5 feet below the observed water table. Continuous lithologic soil samples will be collected at four piezometer locations (DP-5, -7, -8, and –10) using the DPT Macrocore sampling system to assess the location of the water table and geology. All soil samples will be described by the field geologist for grain size, mineralogy, color, moisture content, odor, and structure. Furthermore, soil samples will be field screened with an OVA to determine the vertical extent of the free product and smear zone. Descriptions will be recorded in the field logbook. To establish the depth to the water table, water levels may be measured in nearby monitoring wells. Based on previous water levels, the depth to water is approximately between 5 and 25 feet bls.

Once the DPT rods have been advanced to the desired depth, each piezometer will be installed within the DPT rod as it is withdrawn from the boring. The piezometers will be constructed of an unused, threaded, 1-inch inside diameter (ID), schedule 40, polyvinyl (PVC) casing and 10-foot, 0.010-inch slotted screen with a pre-packed filter pack. The piezometer will be set such that 5 feet of screen lies below the water table. A threaded PVC well point will be placed at the bottom of the screen section.

A bentonite seal of at least 2 feet thick will be placed above the pre-packed filter pack. The depths to the bottom and top of the bentonite seal will be measured and documented. The bentonite will be allowed to hydrate according to manufacturer-recommended hydration time prior to beginning grouting of the annular space. Potable water may be added to the borehole to hydrate well seals placed above the water table surface. A grout seal of Portland cement/bentonite slurry will be placed above the bentonite seal to land surface. Piezometer construction details are summarized in Table 2-1. A typical piezometer construction diagram is shown on Figure 2-2.

All piezometers will be installed with flushmount wellhead completion. The top of each PVC well casing will be cut square and smooth. The casing will be equipped with a water tight locking cap and covered by an 8-inch diameter steel bolt down manhole cover. The manhole will be set into a 2-foot by 2-foot by 4-inch deep concrete well pad, sloped to drain water away from the manhole cover. Concrete for the well pad will be ready-mixed conforming to ASTM C94, Alternate 3. Concrete will be a dry, bagged premix variety that will be mixed with water in accordance with manufacturer specifications. Concrete mix will be agitated and placed within 1-1/2 hours after mixing. The pad and well will be marked with the well identification number. Each well will be equipped with a keyed-alike lock.

SOURCE:

LOCATIONS OF ROADS AND FORMER LOCATIONS OF BUILDINGS, TANKS, AND DISTRIBUTION LINES ARE TAKEN FROM N.A.S. DRAWING NO. 23032 DATED JUNE 24, 1944 AND FIELD OBSERVATIONS. WELL LOCATIONS ARE APPROXIMATE.

LEGEND

MW-23	MONITORING WELL LOCATION AND DESIGNATION
DMW-60	DEEP MONITORING WELL LOCATION AND DESIGNATION
P-4	PIEZOMETER LOCATION AND DESIGNATION
(NF)	INDICATES WELL NOT FOUND DURING SAR ADDENDUM FIELD EVENT
(18.87)	GROUNDWATER ELEVATION [1]
	GROUNDWATER ELEVATION ISOCONTOUR [1] (DASHED WHERE APPROX.)
	GROUNDWATER FLOW DIRECTION
(NM)	NOT MEASURED
(NA)	NOT AVAILABLE

1 - ELEVATION IN FEET ABOVE MEAN SEA LEVEL

MW-53 (18.80)
MW-48 (18.76)
MW-54 (NF)
MW-33 (18.87)
MW-32 (DRY)
(NA)
MW-59 (DRY)
MW-68
MW-55 (18.63)
MW-46 (18.92)
MW-28 (18.74)
MW-52 (DRY)
DMW-69 (NA)
MW-31 (18.65)
MW-27 (18.71)
MW-26 (18.67)
MW-67 (NA)
MW-25 (NM)
MW-1 (18.65)
MW-16 (18.69)
MW-30 (18.58)
MW-24 (18.61)
MW-17 (18.67)
MW-5 (18.66)
MW-15 (18.66)
MW-3 (18.64)
MW-18 (18.65)
MW-6 (18.66)
MW-23 (18.75)
MW-4 (18.65)
MW-14 (18.69)
MW-22 (18.73)
BUILDING 1159
DIESEL UST
MW-13 (DRY)
MW-7 (18.63)
MW-29 (18.58)
MW-8 (18.61)
DMW-61
MW-43 (NF)
MW-9 (18.60)
MW-19 (18.59)
MW-12 (DESTROYED)
MW-21 (18.59)
MW-11 (18.63)
MW-20 (18.59)
MW-10 (18.20)
(18.40)
MW-2 (18.64)
(18.61)
MW-50
MW-51 (DRY)
MW-66 (NA)
MW-58 (DRY)
MW-42 (18.90)
MW-39 (DRY)
MW-57 (23.71)
MW-38 (19.15)
MW-56 (26.84)
MW-62 (NA)
MW-40 (NF)
MW-41 (NF)
MW-37 (19.16)
MW-65 (NA)
MW-63 (NA)
MW-35 (DRY)
MW-36 (19.11)
MW-34 (19.05)
MW-44 (18.96)
MW-64 (NA)
MW-45 (19.11)
P-2
P-3
P-1
P-6
DMW-60 (19.26)
P-4
P-5
MW-47 (18.99)
FORMER FUEL DISTRIBUTION LINE
SERVICE PIT (TYP.)
FORMER LOCATION OF 25000 GALLON GASOLINE STORAGE TANK (TYP. 1 OF 6)
1136
1135
1134
1133
1132
1131
WOODED AREA
WOODED AREA
18.60
18.70
18.80
18.90
19.00
19.10

60 0 60
SCALE IN FEET

FIGURE 1-3

GROUNDWATER POTENTIOMETRIC SURFACE MAP FOR JULY 25, 2000
UST SITE NO. 1159
REMEDIAL ACTION PLAN

OUTLYING FIELD BRONSON
PENSACOLA, FLORIDA

n1tx17b.dgn A052003002ATL1103.ai

CAD FILE NO./DATE: k:\dgn\navy\pensacol\bronson\ 0401c\ 0401c003.dgn/10-18-01

Source: Remedial Action Plan for Site1159, Tetra Tech NUS, Inc. September 2002

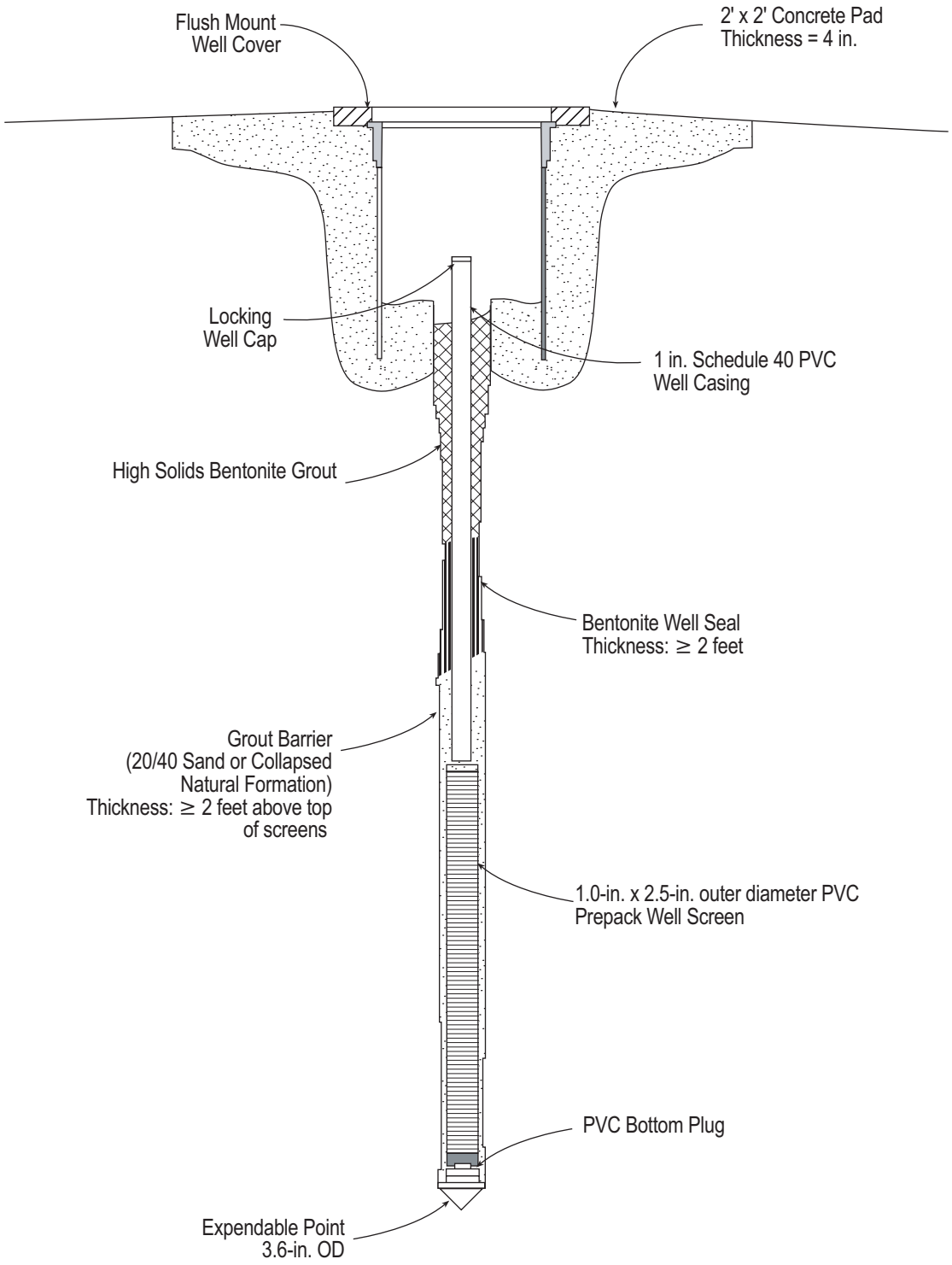

Figure 2-2
Typical Piezometer Construction Details
Site 1159
OLF Bronson

TABLE 2-1
Summary of Piezometer and Well Construction Details

Well ID	Well Depth (feet)	1-inch Diameter Well Casing[a] (feet)	1-inch Diameter Well Screen; 0.010-inch slot; with pre-packed filter pack (feet)	4-inch Diameter Well Casing[a] (feet)	4-inch Diameter Well Screen; 0.010-inch slot (feet)	Sand Pack (20/40 Filter Sand) (feet bls)	Bentonite Seal (feet bls)	Grout (feet bls)	Concrete Pad With Protective Cover Completion[b]	Lithologic Soil Samples
Piezometers [c]										
DP-1	22	12	10	NA	NA	NA	10-12	0-10	1	NA
DP-2	19	9	10	NA	NA	NA	7-9	0-7	1	NA
DP-3	19	9	10	NA	NA	NA	7-9	0-7	1	NA
DP-4	25	15	10	NA	NA	NA	13-15	0-13	1	NA
DP-5	24	14	10	NA	NA	NA	12-14	0-12	1	Continuous
DP-6	18	8	10	NA	NA	NA	6-8	0-6	1	NA
DP-7	27	17	10	NA	NA	NA	15-17	0-15	1	Continuous
DP-8	19	9	10	NA	NA	NA	7-9	0-7	1	Continuous
DP-9	18	8	10	NA	NA	NA	6-8	0-6	1	NA
DP-10	29	19	10	NA	NA	NA	17-19	0-17	1	Continuous
DP-11	21	11	10	NA	NA	NA	9-11	0-9	1	NA
DP-12	21	11	10	NA	NA	NA	9-11	0-9	1	NA
Groundwater Recovery Well [c]										
RW-1	20	NA	NA	13	10	8-20	6-8	0-6	1	Continuous
Bioslurping Extraction Well [c, d]										
BS-1	18	NA	NA	16	5	11-18	9-11	0-9	1	Continuous

Notes:

[a] Schedule 40 polyvinyl chloride

[b] Flushmount completion with 8-inch manhole bolt-down manhole cover with expandable locking well cap.

[c] Piezometers will be installed using direct push technology. Groundwater and bioslurping extraction wells with be installed using Hollow Stem Auger.

[d] Bioslurping extraction well requires vacuum tight well head, downhole dip tube, sampling port, pitot tube, and ball valve.

bls – below land surface

2.5.2 Bioslurping and Groundwater Extraction Well Installation

One groundwater extraction test well will be installed to complete the final design for a groundwater pump and treat system. An aquifer pump test, described in Section 2.7, will be performed using this well to determine the hydraulic conductivity at the site and specific capacity of the well. The groundwater extraction well will be installed in the vicinity of existing monitoring wells MW-2 and DMW-61 (Figure 2-1).

One bioslurping extraction well will be installed as part of the bioslurping pilot study (Section 2.8). The bioslurping extraction well will be installed in the vicinity of existing monitoring wells MW-47 and DMW-60 (Figure 2-1). This location allows the use of existing monitoring wells (MW-47 and DMW-60) and piezometers (P-4, P-5, and P-6) as monitoring points for the pilot study.

Prior to both well installations, continuous lithologic soil samples will be collected using the DPT Macrocore sampling system to assess the location of the water table and geology. All soil samples will be described by the field geologist for grain size, mineralogy, color, moisture content, odor, and structure. Descriptions will be recorded in the field logbook. Soil samples will be field screened with an OVA to define the vertical extent of LNAPL. Additionally, geotechnical soil samples will be collected from the screened intervals, as determined by the depth of the groundwater table, of both the bioslurping extraction well and the recovery well. Grain size analyses will be performed on these samples to assist with well design.

The well boreholes will be advanced using HSA drilling techniques. Borehole diameters will be at least 4 inches larger than the outside diameter of the casing and well screen. For HSA, the augers will be at least 8-¼ inches in diameter. The borehole for the groundwater extraction well will be completed to approximately 10 feet below the observed water table. The borehole for the bioslurping pilot test well will be completed to approximately 3 feet below the observed water table.

Once the augers have been advanced to the desired depth, both wells will be installed within the augers as they are removed from the boring. Each well will be constructed of an unused, threaded, 4-inch inside diameter (ID), schedule 40, PVC casing and 0.010-inch slotted screen. The groundwater extraction well screen will be 10 feet in length and the bioslurping extraction well screen will be 5 feet in length. The groundwater extraction well will be set so the entire screen lies below the water table. The bioslurping pilot test well will be set so approximately 3 feet of screen is below the water table and 2 feet of screen is above the water table. A threaded PVC well point will be placed at the bottom of each screen section. A minimum 2-inch annular space will be maintained between the casing and the borehole walls. The well casing, screen, and end cap will be assembled and installed so as to prevent damage to the sections and joints. No glue, solvents, or pipe dope will be used on casing threads to secure casing joints.

Before the well casing and screen are installed to the bottom of the borehole, approximately 6 inches of filter pack material (20/40 screen size sand) will be placed at the bottom of the borehole to serves as a firm footing. The top of the casing will have a temporary cap during installation of the annulus materials.

After the casing and screen assemblies are set at the appropriate depth, a sand filter pack will be installed around the well to a minimum of 2 feet above the screen. The sand filter pack will consist of a thoroughly washed, sound, durable, siliceous material containing less than 5 percent of silt or clay (commercially available 20/40-grain size or equivalent). No organic material, anhydrite, gypsum, mica, or calcareous material will be used. The filter pack will be installed around the well screen using a tremie in appropriate 2-foot lifts to prevent bridging. The top of the sand filter pack will be measured periodically using a weighted measuring tape. A bentonite seal of at least 2 feet thick will be placed above the sand filter pack. The depths to the bottom and top of the bentonite seal will be measured and documented. The bentonite will be allowed to hydrate according to manufacturer-recommended hydration time prior to beginning grouting of the annular space. Potable water may be added to the borehole of the bioslurping well to hydrate the well seal above the water table. A grout seal of Portland cement/bentonite slurry will be placed above the bentonite seal to land surface. A summary of well construction details is presented in Table 2-1. Details for a 4-inch diameter well are shown on Figure 2-3.

Both wells will be installed with flushmount wellhead completion. The top of each well casing will be cut square and smooth. The casing will be equipped with a water tight locking cap and covered by an 8-inch diameter steel bolt down manhole cover. The manhole will be set into a 3-foot by 3-foot by 4-inch deep concrete well pad, sloped to drain water away from the manhole cover. Concrete for the well pad will be ready-mixed conforming to ASTM C94, Alternate 3. Concrete will be a dry bagged premix variety and mixed with water in accordance with the manufacturer specifications. Concrete mix will be agitated and placed within 1-1/2 hours after mixing. The pad and well will be marked with the well identification number. Each well will be equipped with a keyed-alike lock.

In addition, the bioslurping extraction well will be fitted with a compression well seal which will be used in conjunction with a 1-inch diameter dip or vacuum tube, set near the free product/water interface. The compression well seal will be used to create a vacuum tight well seal.

Both the groundwater recovery well and the bioslurping extraction well will be developed after a minimum of 24 hours has elapsed since well installation was completed. The wells will be developed by alternately pumping and surging until the water is visibly free of sediment. Development will be considered complete when a minimum of five well volumes has been removed and field parameters (pH, temperature, specific conductance, and turbidity) have remained stable for three successive measurements. Typical well development will require 2 hours of pumping. Development water will be contained and managed in accordance with the waste management requirements in Section 4.0 Waste Management Plan. Development equipment will be decontaminated as specified in Section 2.11. No detergents, soaps, acids, bleaches, or other additives will be used to develop a well.

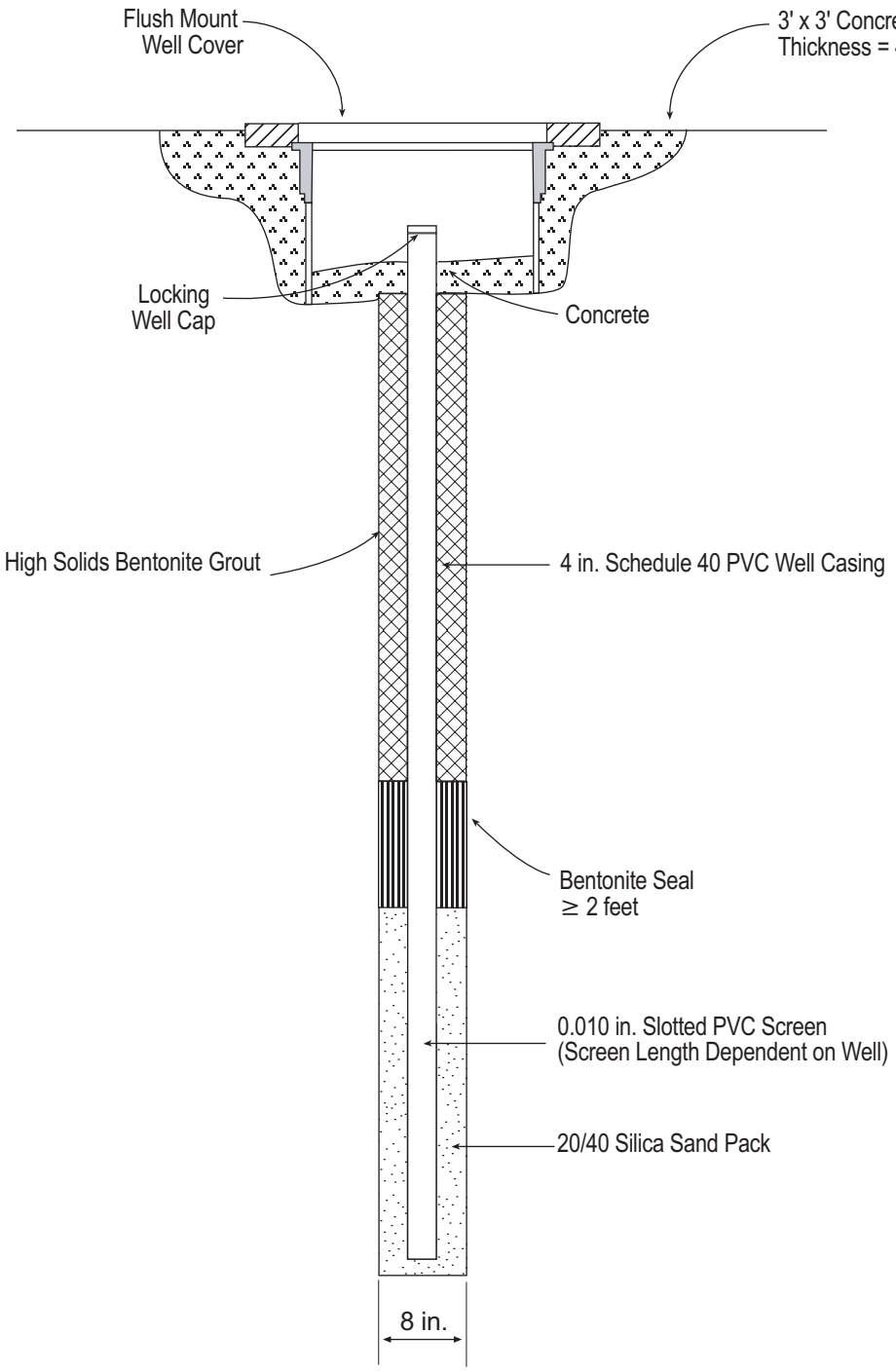

Figure 2-3
Typical 4-inch Diameter Well Details
Site 1159
OLF Bronson

2.5.3 Surveying

A Florida registered surveyor will survey new piezometer and extraction well locations relative to local benchmarks that reference to North American Datum (NAD). If no local benchmark can be established, the top of casing of monitoring well MW-1 will be assigned an arbitrary elevation of 30 feet msl and be used as an arbitrary benchmark. Horizontal control surveying (X-, Y-coordinates) will be performed at the ground surface of each sampling location. Vertical control surveying (Z-coordinate) will be performed on the monitoring wells at the top of casing and the ground surface referencing the North American Vertical Datum (NAVD).

2.6 Baseline Groundwater Evaluation

Groundwater samples will be collected from up to 36 existing monitoring wells, 10 DPT piezometers, and the groundwater extraction well to evaluate baseline groundwater quality conditions prior to the initiation of the aquifer and the bioslurping pilot tests. Groundwater samples will not be collected from wells that indicate the presence of LNAPL. Sample procedures will be performed as described in Section 3.0 Sampling and Analysis Plan.

Prior to groundwater sampling, water levels and the thickness of LNAPL will be recorded at all wells included in the baseline sampling event. Water levels will be measured using an oil/water interface probe with tape graduated in 0.01-foot increments. Measurements will be recorded as depth to water from a mark on the top of the well casing. Wells with greater than 0.1 foot of free product will not be sampled. Well number, date and time of measurement, and depth to water will be recorded in the field logbook.

Wells will be purged and sampled using a submersible or peristaltic pump. The wells will be purged using low-flow techniques in order to minimize agitation of the groundwater and turbidity. New Teflon tubing will be used for each well or piezometer; the tubing intake will be placed at the midpoint of the screen interval. Prior to sample collection, each well will be purged a minimum of three well volumes. Field parameters (temperature, pH, conductivity, dissolved oxygen [DO], oxidation-reduction potential [ORP], turbidity, and depth to water) will be measured during well purging activities after each well volume is removed. A minimum of three sets of readings will be recorded until two consecutive sets of readings stabilize to within 10 percent or five well volumes are removed. Field parameters will be measured using a multi probe meter (i.e., Horriba U22) equipped with an airtight flow-through cell.

The groundwater samples will be submitted to an offsite laboratory for analysis of BTEX and MTBE (SW-846 Method 8260B), TRPH (Florida Petroleum Residual Organic [FL-PRO] method), PAHs (SW-846 Method 8310), and total lead (SW-846 Method 6010). The sample preparation, handling, and analysis will be performed as detailed in Section 3.0 Sampling and Analysis Plan.

2.7 Aquifer Testing

2.7.1 Aquifer Pump Tests

A step drawdown test and a 72-hour constant rate pump test will be conducted on the surficial aquifer using the newly installed 4-inch diameter groundwater extraction well. This well will be located outside the limits of the free product plume. Existing monitoring wells will be used as observation wells during the test. (see Figure 2-1). The objective of the pump test is to determine extraction well yields and aquifer characteristics for the groundwater recovery system at the site. Due to the high storage capacity expected at the site, a 72-hour pump test is required to sufficiently impact the aquifer. In addition, the aquifer test will help identify the maximum amount of groundwater that may be collected by the extraction wells and any disposal limitations.

Prior to the start of the pump tests, up to 24 hours of background data will be recorded in each of the wells to account for changes in water levels due to tide fluctuations or changes in barometric pressure should adjustments to the pump test data be required. A submersible pressure transducer will be placed in the groundwater extraction well at a fixed depth, at which groundwater in the well is not expected to draw down below. Pressure transducers will also be placed in the observation wells. All data collected in the field by the transducers will be logged at a linear or logarithmic rate. Any other pumping systems in the area will be identified during the background and testing periods. This data will also be used to identify any impact tidal fluctuations may have on water levels.

After background data have been collected, a step-drawdown test will be performed on the extraction well. The purpose of the step-drawdown test will be to determine the maximum extraction rate achievable without inducing adverse drawdown effects within the extraction well. A minimum of three consecutive steps will be conducted at successively increasing extraction rates; each step will last 1 hour. A test pump, such as a Grundfos ready flow pump, will be placed into the well. The data logger will be programmed to collect water level/drawdown measurements at a log scale for the duration of each step. The discharge pipe from the pump will be equipped with a valve or other means to control the volume of flow. A flowmeter, or similar device, will be used to measure the discharge rate from the well. Once the pump setting requirements and a safe extraction rate are determined, a 24-hour static monitoring period will be conducted to allow water levels to return to static conditions. Recovery water levels will be monitored.

The 72-hour aquifer pump test will be performed on the surficial aquifer at an extraction rate defined during the step-drawdown test. Based on the site geology, the expected constant flow rate may be 50 gallons per minute (gpm) or greater. The test will not begin until water levels in all wells have adequately recovered after the step test. The data logger will be programmed to collect water level/drawdown measurements at a log scale over a 72-hour period. Throughout the test, water levels will be taken periodically by hand using a water-level indicator to compare with readings from the data logger. Periodic measurements of discharge and corrections using the valve will be made and recorded during the pump test. The duration of the pump test may be modified by the engineer or geologist onsite based on field observations of the pumping stress.

Upon completion of the 72-hour pump test, the data logger will be programmed to record recovery water level data at a log scale until the aquifer is back to equilibrium conditions, up to 24 hours or until 90 percent recovery is achieved. These recovery data can be used to check the results from the pumping test.

Groundwater collected during the aquifer tests will be pumped into 20,000-gallon frac tanks. Based on contaminant concentrations, the extracted groundwater will be treated onsite using a portable treatment unit (i.e., air stripper) and transported offsite to the local POTW, Bayou Marcus Waste Reclamation Facility, or the water will be disposed directly to the POTW. Approval for disposal will be obtained from the Escambia County Utilities Authority prior to conducting the aquifer test. The groundwater extraction rate proposed in the RAP was 0.5 gpm. Production wells in sand and gravel aquifers which are fully penetrating have recorded pumping rates of 150 gpm and higher; however, since the extraction wells used at the site will be only partially penetrating and 4 inches in diameter, the optimal flow rate is anticipated to be between 40 to 60 gpm. Approximately 225,000 gallons are assumed for treatment and disposal during the pump test.

Data recorded by the data logger will be imported into a computer and analyzed to determine the transmissivity of the aquifer zone. Pumping test data will be analyzed using the Cooper-Jacob straight line method and the recovery test data will be analyzed using the Theis and Jacob recovery method. The total well yield will be recorded along with the pump rate and used to compute the specific capacity of the well.

2.7.2 Aquifer Test Sampling

Grab water samples will be collected during the step test and the 72-hour aquifer pump test. One sample will be collected per day during the pump tests for BTEX and MTBE (SW-846 Method 8260B), TRPH (FL-PRO method), and PAHs (SW-846 Method 8310). Three samples will be collected each day of pumping for total lead (SW-846 Method 6010) to help estimate lead extraction rates.

After completion of the aquifer pump tests, groundwater samples will be collected from up to seven existing monitoring wells (MW-2, MW-4, MW-7, MW-8, MW-9, and MW-10 and DMW-61) and the recovery well (RW-1) to evaluate the effects of the test on groundwater quality. Wells will be purged and samples will be collected using a submersible or peristaltic pump. The wells will be purged using a low-flow techniques in order to minimize agitation of the groundwater and turbidity. New Teflon tubing will be used for each well; the tubing intake will be placed at the midpoint of the screen interval. Prior to sample collection, each well will be purged a minimum of three well volumes. Field parameters (temperature, pH, conductivity, DO, ORP, turbidity, and depth to water) will be measured during well purging activities after each well volume is removed. A minimum of three sets of readings will be recorded until two consecutive sets of readings stabilize to within 10 percent or five well volumes are removed. Field parameters will be measured using a multi probe meter (i.e., Horriba U22) equipped with an airtight flow-through cell.

The groundwater samples will be submitted to an offsite laboratory for analysis of BTEX and MTBE (SW-846 Method 8260B), TRPH (FL-PRO method), PAHs (SW-846 Method 8310), and total lead (SW-846 Method 6010). The sample preparation, handling, and analysis will be performed as detailed in Section 3.0 Sampling and Analysis Plan.

2.8 Bioslurping Pilot Test

The bioslurping pilot study network will include the newly installed bioslurping extraction well and existing monitoring wells (MW-47 and DMW-60) and piezometers (P-4, P-5, and P-6). The location of these wells are presented on Figure 2-1. During pilot test activities, monitoring wells and piezometers will be sealed under vacuum enhanced conditions. Additional monitoring points may be used or installed if necessary.

2.8.1 Baseline Field Data

Prior to initiating the pilot study test, baseline soil gas concentrations will be collected at the selected monitoring points. Total hydrocarbons will be measured using an OVA or toxic vapor analyzer (TVA). Oxygen concentrations will also be measured and recorded using an lower explosion limit (LEL)/oxygen meter. All meters will be calibrated in the field.

Water levels and the thickness of LNAPL will be measured in the bioslurping extraction well and all piezometers and monitoring wells to be included in the pilot study analysis using an oil/water interface probe. Measurements will be recorded as depth to water from a mark on the top of the well casing. Well number, date and time of measurement, and depth to water will be recorded in the field logbook. Additionally, ambient soil and atmospheric temperatures, and weather conditions will be recorded. This data may be obtained in conjunction with other events.

2.8.2 Baildown Test

Baildown product recovery tests will be performed prior to the pilot study startup to estimate recovery potential and determine whether free product is mobile at the site under passive conditions. Wells with free product will be determined during the baseline groundwater and free product evaluation.

Before each test, the depth to product and water will be measured with an oil/water interface probe. The free product will be rapidly bailed from each well with product using a Teflon bailer, minimizing groundwater removal. The recovered LNAPL will be poured into a graduated cylinder to determine its volume. The top of the LNAPL surface will be measured using the oil/water interface probe and recorded as the well recovers. Measurements may be taken every hour for 2 hours, then every 2 to 4 hours for a maximum of 24 hours. Measurements can be made more frequently if LNAPL recovery is rapid or less frequently if recovery is very slow. An example of a baildown test record sheet is provided in Appendix A. The true thickness of the LNAPL will be determined by plotting the elevation of the top of LNAPL in the well versus time since bailing. The recovered free product will be containerized in a 55-gallon drum and recycled through the Defense Reutilization and Marketing Office (DRMO) in accordance with Section 4.0 Waste Management Plan.

2.8.3 Bioslurping Pilot Test Operation

Following the site characterization activities, a bioslurper pilot test will be conducted to determine the achievable radius of influence within the subsurface at Site 1159. During the pilot study test, free product thickness, groundwater levels, and soil gas concentrations will be measured and recorded. The pilot test will run for 3 to 5 days, depending on

observations in the field. A brief startup test will be conducted to ensure that all system components are operating properly before conducting the bioslurper pilot test.

2.8.3.1 Pilot Study Configuration

A drop tube (such as a 1-inch diameter PVC pipe) will be installed through the compression well seal and set in the bioslurping extraction well at the approximate water/free product interface, based on results from the baildown test, which compensates for the depression of the water level in the well caused by excessive LNAPL thickness. The wellhead and applicable monitoring points with vacuum tight seals will be connected to a vacuum/pressure gauge box so that pressure readings can be taken during the pilot test.

A vacuum truck will be used to pump contaminant vapors, free product, and groundwater from the bioslurping extraction well and to create the necessary vacuum pressure in the subsurface to create bioslurping conditions. The vacuum truck will separate the liquid phase components from the vapor phase components, which will be released to the atmosphere. If possible, an air samples will be collected from vapors releasing from the vacuum truck, as described in Section 2.8.4.1. If necessary, vapor treatment will be conducted using a portable treatment system, such as activated carbon.

The free product/water mixture will be pumped from the vacuum truck into an OWS, where groundwater and free product will be separated. Free product will be collected and recycled through the DRMO. Groundwater from the OWS will be disposed of at a sanitary sewer that connects to the POTW. All groundwater and free product extracted during these tests will be managed and disposed of as presented in Section 4.0 Waste Management Plan.

2.8.3.2 Soil Gas Permeability Testing

To evaluate the radius of influence exerted by the bioslurping system, soil gas permeability testing will be performed. During this testing, the soil gas pressure in each monitoring point will be measured; the change in pressure and the distance of each monitoring point from the bioslurping extraction well will be recorded. The radius of influence can be estimated by plotting the log of the pressure versus the distance from the extraction well and is defined as the distance at which the curve intersects a pressure of 0.1 inch of water.

Prior to pilot study startup, soil gas pressures will be measured in all site monitoring wells fitted with the a vacuum tight seal with the vacuum/pressure gauge. Soil gas pressure data will be collected immediately when the wellhead ball valve is closed and frequently during the first 20 minutes of the test. After 20 minutes, data will be collected depending on the rate of pressure change.

Soil gas will be monitored for oxygen and total hydrocarbon concentrations using field screening meters prior to the startup of the pilot test and then beginning 1 hour after the test is started and throughout the test. Soil gas can be collected from the extraction well via the sampling tube installed as specified in Section 2.5. These data will also be used to estimate the radius of influence at the site.

The final depths to water and free product will be measured after completion of the pilot study test. Drawdown in the extraction well and in monitoring points will be recorded. Drawdown can also be measured during the test in wells without airtight seals or with an oil/water interface probe set within an airtight well cap.

2.8.4 Process Monitoring

Process monitoring will be conducted throughout the pilot study test to estimate the mass of hydrocarbons in the removed free product, dissolved in groundwater, and in the vapor phase.

2.8.4.1 Vapor Discharge Sampling and Analysis

To support the system design, two vapor emission samples will be collected during the pilot test; one sample will be collected after startup and one sample will be collected just prior to the pilot study shutdown. Samples will be sent to an offsite laboratory and analyzed for BTEX and TPH as gasoline by EPA TO-3 Method 8260B. Air samples will be collected using Tedlar bags or a Suma canister, as outlined in Section 3.0 Sampling and Analysis Plan. Samples will be analyzed for BTEX and total petroleum hydrocarbons (TPH) as gasoline by EPA TO-3 Method 8260B. If necessary, vapor treatment will be conducted using a portable treatment system, such as activated carbon.

Air emissions are monitored in accordance with FAC 62-770.700 to ensure that the mass of TPH in the air emissions from the remediation equipment systems don't exceed 13.7 pounds per day.

2.8.4.2 Aqueous Effluent Analysis

Two aqueous effluent samples will be collected from the OWS discharge during the pilot test; samples will be collected at the beginning and the end of the vacuum enhanced bioslurping test. Samples will be sent to an offsite laboratory and analyzed for BTEX (SW-846 Method 8260B) and TRPH (FL-PRO method). Samples will be collected as outlined in Section 3.0 Sampling and Analysis Plan.

2.8.4.3 Recovery Rates and Volumes

The total volumes of free product and groundwater recovered during the pilot study will be quantified after separation by the OWS. The recovery rate, will be determined by dividing the total volumes recovered over the total time of pilot test operation. The volume of hydrocarbons removed via the extracted groundwater can be calculated based on the concentration determined from the aqueous effluent analysis.

The volume of vapor discharge may be estimated using the pitot tube connected to the bioslurping extraction well. The mass of hydrocarbons extracted in the vapor phase will be based on the average concentration of the two vapor samples taken and the volume of soil gas extracted.

2.9 Waste Characterization

Solid and liquid wastes will be containerized and the containerized wastes will be stored in accordance with all applicable rules and regulations until treated and/or disposed of offsite, as discussed in Section 4.0 Waste Management Plan. Solid and liquid wastes will be disposed of at offsite facilities approved to receive the wastes. Documentation of the transport and disposal of wastes offsite will be provided as discussed in Section 4.0 Waste Management Plan.

2.9.1 Soil and Solid Waste

Following the completion of work, sample(s) from the soil cuttings generated during drilling will be collected by CCI to characterize the solid waste for offsite transport and disposal. The samples will be sent to an offsite laboratory and analyzed using EPA SW-846 procedures for Toxic Characteristic Leaching Procedure (TCLP) VOCs, TCLP semivolatile organic compounds (SVOCs), TCLP metals, TCLP pesticides, TCLP herbicides, polychlorinated biphenyls (PCBs), Reactivity/Corrosivity/Ignitability (RCI), and TRPH. Analytical Methods are included in Section 3.0 Sampling and Analysis Plan.

2.9.2 Liquid Waste

Liquid wastes may be generated from well development, decontamination activities, aquifer pump tests, and the bioslurping pilot test. CCI will collect representative samples of the liquid wastes for waste characterization. The samples will be sent to an offsite laboratory and analyzed using EPA SW-846 procedures for RCI, VOCs, SVOCs, pesticides, herbicides, metals, and TRPH. Analytical methods are included in Section 3.0 Sampling and Analysis Plan.

2.10 Site Cleanup and Restoration

Disturbed areas will be repaired or rebuilt to return to conditions that existed prior to the initiation of work. All debris resulting from site cleanup activities will be managed as described in Section 4.0 Waste Management Plan.

2.11 Decontamination and Demobilization

Personnel and equipment will be decontaminated prior to leaving the site in accordance with the Health and Safety Plan, presented in Appendix B. Equipment will be properly decontaminated to remove all contamination, which may be associated with the equipment as a result of the scope of work activities. All debris and rinsate generated by the treatment activities will be properly containerized, sampled and analyzed, and disposed offsite as specified in Section 4.0 Waste Management Plan.

2.12 Project Operations

2.12.1 Operation Considerations

Several considerations related to the execution of the field work at Site 1159 are listed below.

- Camping Facilities
  - Several camping facilities are located within the area of site activities.
  - CCI will coordinate with MRW personnel to ensure that recreational site usage will not interfere with the site characterization field work.

  - During working hours, CCI will secure the working area from non-authorized persons with warning tape, orange safety fencing, or other appurtenances to prevent unwanted intrusion.
  - During non-working hours, CCI will be responsible for securing our equipment and other appurtenances at the site.
- Site Access
  - Site 1159 is heavily forested with large oak trees. A paved road runs east-west along the southern portion of the site. A dirt road runs north-south on the western portion of the site. All other paths into the site area are foot trails.
  - Exiting monitoring wells may need to be located with the use of a survey or GPS unit.
  - The installation of DPT piezometers may need to be performed by a smaller mobile rig.
  - The bioslurping pilot study area may need to be re-evaluated if an HSA drill rig can not mobilize to the study area.
- Retention Pond/Groundwater Monitoring
  - A few of the site monitoring wells are located within a retention pond, in the southwestern portion of the site, which currently contains water.
  - The groundwater monitoring and sampling plan will be re-evaluated before mobilizing to the site to determine which wells should be included.
  - The source of stormwater entering the retention pond will be evaluated.

2.12.2 Health and Safety

Worker and community safety is of the utmost importance on this project. CCI will comply with the health and safety requirements outlines in the project Health and Safety Plan (Appendix B). All workers involved in any intrusive work or those who may be exposed to subsurface soils, groundwater or waste-impacted materials will provide evidence of medical certification, respirator fit test, 40hour and 8-hour refresher Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations (HAZWOPPER) training to CCI prior to the start of work. No onsite work will be allowed until all the information is provided to CCI.

2.12.3 Traffic Control Plan

Traffic control will be the responsibility of the CCI Site Superintendent. However, traffic control is not anticipated to be a major concern during completion of this work at OLF Bronson since there is only one paved road through the area. CCI will consult with MWR personnel to evaluate placement of equipment, temporary storage areas, and traffic flow to minimize the impact of this work.

2.13 Project Submittals

After completion of the bioslurping pilot test, results from all activities described in this Work Plan Addendum will be presented in a RAP Addendum for Site 1159. This RAP Addendum will include the final design of the full-scale remedial alternative.

2.14 Project Schedule

The proposed project schedule to complete the work activities described in this Work Plan Addendum is provided in Appendix C. This schedule may be adjusted based on regulatory review times, contracting times, and budgeting constraints.

The proposed site operations are 8:00 a.m. to 5:00 p.m. during the week and on weekends. Depending on the magnitude of adverse weather and its potential impact to the project schedule, time lost during the scheduled work week may be made up at an accelerated schedule at the discretion of the CCI Project Manager.

2.15 Communications Plan

A communication matrix outlining the lines of communication for the Southern Division, NAVFAC and CCI personnel for this work is presented in Table 2-2. Table 2-3 provides a project personnel directory.

TABLE 2-2
Communications Matrix

CCI Position	Navy Direct Report
Scott Newman, Program Manager	Eva Clement, ACO Jimmy Jones, COTR
Scott Smith, Senior Project Manager	Jimmy Jones, COTR Richard Stanley, Contract Officer
Greg Wilfley, CTO Project Manager	Byas Glover, RPM

ACO – Administrative Contracting Officer
COTR – Contracting Officer's Technical representative
RPM – Remedial Project Manager

TABLE 2-3
Project Personnel Directory

Contact	Company
Scott Newman Scott Smith Theresa Rojas Joe Giandonato Greg Wilfley	CH2M HILL Constructors, Inc. 115 Perimeter Center Place, N.E. Suite 700 Atlanta, GA 30346-1278 770/604-9182
Rich Rathnow	CH2M HILL Constructors, Inc. 151 Lafayette Drive Suite 110 Oak Ridge, TN 37830 855/483-9032
Eva Clement Richard Stanley	Southern Division Naval Facilities Engineering Command P.O. Box 190010 North Charleston, SC 29419-9010
Jimmy Jones	Southern Division Naval Facilities Engineering Command P.O. Box 190010 North Charleston, SC 29419-9010 843/820-5544
Byas Glover	Southern Division Naval Facilities Engineering Command P.O. Box 190010 North Charleston, SC 29419-9010 843/820-5651

3.0 Sampling and Analysis Plan

This Sampling and Analysis Plan (SAP), describes CCI's tasks and responsibilities with respect to the sampling and analysis associated with the work effort described in Section 2.0. CCI intends this document to be a site-specific guide for use by the field team while performing the project-required sampling and analysis. Any changes to the activities described in this SAP must be documented as an addendum to this SAP and approved by the Project Manager and Project Chemist.

Samples will be collected in accordance with the U.S. Environmental Protection Agency (EPA) Region IV Environmental Investigative Standard Operating Procedures and Quality Assurance Manual (EISOPQAM), 1996, and 1997 revisions.

The sampling team will be qualified under the Navy Installation Restoration Chemical Data Quality Manual (IRCDQM), 1999 sampling requirements. FDEP SOPs will be followed for each sampling task.

A Navy, United States Army Corps of Engineers (USACE), or Air Force Center for Environmental Excellence (AFCEE) and Florida approved laboratory will be used for all sample analyses.

3.1 Data Quality Levels for Measurement Data

The data quality levels for each sampling task described above are listed in Table 3-1. The sampling events, the sampling and analytical requirements, along with the required level of quality and data packages are listed in Table 3-2. The quantitation, project action, accuracy, precision, and completeness limits by which the data will be evaluated will be provided by the selected laboratory and approved by CCI's Quality Assurance Chemist.

A Navy-, USACE-, or AFCEE-, and FDEP-approved laboratory will be used for all sample analyses. In addition, the laboratory will also follow FDEP SOPs.

Navy Level C Quality Control and CCI Level C data package will be required along with appropriate Quality Control samples for the required analyses. All analytical data will be submitted by both hard copy and electronic files.

TABLE 3-1
Data Quality Levels

Sampling Activity	Data Quality Level Category
LNAPL Delineation and Subsurface Soil Investigations (onsite)	Screening
Baseline Groundwater Evaluation (offsite laboratory analyses)	Definitive
Aquifer Pump Tests (offsite laboratory analyses)	Definitive
Aqueous Effluent Analysis Process Monitoring (offsite laboratory analyses)	Definitive
Vapor Discharge Analysis Process Monitoring (offsite laboratory analyses)	Definitive
Backfill characterization (offsite laboratory analyses)	Definitive
Waste and Disposal characterization (offsite laboratory analyses)	Definitive

TABLE 3-2

Samplling and Analytical Summary

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT[1]	Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservtn	Containers
LNAPL Delineation Soil Screening													
Screening of selected DPT locations	DPT borings	Soil	Two samples per boring	6	Grab	Auger, SS spoon, SS bowl, OVA/FID	ASAP	Screening	Organic vapor screening	NA	ASAP	NA	(2) 16oz amber glass
Baseline Groundwater Sampling													
Baseline Groundwater Monitoring Well Sampling	36 Monitor Wells, 10 Piezometers, and 1 Extraction Well	Water	Once	47 + 5 dup + 3 MS + 3 MSD Total = 58	Grab	Peristaltic pump; Teflon tubing	14 days	CCl Level C	BTEX + MTBE	8260B	14 day	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
									PAHs	8310	14 day extr; 40 day analysis	Cool to 4°C	(1) L amber glass
									TRPH	FL-PRO	7 day extr; 40 day analysis	HCl pH< 2; Cool to 4°C	(1) L amber glass
									Lead	6010B	180 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
	Pre-Equipment Rinsate Blank	Water	1 per set of pre-cleaned equipment (5%)	3	Prepared in Field	Analyte-free water, SS funnel	14 days	CCl Level C	BTEX + MTBE	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									PAHs	8310	14 day extr; 40 day analysis	Cool to 4°C	(1) L amber glass
									TRPH	FL-PRO	7 day extr; 40 day analysis	HCl pH< 2; Cool to 4°C	(1) L amber glass
									Lead	6010B	180 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
	Post-Equipment Rinsate Blank	Water	1 per set of field-cleaned equipment (5%)	3 (or as needed)	Prepared in Field	Analyte-free water, SS funnel	14 days	CCl Level C	BTEX + MTBE	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									PAHs	8310	14 day extr; 40 day analysis	Cool to 4°C	(1) L amber glass
									TRPH	FL-PRO	7 day extr; 40 day analysis	HCl pH< 2; Cool to 4°C	(1) L amber glass
									Lead	6010B	180 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
			(if equipment are decontaminated in the field)										

Notes:

1. Calendar days

TABLE 3-2
Samplling and Analytical Summary

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT[1]	Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservtn	Containers
	Trip Blank	Water	1 Per cooler containing volatile samples	1	Prepared by Lab	(2) 40 mL vials	14 days	CCI Level C	BTEX + MTBE	8260B	14 day	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
Aquifer Pump Tests	Well Head	Water	1 After six hour step test, then 1 every 24 hours	4 + 1 dup + 1MS + 1 MSD = 7	Grab	Grundfos pump or dip jar	14 days	CCI Level C	BTEX + MTBE	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									PAHs	8310	14 day extr; 40 day analysis	Cool to 4°C	(1) L amber glass
									TRPH	FL-PRO	7 day extr; 40 day analysis	HCl pH< 2; Cool to 4°C	(1) L amber glass
		Water	3 After six hour step test, then 3 every 24 hours	12 + 1 dup + 1MS + 1 MSD = 16	Grab	Grundfos pump or dip jar	14 days	CCI Level C	Lead	6010B	180 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
	Monitor Wells: MW-2, MW-4, MW-7, MW-8, MW-9, MW-10, DMW-61, and RW-1	Water	Once	7 + 1 dup + 1 MS + 1 MSD Total = 10	Grab	Peristaltic pump; Teflon tubing	14 days	CCI Level C	BTEX + MTBE	8260B	14 day	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
									PAHs	8310	14 day extr; 40 day analysis	Cool to 4°C	(1) L amber glass
									TRPH	FL-PRO	7 day extr; 40 day analysis	HCl pH< 2; Cool to 4°C	(1) L amber glass
									Lead	6010B	180 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
	Pre-Equipment Rinsate Blank	Water	1 per set of pre-cleaned equipment (5%)	1	Prepared in Field	Analyte-free water, SS funnel	14 days	CCI Level C	BTEX + MTBE	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									PAHs	8310	14 day extr; 40 day analysis	Cool to 4°C	(1) L amber glass
									TRPH	FL-PRO	7 day extr; 40 day analysis	HCl pH< 2; Cool to 4°C	(1) L amber glass
									Lead	6010B	180 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE

Notes:
1. Calendar days

TABLE 3-2

Samplling and Analytical Summary

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT[1]	Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservtn	Containers
	Post-Equipment Rinsate Blank	Water	1 per set of field-cleaned equipment (5%)	1 (or as needed)	Prepared in Field	Analyte-free water, SS funnel	14 days	CCI Level C	BTEX + MTBE	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									PAHs	8310	14 day extr; 40 day analysis	Cool to 4°C	(1) L amber glass
									TRPH	FL-PRO	7 day extr; 40 day analysis	HCl pH< 2; Cool to 4°C	(1) L amber glass
									Lead	6010B	180 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
			(if equipment are decontaminated in the field)										
	Trip Blank	Water	1 Per cooler containing volatile samples	1	Prepared by Lab	(2) 40 mL vials	14 days	CCI Level C	BTEX + MTBE	8260B	14 day	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
Bioslurp Pilot Study													
Vapor Sampling	Vapor Exhaust	Air/Vapor	1 at the beginning of test, 1 at the end	2	SUMMA	SUMMA	14 days	CCI Level C	EPA TO-3 BTEX + MTBE + TRPH (Gasoline)	8260B	14 day	None	SUMMA Canister
Aqueous Effluent Samples	OWS Discharge	Water	1 at the beginning of test, 1 at the end	2	Grab	Sample Container or dip jar	14 days	CCI Level C	BTEX + MTBE	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									TRPH	FL-PRO	7 day extr; 40 day analysis	HCl pH< 2; Cool to 4°C	(1) L amber glass

Notes:

1. Calendar days

TABLE 3-2
Samplling and Analytical Summary

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT[1]	Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservtn	Containers
Waste Characterization Sampling Solids													
Drill Cuttings	Drums	Soil/ Solids	1 per 6 Drums	1	Composite 5 random grabs into 1 sample (do not composite VOCs)	SS spoon, SS bowl	14 days	DQO Level III, CCI Level B	TCLP Volatiles	1311/8260B	14 day TCLP extr; 14 day analysis	Cool to 4°C	(1) 4 oz amber glass
									TCLP Semi-Volatiles	1311/8270C	14 day TCLP extr; 7 day extr; 40 day analysis	Cool to 4°C	(2) 8 oz amber glass
									TCLP Metals	1311/6010B/7470	6 month TCLP extr; 6 month analysis Hg: 28 day TCLP extr; 28 day analysis		
									TCLP Pesticides	1311/8081A	14 day TCLP extr; 7 day extr; 40 day analysis		
									TCLP Herbicides	1311/8151A	14 day TCLP extr; 7 day extr; 40 day analysis		
									PCBs	8082	14 day extr; 40 day analysis		
									Corrosivity	9045a	ASAP		
									Ignitability	1010/1020	ASAP		
									TPH	FL-PRO	7 day extr; 40 day analysis	Cool to 4°C	(1) 4 oz amber glass

Notes:
1. Calendar days

TABLE 3-2

Samplling and Analytical Summary

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT[1]	Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservtn	Containers
Waste Characterization Sampling Liquids													
Characterization of Decontamination Water and/or Well Development Water	Decon, Purge or Development water, OWS Discharge Water	Water	As Required	5 (or as needed for disposal)	Grab	Drum thief or dip jar	14 days	CCI Level B	TCL Volatiles	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									TCL Semi-volatiles	8270C	14 days ext; 40 days analysis	Cool to 4°C	(3) 1L amber glass
									TCL Pesticides	8081A	14 days ext; 40 days analysis		
									TCL Herbicides	8151A	7 day extr; 40 day analysis		
									TPH	FL-PRO	7 day extr; 40 day analysis	HCl pH< 2; Cool to 4°C	(1) L amber glass
									TAL Metals	6010B/7470A	180 days; Hg = 28 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
									Ignitability	9040B	ASAP	Cool to 4°C	(1) 250 mL amber glass
									Corrosivity	Chapter 7.3	ASAP	Cool to 4°C	(1) L amber glass
Product Characterization Sampling													
Product from Evaluations or OWS	Drum or OWS	Organic	2 or as required	2	Grab	Drum thief or dip jar	14 days	CCI Level B	RCRA 8 Metals	8260B	180 days	Cool to 4°C	(1) 2oz amber glass
									TOX	450.1	14 Days		
									TSS	160.2	7 Days		

Notes:

1. Calendar days

Data will be evaluated against the following FDEP groundwater cleanup levels:

- Benzene (1 µg/L)
- Toluene (40 µg/L)
- Ethylbenzene (30 µg/L)
- Total Xylenes (20 µg/L)
- MTBE (50 µg/L)
- TRPH (5,000 µg/L)
- Lead (15 µg/L)

3.2 Sampling Objectives

The sampling objectives for this project will be as follows:

- Screen soil samples for LNAPL delineation and subsurface soil investigations from three DPT sample locations.
- Collect samples for baseline evaluation from 47 monitoring wells.
- Collect aquifer pump test samples from 8 monitor wells and 16 grab points.
- Collect vapor emission and aqueous effluent samples during vacuum enhanced bioslurping pilot test.
- Collect free product/water mixture samples for disposal.
- Collect samples for waste characterization of drummed well cuttings.
- Collect samples for water used in equipment decontamination, or well development as necessary.

3.3 LNAPL Delineation and Subsurface Soil Screening

During the delineation phase of the project DPT sampling will be used to collect continuous lithologic and screening samples. The screening samples will be collected at the following locations: BS-1, DP-5, and DP-7. Two samples will be collected at each boring. The OVA will be calibrated and operated according to manufacturers specifications. Results of all OVA readings will be entered into the logbook.

An OVA/FID will be used at three DPT locations to analyze samples collected from the borings. Samples will be obtained from the DTP core samples and placed into 16-ounce jars covered with aluminum foil. Readings must be obtained from the headspace of samples in half-filled, 16-ounce jars. Each soil sample should be obtained from the vadose zone (the area above the water table), brought (if necessary) to a temperature of between 20 degrees Celsius (°C) (68°F) and 32°C (90 degrees Fahrenheit (°F), and the reading obtained 5 minutes thereafter. Since an OVA/FID will be used, each soil sample must be split into two jars, and one of the readings must be obtained with the use of an activated charcoal filter. The total corrected hydrocarbon measurement must be determined by subtracting the filtered reading from the unfiltered reading. Analytical instruments must be calibrated in accordance with the manufacturer's instructions.

3.4 Baseline Groundwater and Free Product Evaluation

Prior to groundwater sampling all monitor wells will be measured prior to any sampling. The data generated from this event will be used to generate a current potentiometric map for the willow zone of the site and to assess the current extent of LNAPL present at the site. (See Section 3.5.1 for measurement methodology).

In order to evaluate the effectiveness of the proposed remediation, baseline samples will then be collected from existing monitor wells, ten DPT piezometers, and the groundwater extraction well. The samples will be collected in the following manner and analyzed in accordance with Table 3-2.

3.4.1 Water-level Measurements

Groundwater levels will be measured in monitoring wells prior to sampling. Water levels will be measured using an electronic sensor with tape graduated in 0.01 feet. Measurements will be recorded as depth to water or free product from the mark on the top of the well casing. Well number, date and time of measurement, and depth to water will be recorded in the field logbook.

3.4.2 Well Purging

Before sampling, each well will be purged using a low-flow pump to minimize both agitation of the groundwater and sample turbidity. The following methods are consistent with Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures (EPA, 1996). The intent of this procedure is to remove stagnant water from the well and introduce fresh groundwater into the well at a rate that does not produce drawdown of the water table in the well being sampled. This procedure also reduces the time it takes to purge the wells and the quantity of water removed as investigation derived waste (IDW). The field team will keep the pumping rate as low as possible, being careful not to lower the water table in the well. The anticipated pumping rate is 0.15 to 0.25 gallons per minute (gpm). Water level measurements will be made concurrently with the water quality parameter measurements. Field measurements of DO, ORP, turbidity, pH, temperature, and specific conductance will be made before initial purging and at 5-minute intervals thereafter. The water quality parameters will be measured using an airtight flow-through cell. Measurement data will be recorded on the Well Purging Form. Purging will continue until field measurements are stable to within +/- 10 percent over three successive measurements or a maximum of five well volumes has been removed. The above parameters will be documented in the logbook and the wells will be sampled.

Samples will be collected as soon as enough water recharges after purging. Water samples will be preserved as required in Table 3.2 and will be delivered to the laboratory within 24 hours of collection. In addition to the groundwater samples, quality control (QC) samples will be collected according to Table 3-2.

3.4.3 Collecting Samples from Monitoring Wells

Samples will be collected using the low-flow pump and Teflon® tubing. Once the field parameters have stabilized, the pump will be turned off and the tubing leading to the flow-through cell will be removed. The pump will then be turned back on and the appropriate

sample containers will be filled. Samples for VOC analysis will be collected first by filling the Teflon® tube, by one of two methods, and allowing it to drain into the sample vials. The tubing can be momentarily attached to the pump to fill the tube with water. After the initial water is discharged through the pump head, the tubing is quickly removed from the pump and a gloved thumb placed on the tubing to stop the water from draining out. The tubing is then removed from the well and the water allowed to drain into the sample vials. Alternatively, the tubing can be lowered into the well the desired depth and a gloved thumb placed over the end of the tubing. This method will capture the water contained in the tubing. It can then be removed from the well and the water collected by draining the contents of the tubing into the sample vials. Headspace in the VOC sample container must be minimized by filling the sample jar until a positive meniscus is present. (If a bubble is present in the container upon closing, or any headspace is visible, the container must be refilled.) After filling the VOC containers, the other required containers will be filled following the same procedure.

Containers will be quickly and adequately sealed; container rims and threads should be clean before tightening lids; unless otherwise specified, Teflon®-lined screw lids should be used to seal the jar. Sample containers will be properly labeled according to EPA procedures. The samples will be immediately cooled to 4 plus or minus 2°C and this temperature should be maintained through delivery to the laboratory until the samples are analyzed. New tubing should be used and the pump decontaminated for each well.

3.5 Aquifer Pump Tests

A 72-hour drawdown test will be performed using the new extraction well. Prior to the test a 6-hour step-drawdown test will be performed to determine the maximum extraction rate. At the end of the step-drawdown test, one grab sample will be collected. After the start of the 72-hour test one grab sample will be collected every 24 hours. In addition to these samples, three separate samples will be collect per day for lead analysis, this includes one for the 6-hour drawdown test as well. Including the 6-hour test sample a total of 16 grab samples will be collected. These samples will be collected from the Grundfos pump discharge directly into to the sample container. If the flow rate is too great, samples will first be collected into a dip jar and then transferred to the sample container. After completion of the drawdown test, up to seven existing monitor wells (MW-2, MW-4, MW-7, MW-8, MW-9, MW-10, DMW-61, and RW-1) may be sampled. These wells will be sampled according to Sections 3.4.1, 3.4.2, and 3.4.3.

The grab samples will be collected as follows and analyzed in accordance with Table 3-2.

1. Using the effluent of the Grundfos pump, or if the pump flow is too great, a dip jar collect a water sample. (In the Grundfos pump is used collect sample directly into the sample container, volatiles first, followed by other parameters)

2. The sample containers for volatile analyses will be filled first. The 40-ml vials will be filled so that there is no headspace in each vial.

3. The sample containers for the remaining analyses will then be filled.

4. label and package the samples for shipment to the laboratory.

3.6 Bioslurping Pilot Test

The bioslurping pilot study network will include the newly installed bioslurping extraction well and existing monitoring wells (MW-47 and DMW-60) and piezometers (P-4, P-5, and P-6). The locations of these wells are shown on Figure 2-1. Additional monitoring points may be used or installed if necessary. Prior to initiating the pilot study test, baseline soil gas concentrations will be collected at the selected monitoring points. Soil gas measurements will also be made during other parts of the bioslurping test. Total hydrocarbons will be measured using an OVA or TVA. Oxygen concentrations will also be measured and recorded using an LEL/oxygen meter. All meters will be calibrated in accordance with manufacturer's specifications and all calibration and sample data will be entered into the logbook.

Water levels and the thickness of LNAPL will be measured in the bioslurping extraction well and all piezometers and monitoring wells to be included in the pilot study analysis using an oil/water interface probe. This activity will be carried out in accordance with Section 3.5.1.

During the bioslurping test any free product will either be drummed, or separated via an OWS. All samples of free product will be collected as grab samples via dip jar or bailer. The grab samples will be collected as follows and analyzed in accordance with Table 3-2.

1. Using a dip jar, or disposable Teflon bailer for drummed product, collect a product sample.

2. Fill the samples containers completely full.

3. Label and package the samples for shipment to the laboratory.

3.6.1 Process Monitoring

During the pilot tests system performance samples will be collected to monitor the process. Two types of samples will be collected. Vapor samples will be collected from a pitot tube at the bioslurper vapor discharge stack. Aqueous samples will be collected from the water discharge on the OWS.

3.6.1.1 Aqueous Effluent Analysis

Aqueous samples will be collected as grab samples from the discharge of the OWS. The grab samples will be collected as follows and analyzed in accordance with Table 3-2.

1. From the effluent or discharge of the OWS, the samples may be collected directly into their containers, or if the discharge rate is too great, a dip jar may be used. (Collect volatiles first, followed by other parameters).

2. The sample containers for volatile analyses will be filled first. The 40-ml vials will be filled so that there is no headspace in each vial.

3. The sample containers for the remaining analyses will then be filled.

4. Label and package the samples for shipment to the laboratory.

3.6.1.2 Vapor discharge sampling

Two samples will be collected for vapor analysis one at the beginning of the test and one at the end. System should be running for at least 1 hour prior to collecting the first sample. The second sample should be collected at the end of the test before equipment is stopped. A vacuum gage, several feet of Tygon tubing, SUMMA canisters, and a Tedlar bag will be required . The vapor samples will be collected as follows and analyzed in accordance with Table 3-2.

1. Attach a length of Tygon tubing to the pitot tube (maintain the length as short is possible).
2. Allow the Tygon tube to purge several minutes.
3. Attach the Tedlar bag and allow it to fill.
4. Remove the Tedlar bag and with a calibrated OVA take a reading, and record into the logbook. (A small piece of Tygon tubing can facilitate connection to the bag.)
5. Record initial SUMMA canister vacuum.
6. After recording the vacuum, connect the SUMMA canister, to the Tygon tubing on the discharge, and open the valve on the SUMMA canister until there is no audible "hissing" and close the valves.
7. Record final vacuum.

Label SUMMA canisters and replace them into their shipping containers.

3.7 Waste Characterization and Disposal Sampling

Solid waste from the site will be in the form of drummed drill cuttings. One sample should be collected for approximately every six drums. The samples will be collected in the following manner and analyzed in accordance with Table 3-2.

3.7.1 Procedure for Collecting Volatile Fractions

1. At the selected sample location, and appropriate depth, using an auger, split spoon, or other similar device retrieve a core.
2. Fill the appropriate sample jars completely full with the sample from the core.
3. Close the jar, label, and package the sample for shipment to the laboratory.

3.7.2 Procedure for Collecting Non-Volatile Samples

1. From four randomly selected sample locations, collect several spoonfuls of the soil into a stainless steel bowl.

2. Homogenize the four samples by the quartering techniques using the stainless steel spoon.
3. Fill the appropriate sample jars completely full with the homogenized sample
4. Close the jar, label, and package the sample for shipment to the laboratory.

3.7.3 Decontamination and Purge Water Sampling

Decontamination water and any water from well development, pump tests, or pilot studies will be contained in drums or frac tanks. The samples will be collected in the following manner and analyzed in accordance with Table 3-2.

1. Using a bailer or dip jar collect a water sample from its containment.
2. The sample containers for volatile analyses will be filled first. The 40-ml vials will be filled so that there is no headspace in each vial.
3. The sample containers for the remaining analyses will then be filled.
4. Label and package the samples for shipment to the laboratory.

3.8 Sample Documentation

Sampling documentation will include the following:

- Numbered Chain-of-Custody (COC) Reports
- Sample Log Book which includes the following information:
- Name of laboratories and contacts to which the samples were sent, turnaround time (TAT) requested, and data results, when possible
- Termination of a sample point or parameter and reasons
- Unusual appearance or odor of a sample
- Measurements, volume of flow, temperature, and weather conditions
- Additional samples and reasons for obtaining them
- Levels of protection used (with justification)
- Meetings and telephone conversations held with the Southern Division, NTR, regulatory agencies, project manager, or supervisor
- Details concerning any samples split with another party
- Details of QC samples obtained
- Sample collection equipment and containers, including their serial or lot numbers Details of QC samples obtained
- Field analytical equipment, and equipment utilized to make physical measurements will be identified

- Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment
- Property numbers of any sampling equipment used, if available
- Sampling station identification
- Date and Time of sample collection
- Description of the sample location
- Description of the sample
- Sampler(s)' name(s) and company
- How the sample was collected
- Diagrams of processes
- Maps/sketches of sampling locations
- Weather conditions that may affect the sample (e.g., rain, extreme heat or cold, wind, etc.)
- Sample Labels
- Custody Seals (minimum of two on each shipping container)

3.9 Field Quality Control

Field duplicate samples and equipment blank samples will be collected at a minimum frequency of 10 percent times the total number of samples collected for an analysis and rounded to the nearest whole number. Pre and post equipment blanks will be collected at a minimum of 5 percent of the total number of samples collected for an analysis and rounded to the nearest whole number. One trip blank sample will be provided at a frequency of one per sample cooler containing volatile samples. Matrix spike/matrix spike duplicates (MS/MSD) will be required at a frequency of one per sample event or a minimum of 5 percent of the total number of samples collected for an analysis and rounded to the nearest whole number. Quantity and frequency are detailed in Table 3-2.

3.10 Analytical Methods

Samples will be collected for analytical methods summarized in Table 3-2.

Preliminary analytical results will be faxed to Bonnie Hogue at the following fax number per the turn-around-times listed in Table 3-2 from day of sample receipt. The final hardcopy data and electronic file will be delivered to Melissa Aycock within 14 days of sample receipt.

Bonnie J. Hogue
Laboratory Coordinator
CCI
115 Perimeter Center Place, Suite 700
Atlanta, GA 30346
770-604-9182 ext 263
EFax: 678-579-8106
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Melissa Aycock
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4.0 Waste Management Plan

The scope of this waste management plan addresses the management and disposal requirements for wastes generated during site characterization at Site 1159, Outlying Landing Field Bronson. It is anticipated that the following wastes and materials will be generated during these activities:

- Recovered petroleum (AVGAS)
- Clean soil
- Petroleum contaminated soil cuttings
- Sampling-related waste including, but not limited to sampling tubing, gloves, and protective clothing.
- Wastewater from decontamination activities
- Clean and uncontaminated construction debris. (Debris includes discarded materials generally considered to be not water-soluble. Debris includes, but is not limited to, concrete, asphalt material, pipe, and materials used in decontamination, e.g., plastic sheeting, sampling materials and personal protective clothing.)

4.1 Waste Characterization

Wastes will be characterized and managed according to Section 3.0 Sampling and Analysis Plan. Waste characterization information typically will be included on a waste profile form provided by the offsite facility. CCI will provide analytical data from the most recent characterization sampling and analysis event. However, in some cases, facilities that are permitted to accept a specific waste material might require specific or additional analyses to evaluate the waste stream before acceptance.

It is assumed that petroleum-contaminated media (i.e., soil cuttings or groundwater) that fail the Toxicity Characteristic test for the organic compounds associated with the D018 through D043 waste codes is not hazardous waste because it is a result of petroleum cleanup activities (40 Code of Federal Regulation [CFR] 261.4(b)(10)).

Waste characterization information for wastes will be documented on a waste profile form provided by the offsite treatment or disposal facility as part of the waste acceptance process. An approved copy of the waste profile will be received prior to offsite transportation of the material. If generator certification and/or signature are required, NAS Pensacola personnel will provide.

The profile typically requires the following information:

- Generator (Navy) information including name, address, contact, and phone number
- Site name including street/mailing address
- Activity generating waste (e.g., petroleum cleanup)

- Source of contamination
- Historical use for area
- Physical state of waste (e.g., solid, liquid, etc.)
- Applicable hazardous waste codes

4.2 Waste Management

4.2.1 Waste Storage Time Limit

Hazardous wastes may only be accumulated for 90 days after the first date of generation. Additionally, as required under FAC 62-770, petroleum-contaminated soil (including excessively contaminated soil) will not be stored or stockpiled onsite for more than 60 days. However, petroleum-contaminated soil (including excessively contaminated soil) may be containerized in watertight drums and stored onsite for 90 days, after which time proper treatment or proper disposal of the contaminated soil will occur. Other wastes will be removed from the site as soon as possible. The date of generation (or accumulation start date) is the day that a waste is first placed in a container (drum or roll-off), tank, or stockpile.

4.2.2 Labels

The labeling of waste containers will be in accordance with 49 CFR 172, 173 and 178. Labels will include the type of waste, location from which the waste was generated, and accumulation start date.

Waste labels will include the following information, as applicable for the type of waste:

- "Analysis Pending" or "Waste Material" - Temporary pre-printed or handwritten label will include the accumulation start date. Once analytical results are reviewed and the waste characterized, the label will be replaced with appropriate final label (i.e., "Hazardous Waste" or "Non-Hazardous Waste").
- "Hazardous Waste" - Pre-printed hazardous waste labels with the following information:
  - Accumulation start date
  - Generator Name:
  - USEPA ID number:
  - Waste codes
  - Manifest number (for containers of less than 110-gallon capacity)
- "Non-Hazardous Waste" - Preprinted labels with the following information:
  - Accumulation start date
  - Generator name:
  - USEPA ID number:
  - Waste-specific information (e.g., contaminated soil)

Waste materials that will be recycled (e.g., scrap metal) or reclaimed (e.g., recovered fuel that can be burned for energy recovery), and that are exempt from waste management

requirements, will be labeled accordingly. For example, containers or tanks of recovered petroleum that will be burned will have labels identifying the contents as "Recovered Petroleum" or equivalent.

For all wastes or materials, the major hazards (e.g., flammable, oxidizer, and carcinogen) will be identified on the label, as applicable.

4.2.3 General Waste Management Requirements

Hazardous wastes will be segregated from non-hazardous wastes. Additionally, incompatible wastes (e.g., flammable and corrosive wastes) will be segregated. Wastes of the same matrix, contamination, and the same source may be aggregated to facilitate storage and disposal.

Wastes will be accumulated in an area identified or approved by the Navy. If an accumulation area is not designated, CCI will accumulate hazardous wastes in an area that is not accessible to the general public, and that can be secured.

Waste accumulation areas will contain appropriate emergency response equipment. The Health and Safety Plan (Appendix B) identifies the specific emergency response procedures and equipment. Hazardous waste accumulation areas will include fire extinguishers (in areas where wastes are known or suspected to be flammable or ignitable), decontamination equipment, and an alarm system (if radio equipment is not available to all staff, including subcontractors, working in accumulation area). Spill control equipment (e.g., sorbent pads) will be available in the waste accumulation areas, and where liquids are transferred from one vessel to another.

4.2.3.1 Drums/Small Containers

The following requirements apply to drums and small containers:

- Drums and small containers of hazardous waste will be transported to the temporary accumulation areas on wood pallets and will be secured together with non-metallic banding.
- Drums will be inspected and inventoried upon arrival onsite for signs of contamination and/or deterioration.
- Adequate aisle space (e.g., 30 inches) will be provided for containers such as 55-gallon drums to allow the unobstructed movement of personnel and equipment. A row of drums should be no more than two drums wide.
- Each drum will be provided with its own label, and labels will be visible.
- Drums will remain covered except when removing or adding waste to the drum. Covers will be properly secured at the end of each workday.
- Drums will be disposed of with the contents. If the contents are removed from the drums for offsite transportation and treatment or disposal, the drums will be decontaminated prior to re-use or before leaving the site.

- Drums containing liquids or hazardous waste will be provided with secondary containment.

4.2.3.2 Tanks

- Tanks will be inspected upon arrival onsite for signs of deterioration and contamination. Any tank arriving onsite with contents will be rejected.
- Tanks will be provided with covers and secondary containment.
- Only non-stationary tanks (such as a cargo tank or other wheeled tank) will be used to accumulate hazardous waste.
- Each tank will be labeled.

4.2.3.3 Roll-off Boxes

- Roll-off boxes will be inspected upon arrival on-site. Any roll-off container arriving with contents will be rejected.
- Roll-off boxes for hazardous or "excessively contaminated" soil will be provided with covers and disposable liners. Liners will be disposed of as contaminated debris.
- When not in use, securely fastened covers will be installed on all roll-off boxes.
- Old labels will be removed.
- Roll-off containers will be inspected by the transporter after removal of the liner and decontaminated in the event of evidence of liner failure.

4.2.3.4 Soil Stockpiles

- Stockpiles of contaminated soil will be located near the excavation areas and within an area of existing contamination.
- Stockpiles will be provided with liner, cover, and perimeter berm to prevent release or infiltration of liquids.
  - Minimum 10- and 6-mil polyethylene sheeting will be used for liners and covers, respectively.
  - The perimeter berm will be constructed of clean materials (e.g., hay bales under the liner) and allow for collection of any free liquids draining from the stockpile.
  - Accumulated free liquids will be pumped-out to a container or tank.
- Covers and perimeter berms will be secured in-place when not in use and at the end of each workday, or as necessary to prevent wind dispersion or run-off from major precipitation events.
- Construction materials for the stockpiles that contact contaminated soil will be disposed of as contaminated debris.
- Accumulation start dates will be recorded on a log or a sign located at the stockpile.

4.2.3.5 Construction Waste/Debris Stockpiles

Where appropriate, construction debris and waste, or scrap equipment may be accumulated in stockpiles. These stockpiles will be managed in such a manner as to maintain good housekeeping, and to prevent the spread of contamination.

- Contaminated debris stockpiles will be provided with containment as indicated for soil stockpiles. Damaged or leaking equipment will be placed in containers, and may not be stored in storage piles.
- Uncontaminated or decontaminated debris stockpiles, or intact equipment should be placed on a liner. These piles will be covered as necessary to prevent storm water run-on and run-off.

4.2.4 Inspection of Waste Storage Areas

Waste accumulation areas will be inspected for malfunctions, deterioration, discharges, and leaks that could result in a release. The following inspection schedule will be followed:

- At least weekly inspection of containers, tanks and roll-off containers (for leaks, signs of corrosion, or signs of general deterioration).
- At least weekly inspection of stockpiles (for liner and berm integrity).

If operations will suspend for more than 7 days, alternate inspection arrangements will be made. Prior to demobilization, all hazardous wastes will be removed from the site.

Inspections will be recorded in the daily Quality Control Report, and copies of the report will be maintained onsite, and available for review.

4.3 Transportation

Each transportation vehicle and load of waste will be inspected before leaving the site. The quantities of waste leaving the site will be recorded. A contractor licensed for commercial transportation will transport non-hazardous wastes. For hazardous waste, the transporter will have an EPA Identification number, and will comply with transportation requirements outlined in 49 CFR 171-179 (Department of Transportation) and 40 CFR 263.11 and 263.31 (Hazardous Waste Transportation). A copy of the documentation indicating that the selected transporter has appropriate licenses will be received prior to transport of any waste material.

4.3.1 Shipping Documentation

Prior to offsite disposal of any waste, CCI will provide the Navy with a waste approval package for each waste stream. This package shall include a waste profile naming the U.S. Navy as the generator of the waste, analytical summary table(s) applicable to the waste, letter of approval from the proposed waste disposal facility to accept the waste, LDR notification for any hazardous wastes, a completed waste manifest, end any other applicable information necessary for the Navy to complete its review of the disposal package and signature as the generator.

The signed profile will then be submitted to the disposal facility for acceptance approval. Once the approval letter is received from the disposal facility, transportation can be scheduled.

Each load of waste material will be manifested prior to leaving the site. At a minimum, the manifest form will include the following information:

- Generator information including name, address, contact, and phone number, EPA ID number
- Transporter information including name, address, contact and phone number, EPA ID number
- Facility information including name, address, phone number, EPA ID number
- Site name including street/mailing address
- U.S DOT Proper Shipping Name (e.g., Hazardous Waste Solid, n.o.s., 9, UN 3077, PG III (D008))
- Type and number of container
- Quantity of waste (volumetric estimate) CTO or job number
- Profile number
- 24 hour emergency phone number

Additionally, each shipment of waste will also have a haul ticket. A Land Disposal Restriction (LDR) Notification/Certification is also required for hazardous wastes. This form also requires the generator signature and submission to the disposal facility.

The generator (Navy) and the transporter must sign the manifest prior to the load of waste leaving the site. A copy of the manifest will be retained on site and included with the daily QCR. The original signed manifest will be returned to the address of the generator. The facility will provide a copy of this signed manifest to CCI for the final report. The final report will include copies of the facility signed manifest, haul ticket, LDR (if applicable), and the Certificate of Disposal/Destruction/Recycle.

If the signed hazardous waste manifest from the designated offsite facility is not received within 35 days, CCI will contact the transporter or the designated facility to determine the status of the waste. If the signed hazardous waste manifest has not been received within 45 days, CCI, in coordination with the Navy, will issue an "Exception Report" to the state of Florida, as required under 40 CFR 262.42.

4.3.2 Transporter Responsibilities

The transporter will be responsible for weighing loads at a certified scale. For each load of material, weight measurements will be obtained for each full and empty container, dump truck, or tanker truck. Disposal quantities will be based on the difference of weight measurements between the full and empty container, dump truck, or tanker truck. Weights will be recorded on the waste manifest. The transporter will provide copies of weight tickets with the final manifest to CCI.

The transporter will observe the following practices when hauling and transporting wastes offsite:

- Minimize impacts to general public traffic.
- Repair road damage caused by construction and/or hauling traffic.
- Cleanup material spilled in transit.
- Line and cover trucks/trailers used for hauling contaminated materials to prevent releases and contamination.
- Decontaminate vehicles prior to re-use, other than hauling contaminated material.
- Seal trucks transporting liquids.

All personnel involved in offsite disposal activities will follow safety and spill response procedures outlined in the Health and Safety Plan.

No wastes from other sites will be combined with wastes from NAS Pensacola.

4.3.3 Transportation and Disposal Log

Transportation of wastes will be inventoried the day of transportation from the site using the Transportation and Disposal Log. A copy of the initial manifest form for each load will be retained onsite and attached to the Contractor Daily Production Report. All required transportation manifests will be prepared by CCI and signed by a NAS Pensacola representative.

4.4 Disposal of Waste Streams

Offsite treatment or disposal facilities will use the waste profile and supporting documentation (e.g., analytical data) to determine if they will accept a waste. Recovered petroleum will be recycled and/or used for energy recovery, whenever possible. Otherwise, recovered petroleum will be characterized and disposed as a solid waste.

- Any waste that is classified as hazardous will be sent to an offsite permitted, Resource Conservation and Recovery Act (RCRA) Subtitle C Treatment, Storage, and Disposal (TSD) facility.
- Non-hazardous wastes will be disposed at an offsite RCRA Subtitle D facility permitted to receive such wastes.
- Aqueous wastes (i.e., groundwater) will be discharged to a POTW pending approval of the POTW, or disposed offsite at a facility permitted to accept the waste.
- Uncontaminated construction debris may be sent to municipal landfills, or landfills designated for construction/demolition debris.

The treatment or disposal facility will be responsible for providing a copy of the final waste manifest and for a certificate of treatment or disposal for each load of waste received.

4.5 Training

Training requirements for onsite personnel, including subcontractors, is provided in the site-specific health and safety plan.

4.6 Records/Reporting

The following records and documents will be maintained:

- Transportation and offsite disposal records, including:
  - Profiles and associated characterization data
  - Manifests, LDR notifications/certifications, bills of lading, and other shipping records
  - Offsite facility waste receipts, certificates of disposal/destruction
- Training records
- Inspection records

CCI will maintain Material Data Safety Sheets (MSDS) for chemicals and/or hazardous materials brought onsite, including the MSDS for chemicals brought onsite by subcontractors.

5.0 Environmental Protection Plan

The Environmental Protection Plan (EPP) of the Basewide Work Plan addresses general procedures that will be implemented to prevent pollution and protect the environment. The purpose of this plan is to provide specific requirements/procedures to protect the environment during soil remediation activities at NAS Pensacola.

5.1 Regulatory Drivers

All solid/hazardous waste and media will be characterized and managed according to the requirements of FAC Chapter 62-730, Hazardous Waste regulations. Management of petroleum contaminated wastes will comply with the provisions of FAC Chapter 62-770, Petroleum Contamination Site Cleanup Criteria, as appropriate.

5.2 Spill Prevention and Control

The provisions for spill prevention and control establishes minimum site requirements. Subcontractors are responsible for spill prevention and control related to their operations. Subcontractors written spill prevention and control procedures must be consistent with this plan. All spills will be reported to the CCI site superintendent and/or project manager. Refer to the Health and Safety Plan (Appendix B) for emergency response procedures and further reporting requirements.

5.3 Spill Prevention

All fuel, chemical, and waste storage areas will be properly protected from on- and offsite vehicle traffic. All tanks (including fuel storage and waste storage) must be equipped with secondary containment. These tanks must be inspected daily for signs of leaks. Accumulated water must be inspected for signs of contamination (e.g., product sheen, discoloration, and odor) before being discarded. Fire protection provisions outlined in the Health and Safety Plan (Appendix B) and in subcontractor plans must be adhered to.

Chemical products must be properly stored, transferred, and used. Should chemical product use occur outside areas equipped with spill control materials, adequate spill control materials must be maintained at the local work area.

5.4 Spill Containment and Control

Spill control materials will be maintained in the support zone, at fuel storage and dispensing locations, and at waste storage areas. Incidental spills will be contained with sorbent and disposed of properly. Spilled materials must be immediately contained and controlled. Spill response procedures include:

- Immediately warn any nearby workers and notify supervisor.

- Assess the spill area to ensure that it is safe to respond.
- Evacuate area if spill presents an emergency.
- Ensure any nearby ignition sources are immediately eliminated.
- Stop source of spill.
- Establish site control for spill area.
- Contain and control spilled material through use of sorbent booms, pads, or other material.
- Use proper personal protective equipment in responding to spills.

5.5 Spill Clean-up and Removal

All spilled material, contaminated sorbent, and contaminated media will be cleaned up and removed as soon as possible. Contaminated spill material will be drummed, labeled, and properly stored until material is disposed. Contaminated spill material will be managed as waste (see Section 4.0 Waste Management Plan) and disposed of according to applicable, federal, state, and local requirements.

5.6 Erosion Control

During those remediation activities that have the potential to disturb the land, CCI will adhere to the following practices:

- The smallest practical area will be disturbed.
- Trees outside the excavation area will be protected from any construction activity. No ropes, cables, or guy lines will be fastened or attached to any existing trees.
- Temporary erosion and sediment controls will be used to prevent sediment from discharging to any ponds or wetland areas. Structural controls may include the use of straw bales, silt fences, earth dikes, drainage swales, sediment traps, and sediment basins.

Material staging areas will be properly barricaded for containment and to control run-off.

6.0 Quality Control Plan

The Quality Control Plan provided in the Basewide Work Plan details the quality administrators, the project organization for the work to be completed at the Bronson Landing Field, and the definable features of work for each project site.

The Submittal Register, included in Appendix D of this work plan addendum, documents submittals in accordance with Appendix B of CCI's Contract Management Plan (dated July 1998). CCI, the Navy, or others will approve submittals as identified in the Submittal Register. All approved submittals will be distributed by CCI to the appropriate Navy personnel (CO, ROICC (in duplicate), etc.), the project site, and to the project file.

The site-specific project organization chart (Figure 6-1) depicts the chain-of-command for this CTO and the individuals responsible for executing the work as indicated. Individual roles and responsibilities of CTO personnel are summarized in Table 6-1.

6.1 Project QC Manager

Ms. Phyllis Zerangue is the Project QC Manager assigned to this project. Ms. Zerangue's resume and appointment letter are provided in Appendix E.

6.2 Testing Requirements

Construction testing and environmental analysis laboratories and their certifications; construction testing and environmental sampling and analysis; and test control are described in this section. The Testing Plan and Log is provided in Appendix F.

6.2.1 Identification and Certification of Testing Laboratories

The construction testing and environmental testing laboratories utilized for this CTO project will function as a subcontractor or a lower tier subcontractor, and have not yet been identified.

6.2.2 Construction

No construction testing is anticipated for this CTO work activity. In the event that construction testing becomes necessary, laboratories will be National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), American Association of State Highway and Transportation Officials (AASHTO), or American Association for Laboratory Accreditation (AALA) certified.

6.2.3 Environmental

Laboratories performing analysis of environmental samples will be Navy- USACE-, or AFCEE-approved and FDEP approved.

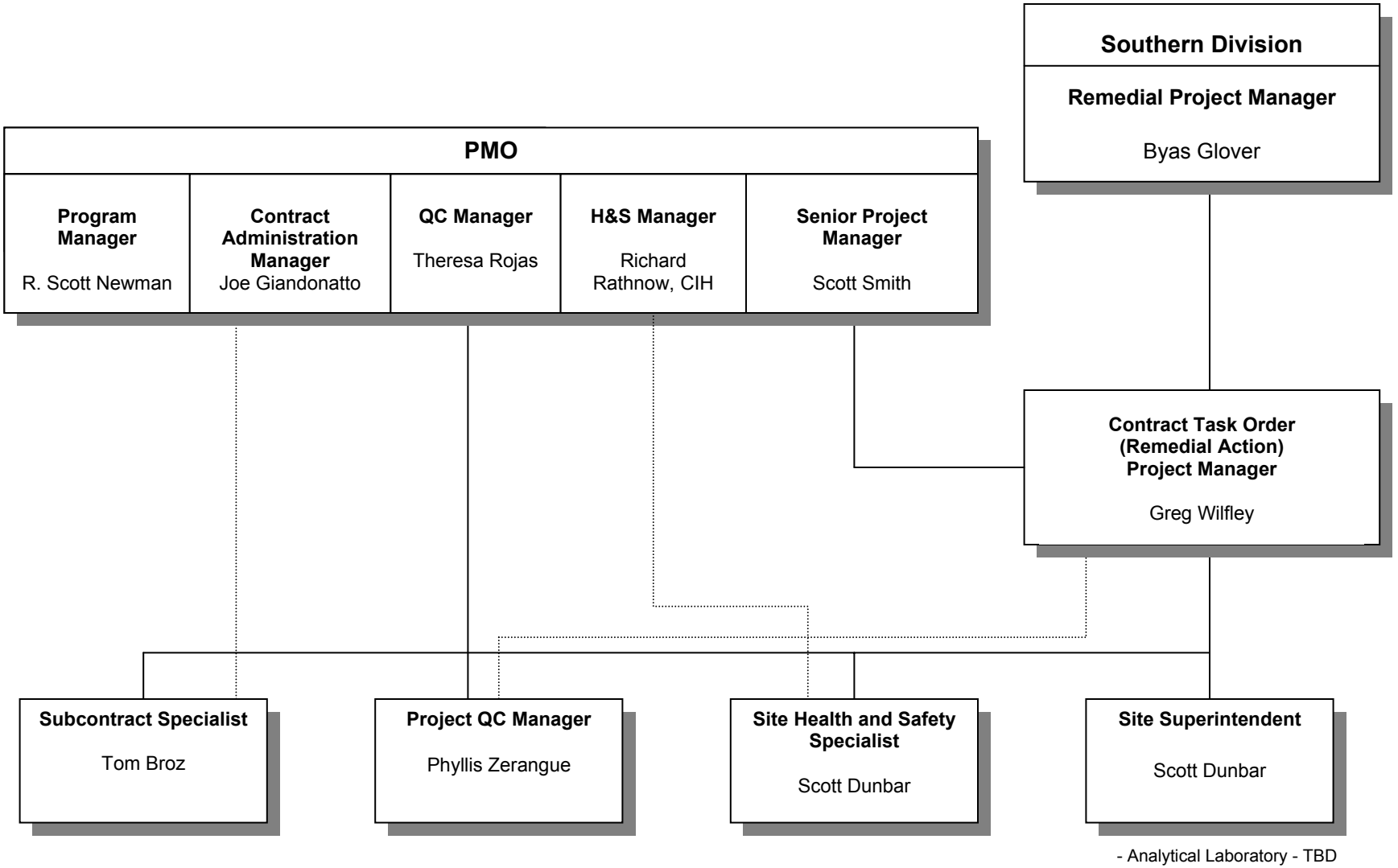

Figure 6-1
Project Organization Chart

TABLE 6-1
Roles, Responsibilities, and Authorities of Individuals Assigned to this Contract Task Order

Role	Responsibility	Authority
Project Manager	• Management and Technical Direction of work • Communication with Southern Division RPM and NTR • Overview subcontractor performance • Select CTO staff • Develop CTO Work Plan and supporting plans • Meet CTO Performance Objectives • Prepare status reports	• Approve subcontractor selection • Approve invoices to Southern Division • Approve CTO baseline schedule • Stop work at the site for any reason • Approve payment to vendors and suppliers • Approve payment to subcontractors
Site Superintendent	• Responsible for all site activities • Provide direction to subcontractors • Act for Project Manager • Provide daily status reports • Prepare CTO Work Plan • Conduct daily safety meetings • Review subcontractor qualifications • Stop work for unsafe conditions or practices	• Stop work for subcontractors • Approve corrective action for site work-arounds • Approve materials and labor costs for site operations • Resolve subcontractor interface issues • Approve daily and weekly status reports
Resident Engineer	• Monitor and oversee subcontractor compliance with scope of work • Review requests for changes in scope o9f work • Review technical qualifications of subcontractors • Prepare Field Change Requests • Respond to Design Change Notices • Recommend improvements in work techniques or metrics • Recommend work-around to Site Superintendent	• Approve Field Change Requests below ceiling amount • Complete daily compliance report
Field Accountant	• Provide project scheduling coordination • Responsible for site cost tracking and reporting • Maintain record of site purchases • Maintain government property records	• Approve payables for disposable items
Transportation and Disposal Coordinator	• Develop site specific procedures for transport and disposal practices • Plan and coordinate the transport and disposal of waste • Review subcontractor qualifications • Audit T&D subcontractors compliance with contract requirements	• Approve subcontractors daily report of waste material removed from the site • Approve corrective action plans from T&D subcontractor

TABLE 6-1 (CONTINUED)
Roles, Responsibilities, and Authorities of Individuals Assigned to this Contract Task Order

Role	Responsibility	Authority
Project Assistant	• Maintain CTO files and correspondence • Coordinate CTO schedule and monitor deliverables • Maintain change management records • Maintain Action Tracking System log	• Submit Action Tracking System log • Assign correspondence log numbers
Project QC Manager/ QC Inspector(s)	• Monitor and report on subcontractor quality and quantities • Audit subcontractors offsite fabrication • Maintain Submittal Register • Participate in Continuous Improvement Team • Stop work for non-compliant operations • Maintain Lessons Learned Log	• Stop work for non-compliant operations • File daily quantities report • File Lessons Learned Log Sheet • Approve resumption of work for resolved quality issues
Site Health and Safety Specialist	• Monitor and report on subcontractor safety and health performance • Record and report safety statistics • Conduct needed site safety and health orientation • Maintain Environmental Log • Stop work for unsafe practices or conditions	• Stop work for unsafe practices or conditions • Approve subcontractor site specific health and safety plan • Set weekly safety objectives • Approve resumption of work for resolved safety issues
Subcontract Specialist	• Prepare bid packages • Purchase disposable materials • Maintain subcontract log	

6.2.4 Testing and Sampling

Soil, drill cuttings, and aqueous wastes will be sampled under CCI or its subcontractors.

6.2.4.1 Construction Testing

No construction testing is anticipated; however, construction inspections will be performed while executing the scope of activities described within this Work Plan Addendum. The construction activities are essentially related to installation of groundwater monitoring wells and piezometers. Other related activities include well development and the collection of field data to complete the design of the selected remedial alternative. Over the course of the project, various field measurements will be completed and recorded. The construction quality controls that will be administered pertain to inspecting materials and equipment and all installations to assess conformity with the work details included in Section 2.0. The results of all inspections will be documented.

6.2.4.2 Surveying

All survey data must conform to the TSSDS. Horizontal control points for graphic and non-graphic information are Mercator Projection, GRS 80, State Plane Coordinate System, NAD 1983, Lambert Zones 1 through 6 (or appropriate zone for region to be mapped). Vertical controls are Mean Sea Level, NAVD 1988.

6.2.4.3 Environmental Sampling and Analysis

Environmental sampling and analysis, including QC sampling and analysis, is specified in Section 3.0 Sampling and Analysis Plan. Samples will be collected in accordance with EPA methods and industry standards of practice. Additionally, personnel that perform sampling will meet the requirements stated in the Navy Installation Restoration Chemical Data Quality Manual – September 1999 (IR CDQM).

6.2.5 Test Control

Environmental samples will be collected in accordance with EPA methods and procedures. Other controls will include, but are not limited to, maintaining a chain of custody; proper handling, packing, and shipping; and the use of qualified laboratories.

The Project QC Manager will verify the following items:

- The facilities and testing equipment are available and comply with testing standards
- Groundwater wells and piezometers are constructed in accordance with the prescribed details, and that the boring logs and development records are accurate and complete.
- Wells are sampled and developed according to the USEPA Region 4 EISOPQAM.
- Recording forms, including all of the test and sampling documentation requirements, have been prepared and checked for accuracy and completeness

6.3 CTO Support Organizations

The supporting organizations are yet to be determined.

7.0 References

ACFEE. January 1995. Draft Test Plan and Technical Protocol for a Field Treatability Test for POL Free Product Recovery - Evaluating the Feasibility of Traditional and Bioslurping Technologies. Brooks AFB, Texas.

Battelle. June 1996. Best Practices Manual for Bioslurping for Naval Facilities Engineering Service Center, Port Hueneme, California.

CH2M HILL Constructors, Inc. June 2000. Basewide Work Plan, Naval Air Station Pensacola, Pensacola, Florida, Contract No. N62467-98-D-0995.

Navy Public Works Center. November 1997. Contamination Assessment Report – Site 1159, U.S. Navy Outlying Landing Field Bronson, Pensacola, Florida.

Tetra Tech NUS, Inc. May 2001. Contamination Assessment Report Addendum For Site 1159, Outlying Landing Field Bronson, Pensacola, Florida.

Tetra Tech NUS, Inc. September 2002. Remedial Action Plan For Site 1159, Outlying Landing Field Bronson, Pensacola, Florida.

U.S. Geological Survey (USGS). 7.5-Minute Quadrangle Map for Lillian, Alabama-Florida. 1987.

Appendix A

Baildown Data Sheet

CH2MHILL	PROJECT NUMBER	WELL NUMBER SHEET 1 OF 1
		Baildown Test Record Sheet

PROJECT : _____ LOCATION : _____
WELL DIAMETER (OD/ID): _____
EQUIPMENT USED : _____
PERSONNEL: _____
START DATE AND TIME: _____

INITIAL READINGS

Depth to Groundwater (ft btoc)	Depth to LNAPL (ft btoc)	LNAPL Thickness (ft)	Total Volume Bailed (L)

TEST DATA

Time	Depth to Groundwater (ft BTOC)	Depth to LNAPL (ft BTOC)	LNAPL Thickness (ft)

Appendix B

Health and Safety Plan

Health and Safety Plan
Work Plan Addendum No. 06
Site Characterization for Site 1159
Outlying Landing Field Bronson

Naval Air Station Pensacola
Pensacola, Florida

Contract No. N62467-98-D-0995
Contract Task Order No. 0071

Revision 00

Submitted to:

U.S. Naval Facilities
Engineering Command
Southern Division

Prepared by:

CH2MHILL
Constructors, Inc.
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Atlanta, GA 30346

July 2003

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Attachments

Acronyms

°F	degrees Fahrenheit
AHA	Activity Hazard Analysis
ALARA	as low as reasonably achievable
APR	air-purifying respirator
ATL	Atlanta
CCI	CH2M HILL Constructors, Inc.
CNS	central nervous system
CPR	cardiopulmonary resuscitation
CTO	Contract Task Order
dBA	decibel A-rated
DOT	Department of Transportation
DPT	direct-push technology
FA	first aid
FFWCC	Florida Fish and Wildlife Conservation Commission
FID	flame ionization detector
GFCI	ground fault circuit interrupter
HAS	Hollow stem auger
HAZCOM	hazard communication
HR	heart rate
HSM	Health and Safety Manager
HSP	Health and Safety Plan
IDLH	immediately dangerous to life and health
IDW	investigation-derived waste
lb	pound
LEL	lower explosive limit
LNAPL	Light non-aqueous phase liquid
mg/m^3	milligrams per cubic meter
MSDS	Material Safety Data Sheet
mW/cm^2	milliwatt per square centimeter
NAS	Naval Air Station
NAVFAC	U.S. Naval Facilities Engineering Command
NDG	nuclear density gauge
NPDES	National Pollutant Discharge Elimination System
NSC	National Safety Council
OSHA	Occupational Safety and Health Administration
OWS	oil/water separator
PAHs	polycyclic aromatic hydrocarbons
PAPR	powered air-purifying respirator
PDF	personal flotation device
PID	photoionization detector
POTW	
PPE	personal protective equipment
ppm	parts per million
RMSF	Rocky Mountain Spotted Fever

SAR	supplied-air respirator
SCBA	self-contained breathing apparatus
SHSS	Site Health and Safety Specialist
SOP	standard of practice
STEL	short-term exposure limit
SZ	support zone
TBD	to be determined
TMCC	truck-mounted crash cushion
TRPH	total recoverable petroleum hydrocarbons
TSDF	treatment, storage, and disposal facility
VOCs	volatile organic compounds

This Health and Safety Plan (HSP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Standards of Practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, as appropriate. In addition, this plan adopts procedures in the project Work Plan. The Site Health and Safety Specialist (SHSS) is to be familiar with these SOPs and the contents of this plan. CH2M HILL Constructors Inc.'s (CCI's) personnel and subcontractors must sign Attachment 1.

1.0 Project Information and Description

Project No: Contract Task Order (CTO) No. 0071

Client: Southern Division, U.S. Navy Facilities Engineering Command (NAVFAC)

Project/Site Name: Naval Air Station (NAS) Pensacola, Pensacola Florida

Site Address: Pensacola Florida

CCI Project Manager: Greg Wilfley

CCI Office: Atlanta, Georgia (ATL)

Date Health And Safety Plan Prepared: April 2003

Date(s) of Site Work: August 2003 to December 2004

Site Background and Setting The objective of the remedial activities being performed by CCI under this CTO includes the continued performance of groundwater monitoring begun under CTO No.0039. In that CTO, in-situ landfarming of residual petroleum contaminated soil in four former fire training burn pits was performed. Initial baseline sampling of existing monitoring wells and thereafter-periodic sampling, with associated reports was also completed. Documentation of the progression of biodegradation of the contaminants of concern in the former burn pit soil, and attainment of the soil cleanup goals was accomplished. Finally, upon attainment of remediation clean-up goals, the site was restored to meet surrounding conditions and specifications.

Description of Specific Tasks to be Performed: The scope of work that will be conducted at Site 1159 will be used to complete the design of the selected remedial alternative, free phase product recovery via bioslurping and groundwater pump and treat. The scope of work includes the following tasks:

- Assess Impact on Gopher Tortoise, a state-listed Species of Special Concern
  - Mobilize and prepare site
  - Conduct field survey
  - Demobilize from site
  - Submit Field Report (Letter/Memo)
  - Coordinate with NAS Pensacola and Florida Fish and Wildlife Conservation Commission (FFWCC) to determine the preferred course of action
  - Obtain Incidental Take Permit
- Baseline Groundwater and Free Product Levels Evaluation
  - Mobilize and prepare site
  - Measure depth to water and depth to product in existing monitoring wells
  - Decontaminate equipment and personnel and demobilize from site
  - Develop potentiometric map for shallow groundwater

  - Re-evaluate locations of proposed direct-push technology (DPT) piezometers for light non-aqueous phase liquid (LNAPL) delineation

- LNAPL Delineation and Subsurface Soil Investigations
  - Obtain dig permit
  - Mobilize and prepare site
  - Install 12 piezometers at the estimated extents of the free product plume using DPT
  - Collect continuous lithologic soil samples at 4 piezometer locations (DP-5, -7, -8, and –10) using DPT
  - Install 1 bioslurping pilot study extraction well in the vicinity of existing wells MW-47 and DMW-60 using hollow stem auger (HSA)
  - Install 1 groundwater extraction well in the vicinity of existing wells MW-2 and DMW-61 using HSA
  - Collect continuous lithologic soil samples at the bioslurping pilot study extraction well location and at the groundwater extraction well location using DPT
  - Collect geotechnical soil samples from the screened intervals of both the bioslurping extraction well and the groundwater recovery well
  - Collect, contain, characterize, store, and dispose of all soil, debris, and water generated during the performance of this work.
  - Decontaminate equipment and personnel, conduct site restoration, and demobilization
  - Conduct field survey of new piezometer and extraction well locations
  - Calculate free product mass

- Baseline Groundwater Sampling Event
  - Mobilize and prepare site
  - Conduct sampling and analysis of groundwater for selected newly installed and existing wells for volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), total recoverable petroleum hydrocarbons (TRPH), and total lead to establish baseline conditions
  - Collect, contain, characterize, store, and dispose of all soil, debris, and water generated during the performance of this work
  - Decontaminate equipment and personnel, conduct site restoration, and demobilization

- Aquifer Testing
  - Obtain National Pollutant Discharge Elimination System (NPDES) permit for disposal of extracted groundwater to the publicly owned treatment works (POTW)
  - Mobilize and prepare site
  - Perform an aquifer step-test and 72-hour constant rate pump test on the newly installed groundwater extraction well
  - Collect grab water samples during the aquifer pump test for analysis of VOCs, PAHs, TRPH, and total lead
  - Conduct sampling and analysis for selected newly installed and existing wells for VOCs, PAHs, TRPH, and lead after the aquifer pump test to evaluate impact on groundwater quality

  - Treat extracted groundwater with portable treatment system prior to disposal
  - Perform aquifer parameter analysis on aquifer test data
  - Collect, contain, characterize, store, and dispose of all soil, debris, and water generated during the performance of this work
  - Decontaminate equipment and personnel, conduct site restoration, and demobilization

- Bioslurping Pilot Test
  - Conduct mobilization and site preparation
  - Collect baseline round of water and free-product levels
  - Perform bail-down tests for wells containing free product
  - Analyze free-product recovered from bail down test
  - Measure baseline soil gas concentrations (hydrocarbons and oxygen) and pressures on monitoring points adjacent to pilot test well
  - Perform system shakedown prior to beginning pilot test
  - Conduct Bioslurper Skimmer Test
  - Conduct Bioslurper Vacuum-Enhanced Extraction Test
  - Conduct Soil Gas Permeability/Radius of Influence Test
  - Measure changes in soil vapor pressure and monitor soil gas concentrations periodically during pilot test
  - Analyze vapor emissions to estimate amount loss to bioventing
  - Treat soil vapor emissions if necessary with portable treatment system
  - Collect and analyze effluent from the oil/water separator (OWS)
  - Collect, contain, characterize, store, and dispose of all soil, debris, and water generated during the performance of this work
  - Decontaminate equipment and personnel, conduct site restoration, and demobilization
  - Estimate mass of free product and groundwater removed

- Provide remedial action plan addendum with results and final design

2.0 Tasks to be Performed Under this Plan

Refer to project documents (i.e., Work Plan) for detailed task information. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin.

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the Health and Safety Manager (HSM) is required before these tasks are conducted on regulated hazardous waste sites**.

3.0 Hazard Control

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CCI employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CCI employees and subcontractors who do not understand any of these provisions should contact the SHSS for clarification.

The health and safety hazards posed by field activities have been identified for each project activity and is provided in this section.

Activity Hazard Analysis (AHA) will be prepared before beginning each project activity posing H&S hazards to project personnel using the AHA form provided in Attachment 5 as a guide. The AHA will identify the work tasks required to perform each activity, along with potential H&S hazards and recommended control measures for each work task. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in Attachment 6. These checklists are to be used to assess the adequacy of CCI and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the HSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records.

Project-activity self-assessments checklist will be completed weekly by the SHSS during the course of the project, completing the applicable checklist depending on the work performed at the time on the project.

3.1 Project-Specific Hazards

3.1.1 Drilling Safety

- The drill rig is not to be operated in inclement weather.
- The driller is to verify that the rig is properly leveled and stabilized before raising the mast.
- Personnel should be cleared from the sides and rear of the rig before the mast is raised.
- The driller is not to drive the rig with the mast in the raised position.
- The driller must check for overhead power lines before raising the mast. A minimum distance of 15 feet between mast and overhead lines (<50 kV) is recommended. Increased separation may be required for lines greater than 50 kV.

- Personnel should stand clear before rig startup.
- The driller is to verify that the rig is in neutral when the operator is not at the controls.
- Become familiar with the hazards associated with the drilling method used (cable tool, air rotary, hollow-stem auger, etc.).
- Do not wear loose-fitting clothing, watches, etc., that could get caught in moving parts.
- Do not smoke or permit other spark-producing equipment around the drill rig.
- The drill rig must be equipped with a kill wire or switch, and personnel are to be informed of its location.
- Be aware and stand clear of heavy objects that are hoisted overhead.
- The driller is to verify that the rig is properly maintained in accordance with the drilling company's maintenance program.
- The driller is to verify that all machine guards are in place while the rig is in operation.
- The driller is responsible for housekeeping (maintaining a clean work area).
- The drill rig should be equipped with at least one fire extinguisher.

If the drill rig comes into contact with electrical wires and becomes electrically energized, do not touch any part of the rig or any person in contact with the rig, and stay as far away as possible. Notify emergency personnel immediately

3.1.2 Welding/cutting with compressed Gas Cylinders

(Reference CH2M HILL, SOP HS-22, *Welding and Cutting*)

- Complete hot work permit.
- Wear appropriate personal protective equipment.
- Remove or combustible materials in the immediate hot work area.
- Station fire watch with fire extinguisher.
- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured in an upright position at all times.
- Cylinders must be positioned to avoid being struck or knock over; coming in contact with electrical circuits or extreme heat sources; and shielded from welding and cutting operations.
- Cylinders must be secured on a cradle, basket or pallet when hoisted; they may not be hoisted by choker slings.

3.1.3 Working around material handling equipment

- Never approach operating equipment from the rear. Always make positive contact with the operator, and confirm that the operator has stopped the motion of the equipment.

- Never approach the side of operating equipment; remain outside of the swing and turning radius.
- Maintain distance from pinch points of operating equipment.
- Because heavy equipment may not be equipped with properly functioning reverse signal alarms, never turn your back on any operating equipment.
- Never climb onto operating equipment or operate contractor/subcontractor equipment.
- Never ride contractor/subcontractor equipment unless it is designed to accommodate passengers; equipped with firmly attached passenger seat.
- Never work or walk under a suspended load.
- Never use equipment as a personnel lift; do not ride excavator buckets or crane hooks.
- Always stay alert and maintain a safe distance from operating equipment, especially equipment on cross slopes and unstable terrain.

3.1.4 Excavation Activities

(Reference CH2M HILL, SOP HS-32, *Excavation and Trenching*)

- CCI personnel must notify and be granted authorization from the excavation competent person prior to entering any excavation. CCI personnel must follow all excavation requirements established by the competent person.
- The competent person must inspect the trench and/or excavation everyday and after everyday hazard increasing event. Documentation of this inspection must be maintained onsite at al times.
- Excavations must be protected from cave-ins by adequate protective systems unless the excavation is less than 5 feet in depth and a competent person determines there is no indication of cave-in or the excavation is made entirely in stable rock that is not fractured.
- Prior to excavating at a location, buried utilities in the area must be identified; refer to Section 3.2.11 “Procedures for Locating Buried Utilities”.
- CCI personnel must not enter any excavation where protective systems are deficient at any time, for any reason. The competent person must be notified of such conditions.
- Refer to CH2M HILL SOP HS-32 “Excavations and Trenching” for more specific details on excavation requirements.

3.1.5 Operating Heavy Equipment

(Reference CH2M HILL, SOP HS-27, *Earthmoving Equipment*)

- CCI authorizes only those employees qualified by training or previous experience to operate material handling equipment.
- Equipment must be checked at the beginning of each shift to ensure the equipment is in safe operating condition and free of apparent damage. The check should include: service brakes, parking brakes, emergency brakes, tires, horn, back-up alarm, steering mechanism, coupling devices, seat belts and operating controls. All defects will be

corrected before the equipment is placed in service. Documentation of this inspection must be maintained onsite at all times.

- Equipment must be on a stable foundation such as solid ground or cribbing; outriggers are to be fully extended.
- Equipment must not be used to lift personnel; loads must not be lifted over the heads of personnel.
- Equipment, or parts thereof, which are suspended must be substantially blocked or cribbed to prevent shifting before personnel are permitted to work under or between them. All controls will be in a neutral position, with the motors stopped and brakes set.
- Equipment which is operating in reverse must have a reverse signal alarm distinguishable from the surrounding noise or a signal person when the operators view is obstructed.
- When equipment is used near energized powerlines, the closest part of the equipment must be at least 10 feet from the powerlines < 50 kV. Provide an additional 4 feet for every 10 kV over 50 kV. A person must be designated to observe clearances and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. All overhead powerlines must be considered to be an energized until the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.
- Underground utility lines must be located before excavation begins; refer to Section 3.2.11 "Procedures for Locating Buried Utilities."
- Operators loading/unloading from vehicles are responsible for seeing that vehicle drivers are in the vehicle cab or in a safe area.
- The parking brake will be set whenever equipment is parked, wheels must be chocked when parked on inclines.
- When not in operation, the blade/bucket must be blocked or grounded; the master clutch must be disengaged when the operator leaves the cab. When equipment is unattended, power must be shut off, brakes set, blades/buckets landed and shift lever in neutral.

3.2 General Hazards

3.2.1 General Practices and Housekeeping

(Reference CH2M HILL- SOP HS-20, *General Practices*)

- Site work should be performed during daylight hours whenever possible. Work conducted during hours of darkness require enough illumination intensity to read a newspaper without difficulty.
- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel should be established and kept free from the accumulation of materials.
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.

- Provide slip-resistant surfaces, ropes, and/or other devices to be used.
- Specific areas should be designated for the proper storage of materials.
- Tools, equipment, materials, and supplies will be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
- Containers should be provided for collecting trash and other debris and will be removed at regular intervals.
- All spills will be quickly cleaned up. Oil and grease will be cleaned from walking and working surfaces.

3.2.2 Hazard Communication

(Reference CH2M HILL-SOP HS-05, *Hazard Communication)*

The SHSS is to perform the following:

- Complete an inventory of chemicals brought on site by CCI using Attachment 2.
- Confirm that an inventory of chemicals brought on site by CCI subcontractors is available.
- Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CCI employees potentially are exposed.
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Give employees required chemical-specific HAZCOM training using Attachment 3.
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

3.2.3 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's *Procedures for Shipping and Transporting Dangerous Goods)*

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

Proper lifting techniques must be used when lifting any object. These include:

- Plan storage and staging to minimize lifting or carrying distances.
- Split heavy loads into smaller loads.
- Use mechanical lifting aids whenever possible.
- Have someone assist with the lift -- especially for heavy or awkward loads.

- Make sure the path of travel is clear prior to the lift.

3.2.4 Fire Prevention

(Reference CH2M HILL- SOP HS-22, *Fire Prevention*)

- Fire extinguishers will be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must:
  - be maintained in a fully charged and operable condition,
  - be visually inspected each month, and
  - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.

3.2.5 Electrical

(Reference CH2M HILL-SOP HS-23, *Electrical*)

- Only qualified personnel are permitted to work on unprotected energized electrical systems.
- Only authorized personnel are permitted to enter high-voltage areas.
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented.
- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service.
- All temporary wiring, including extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.
- Extension cords must be:
  - equipped with third-wire grounding.
  - covered, elevated, or protected from damage when passing through work areas.
  - protected from pinching if routed through doorways.
  - not fastened with staples, hung from nails, or suspended with wire.
- Electrical power tools and equipment must be effectively grounded or double-insulated UL approved.

- Operate and maintain electric power tools and equipment according to manufacturers' instructions.
- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet from overhead power lines for voltages of 50 kV or less, and 10 feet plus ½ inch for every 1 kV over 50 kV.
- Temporary lights will not be suspended by their electric cord unless designed for suspension. Lights will be protected from accidental contact or breakage.
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

3.2.6 Stairways and Ladders

(Reference CH2M HILL-SOP HS-25, *Stairways and Ladders*)

- Stairway or ladder is generally required when a break in elevation of 19 inches or greater exists.
- Personnel should avoid using both hands to carry objects while on stairways; if unavoidable, use extra precautions.
- Personnel must not use pan and skeleton metal stairs until permanent or temporary treads and landings are provided the full width and depth of each step and landing.
- Ladders must be inspected by a competent person for visible defects prior to each day's use. Defective ladders must be tagged and removed from service.
- Ladders must be used only for the purpose for which they were designed and will not be loaded beyond their rated capacity.
- Only one person at a time will climb on or work from an individual ladder.
- User must face the ladder when climbing; keep belt buckle between side rails
- Ladders will not be moved, shifted, or extended while in use.
- User must use both hands to climb; use rope to raise and lower equipment and materials
- Straight and extension ladders must be tied off to prevent displacement
- Ladders that may be displaced by work activities or traffic must be secured or barricaded
- Portable ladders must extend at least 3 feet above landing surface
- Straight and extension ladders must be positioned at such an angle that the ladder base to the wall is one-fourth of the working length of the ladder
- Stepladders are to be used in the fully opened and locked position

- Users are not to stand on the top two steps of a stepladder; nor are users to sit on top or straddle a stepladder
- Fixed ladders > 24 feet in height must be provided with fall protection devices.
- Fall protection should be considered when working from extension, straight, or fixed ladders greater than 6 feet from lower levels and both hands are needed to perform the work, or when reaching or working outside of the plane of ladder side rails.

3.2.7 Heat Stress

(Reference CH2M HILL- SOP HS-09, *Heat and Cold Stress*)

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

Symptoms and Treatment of Heat Stress

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

Monitoring Heat Stress

These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high (>50 percent), or when workers exhibit symptoms of heat stress.

The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 100 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 100 beats/minute at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 100 beats/minute, or 20 beats/minute above resting pulse.

3.2.8 Cold Stress

(Reference CH2M HILL- SOP HS-09, *Heat and Cold Stress*)

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in cool weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.

- NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
- Persons who experience initial signs of immersion foot, frostbite, hypothermia should consult the SHSS to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

Symptoms and Treatment of Cold Stress

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

3.2.9 Compressed Gas Cylinders

- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured in an upright position at all times.
- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.
- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.

3.2.10 Procedures for Locating Buried Utilities

- Where available, obtain utility diagrams for the facility.
- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.

- Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon).
- When the client or other onsite party is responsible for determining the presence and locations of buried utilities, the SHSS should confirm that arrangement.

3.3 Biological Hazards and Controls

3.3.1 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. DO NOT apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

3.3.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

3.3.3 Ticks

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray **only outside** of clothing with permethrin or permanone and spray skin with only DEET; and check yourself frequently for ticks.

If bitten by a tick, grasp it at the point of attachment and carefully remove it. After removing the tick, wash your hands and disinfect and press the bite areas. Save the removed tick. Report the bite to human resources. Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, seek medical attention.

3.3.4 Bees and Other Stinging Insects

Bee and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and

inform the SHSS and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

3.3.5 Bloodborne Pathogens

(Reference CH2M HILL- SOP HS-36, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material. Exposure controls and personal protective equipment (PPE) are required as specified in CCI SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.

3.4 Radiological Hazards and Controls

Refer to CH2M HILL's *Corporate Health and Safety Program, Program and Training Manual,* and *Corporate Health and Safety Program, Radiation Protection Program Manual*, for standards of practice in contaminated areas.

3.5 Chemical Hazards

The following describes the chemical hazards posed by remedial activities at the project. Chemical contaminants of concern (COC), along with their maximum concentration in soil/groundwater, the applicable exposure limit/IDLH and symptoms of exposure are listed in Table 3-1.

3.6 Potential Routes of Exposure

- **Dermal:** Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 5.
- **Inhalation:** Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 5 and 6, respectively.
- **Other:** Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).

TABLE 3-1
Contaminants of Concern
(Refer to Project Files for more detailed contaminant information)

Contaminant	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
Arsenic	0.01 mg/m^3	5 Ca	Ulceration of nasal septum, respiratory irritation, dermatitis, gastrointestinal disturbances, peripheral neuropathy, hyperpigmentation	NA
Benzene	1 ppm	500 Ca	Eye, nose, skin, and respiratory irritation; headache; nausea; dermatitis; fatigue; giddiness; staggered gait; bone marrow depression	9.24
2-Butanone (Methyl Ethyl Ketone, MEK)	200 ppm	3,000	Eye, skin, and nose irritation; headache; dizziness; vomiting; dermatitis	9.54
Cadmium	0.005 mg/m^3	9 Ca	Pulmonary edema, coughing, chest tightness/pain, headache, chills, muscle aches, nausea, vomiting, diarrhea, difficulty breathing, loss of sense of smell, emphysema, mild anemia	NA
Carbon Tetrachloride	2 ppm	200 Ca	Central nervous system (CNS) depression, nausea, vomiting, eye and skin irritation, liver and kidney injury, drowsiness, dizziness	11.47
Chlordane	0.5 mg/m^3	100 Ca	Blurred vision, confusion, ataxia, delirium, coughing, abdominal pain, nausea, vomiting, diarrhea, irritability, tremors anuria	UK
Chlorobenzene	10 ppm	1,000	Skin, eye, and nose irritation; drowsiness; uncoordination; CNS depression	9.07
Chloroform	2 ppm	500 Ca	Dizziness, mental dullness, nausea, confusion, disorientation, headache, fatigue, eye and skin irritation, anesthesia, enlarged liver	11.42
Chromium (as Cr(II) & Cr(III))	0.5 mg/m^3	25	Irritated eyes, sensitization dermatitis, histologic fibrosis of lungs	NA
Chromium (hexavalent)	0.01 mg/m^3	15 Ca	Irritated respiratory system, nasal septum perforation, liver and kidney damage, leucytosis, leupen, monocytosis, eosinophilla, eye injury, conjunctivitis, skin ulcer, sensitization dermatitis	NA
Cobalt (Metal, Dusts, and Fumes)	0.05 mg/m^3	20	Coughing, difficulty breathing, wheezing, decreased pulmonary function, diffuse nodule fibrosous, dermatitis, respiratory hypersensitivity, asthma	NA
Cresol (all isomers of 2-, 3-, & 4-methylphenol)	5 ppm	250	Eye, skin, and mucous membrane irritant; CNS effects including confusion, depression, and respiratory failure; difficulty breathing; irregular rapid respiration; weak pulse; eye and skin burns; dermatitis; lung, liver, kidney, and pancreas damage	8.98

TABLE 3-1
Contaminants of Concern
(Refer to Project Files for more detailed contaminant information)

Contaminant	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
DDT	0.5 mg/m^3	500 Ca	Paresthesia of tongue, lips, hand, and face; tremors; dizziness; confusion; headache; fatigue; convulsion; eye and skin irritation; vomiting	UK
Dibutylphthalate (DBP)	5 mg/m^3	4,000	Eye, upper respiratory system, and stomach irritant	UK
o-Dichlorobenzene (1,2-Dichlorobenzene)	25 ppm	200	Nose and eye irritation, liver and kidney damage, skin blisters	9.06
p-Dichlorobenzene (1,4-Dichlorobenzene)	10 ppm	150 Ca	Headache, eye irritation, nausea, vomiting, swelling periorbital, profus rhinitis, jaundice, cirrhosis	8.98
1,1-Dichloroethane	100 ppm	3,000	CNS depression, skin irritation; liver, kidney, and lung damage	11.06
1,2-Dichloroethane (Ethylene Dichloride)	1 ppm	50 Ca	CNS depression, nausea, vomiting, dermatitis, eye irritation, liver, kidney, and CNS damage; corneal opacity	11.05
Bis-(2-ethylhexyl)phthalate (DEHP, DOP)	5 mg/m^3	5,000 Ca	Eye and mucous membrane irritant	UK
Endosulfan	0.1 mg/m^3	NL	Irritated skin, nausea, confusion, agitation, flushing, dry mouth, tremor, convulsion, headache	UK
Ethyl Benzene	100 ppm	800	Eye, skin, and mucous membrane irritation; headache; dermatitis; narcotic; coma	8.76
Lead	0.05 mg/m^3	100	Weakness lassitude, facial pallor, pal eye, weight loss, malnutrition, abdominal pain, constipation, anemia, gingival lead line, tremors, paralysis of wrist and ankles, encephalopathy, kidney disease, irritated eyes, hypertension	NA
Mercury	0.05 mg/m^3	10	Skin and eye irritation, cough, chest pain, difficult breathing, bronchitis, pneumontitis, tremors, insomnia, irritability, indecision, headache, fatigue, weakness, GI disturbance	
Naphthalene	10 ppm	250	Eye irritation, headache, confusion, excitement, nausea, vomiting, abdominal pain, bladder irritation, profuse sweating, dermatitis, corneal damage, optical neuritis	8.12
PCBs (Limits as Aroclor 1254)	0.5 mg/m^3	5 Ca	Eye and skin irritation, acne-form dermatitis, liver damage, reproductive effects	UK
PNAs (Limits as Coal Tar Pitch)	02 mg/m^3	80 Ca	Dermatitis and bronchitis	UK
1,1,2,2-Tetrachloroethane (Tetrachlorethane)	1 ppm	100 Ca	Nausea, vomiting, abdominal pain, finger tremors, jaundice, hepatitis, liver tenderness, monocytosis, kidney damage, dermatitis	11.10

TABLE 3-1
Contaminants of Concern
(Refer to Project Files for more detailed contaminant information)

Contaminant	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
Tetrachloroethylene (PCE)	25 ppm	150 Ca	Eye, nose, and throat irritation; nausea; flushed face and neck; vertigo; dizziness; sleepiness; skin redness; headache; liver damage	9.32
1,1,2-Trichloroethane	10 ppm	100 Ca	Eye and nose irritation, CNS depression, liver damage, dermatitis	11.00
Trichloroethylene (TCE)	50 ppm	1,000 Ca	Headache, vertigo, visual disturbance, eye and skin irritation, fatigue, giddiness, tremors, sleepiness, nausea, vomiting, dermatitis, cardiac arrhythmia, paresthesia, liver injury	9.45
Toluene	50 ppm	500	Eye and nose irritation, fatigue, weakness, confusion, dizziness, headache, dilated pupils, excessive tearing, nervousness, muscle fatigue, paresthesia, dermatitis, liver and kidney damage	8.82
Xylenes	100 ppm	900	Irritated eyes, skin, nose, and throat; dizziness; excitement; drowsiness; incoherence; staggering gait; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis	8.56
Vinyl Chloride	1 ppm	NL Ca	Weakness, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or cyanosis of extremities	9.99
Vinylidene Chloride (1,1-dichloroethylene)	1 ppm	NL Ca	Eye, skin, and throat irritation; dizziness; headache; nausea; difficult breathing; liver and kidney dysfunction; pneumonitis	10.0

Footnotes:
[a] Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water).
[b] Appropriate value of PEL, REL, or TLV listed.
[c] IDLH = immediately dangerous to life and health (units are the same as specified “Exposure Limit” units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.
[d] PIP = photoionization potential; NA = Not applicable; UK = Unknown.

4.0 Project Organization and Personnel

4.1 CCI Employee Medical Surveillance and Training

(Reference CH2M HILL- SOPs HS-01, *Medical Surveillance,* and HS-02, *Health and Safety Training)*

The employees listed meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SHSS" have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SHSS with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL-SOP HS-04, Reproduction Protection, including obtaining a physician's statement of the employee's ability to perform hazardous activities before being assigned fieldwork.

Employee Name	Office	Responsibility	SHSS/FA-CPR
Greg Wilfley	ATL	Project Manager	
Rich Rathnow	ORO	HSM	SC-HW, SC-C, FA; CPR
Scott Dunbar	ATL	SHSS/Site Superintendent	SC-HW, SC-C, FA; CPR

4.2 Field Team Chain of Command and Communication Procedures

4.2.1 Client

Contact Name: Jimmy Jones COTR
Phone: 843/820-5544
Facility Contact Name: Mark Shull
Phone: 850-452-4616, ext. 129

4.2.2 CCI

Program Manager: Scott Newman/ATL
Project Manager: Greg Wilfley/ATL
Health and Safety Manager: Richard Rathnow/ORO
Site Superintendent:
Site Health and Safety Specialist: TBD

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

- Include standard terms and conditions, and contract-specific HS&E roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors)
- Select safe and competent subcontractors by:
  - obtaining, reviewing and accepting or rejecting subcontractor pre-qualification questionnaires
  - ensuring that acceptable certificates of insurance, including CCI as named additional insured, are secured as a condition of subcontract award
  - including HS&E submittals checklist in subcontract agreements, and ensuring that appropriate site-specific safety procedures, training and medical monitoring records are reviewed and accepted prior to the start of subcontractor's field operations
- Maintain copies of subcontracts and subcontractor certificates of insurance (including CCI as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures in the project file accessible to site personnel
- Provide oversight of subcontractor HS&E practices per the site-specific safety plan
- Ensure that the overall, job-specific, HS&E goals are fully and continuously implemented

The CCI Navy RAC H&S Ma nager is responsible for:

- Review and accept or reject subcontractor pre-qualification questionnaires that fall outside the performance range delegated to the Contracts Administrator (KA)
- Review and accept or reject subcontractor training records and site-specific safety procedures prior to start of subcontractor's field operations
- Support the SHSS's oversight of subcontractor (and lower-tier subcontractors) HS&E practices.

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

- Verify these HSP are current and amended when project activities or conditions change
- Verify CCI site personnel and subcontractor personnel read these FSI and sign Attachment 1 "Employee Signoff Form" prior to commencing field activities

- Verify CCI site personnel and subcontractor personnel have completed any required specialty training (e.g., fall protection, confined space entry) and medical surveillance.
- Verify compliance with the requirements of these FSI and applicable subcontractor health and safety plan(s)
- Act as the project "Hazard Communication Coordinator."
- Act as the project "Emergency Response Coordinator."
- Post OSHA job-site poster; the poster is required at sites where project field offices, trailers, or equipment-storage boxes are established; posters can be obtained by calling 800/548-4776 or 800/999-9111
- Verify that safety meetings are conducted and documented in the project file initially and as needed throughout the course of the project (e.g., as tasks or hazards change)
- Verify that project H&S forms and permits, found in Attachment 7, are being used as outlined in Section 2
- Perform oversight and/or assessments of subcontractor HS&E practices per the site-specific safety plan and verify that project activity self-assessment checklists, found in Attachment 6, are being used.
- Verify that project files available to site personnel include copies of executed subcontracts and subcontractor certificates of insurance (including CCI as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures prior to start of subcontractor's field operations
- Coordinate with the HS&E manager regarding CCI and subcontractor operational performance, interfaces
- Ensure that the overall, job-specific, HS&E goals are fully and continuously implemented

The training required for the SHSS is as follows:

- SHSS 10-hour course
- OHSA 10-hour course for Construction
- First Aid and CPR
- Relevant Competent Person Courses (excavation, confined space, scaffold, fall protection, etc.)

The SHSS is responsible for contacting the Site Superintendent and Project Manager. In general, the Project Manager will contact the client. The Health and Safety Manager should be contacted as appropriate.

4.2.3 CCI Subcontractors

(Reference CH2M HILL- SOP HS-55, *Subcontractor, Contractor, and Owner*)

Certain subcontractors (drilling, remedial and construction contractors) are required to be pre-qualified for safety by completing the Subcontractor Safety Performance Questionnaire. The subcontractors listed above are covered by this HSP. However, this plan does not address hazards associated with the tasks and equipment that the subcontractor has expertise in (e.g., drilling, excavation work, electrical). Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit these procedures to CCI for review before the start of field work by following the Subcontractor Safety Procedure Criteria specific to their work.

Subcontractors are also required to prepare Activity Hazard Analysis before beginning each activity posing H&S hazards to their personnel using the AHA form provided in Attachment 5 as a guide. The AHA will identify the principle steps of the activity, potential H&S hazards for each step and recommended control measures for each identified hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

Subcontractors must comply with the established health and safety plan(s). The CCI SHSS should verify that subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). CCI oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

CCI should continuously endeavor to observe subcontractors' safety performance. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CCI is not responsible for exhaustive observation for hazards and unsafe practices. In addition to this level of observation, the SHSS is responsible for confirming CCI subcontractor performance against both the subcontractor's safety plan and applicable self-assessment checklists. Self-assessment checklists contained in Attachment 6 are to be used by the SHSS to review subcontractor performance.

Health and safety related communications with CCI subcontractors should be conducted as follows:

- Brief subcontractors on the provisions of this plan, and require them to sign the Employee Signoff Form included in Attachment 1.
- Request subcontractor(s) to brief project team on the hazards and precautions related to their work.
- When apparent non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action – the subcontractor is responsible for determining and implementing necessary controls and corrective actions.

- When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
- When an apparent imminent danger exists, immediately remove all affected CCI employees and subcontractors, notify subcontractor safety representative, and stop affected work until adequate corrective measures are implemented. Notify the Project Manager and HSM as appropriate.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

5.0 Personal Protective Equipment

(Reference CH2M HILL- SOP HS-07, *Personal Protective Equipment*, HS-08, *Respiratory Protection*)

Personal Protective equipment (PPE) specifications are listed in Table 5-1.

TABLE 5-1
PPE Specifications[a]

Task	Level	Body	Head	Respirator [b]
General site entry Surveying Oversight of remediation and construction	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat [c] Safety glasses Ear protection [d]	None required
Surface water sampling Aquifer testing Sediment sampling Surface soil sampling Hand augering Geoprobe boring Piezometer installation	Modified D	Work clothes or cotton coveralls **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Safety glasses Ear protection [d]	None required
Groundwater sampling Soil boring Investigation-derived waste (drum) sampling and disposal	Modified D	**Coveralls:** Uncoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Safety glasses Ear protection [d]	None required
Test pit excavation Tasks requiring upgrade	C	**Coveralls:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Ear protection [d] Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H cartridges or equivalent[e]
Tasks requiring upgrade	B	**Coveralls:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Ear protection [d] Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA); MSA Ultralite, or equivalent

[a] Modifications are as indicated. CCI will provide PPE only to CCI employees.
[b] No facial hair that would interfere with respirator fit is permitted.
[c] Hardhat and splash-shield areas are to be determined by the SHSS.
[d] Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.
[e] Cartridge change-out schedule is at least every 8 hours (or one work day), except if relative humidity is > 85%, or if organic vapor measurements are > midpoint of Level C range (refer to Section 5)--then at least every 4 hours. If encountered conditions are different than those anticipated in this HSP, contact the HSM.

Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the HSM, and an SHSS qualified at that level is present. PPE levels may be upgraded for the following reasons:

- Request from individual performing tasks
- Change in work tasks that will increase contact or potential contact with hazardous materials

- Occurrence or likely occurrence of gas or vapor emission
- Known or suspected presence of dermal hazards
- Instrument action levels (Section 6) exceeded

PPE levels may be downgraded for the following reasons:

- New information indicating that situation is less hazardous than originally thought
- Change in site conditions that decreases the hazard
- Change in work task that will reduce contact with hazardous materials

6.0 Air Monitoring/Sampling

(Reference CH2M HILL- SOP HS-06, *Air Monitoring)*

6.1 Air Monitoring Specifications

Air monitoring specifications are listed in Table 6-1.

TABLE 6-1
Air Monitoring Specifications

Instrument	Tasks	Contaminant Concentration	Action Levels[a]	Frequency [b]	Calibration
PID: OVM with 10.6eV lamp or equivalent	All intrusive and potentially contaminated liquid exposure situations	0-5 ppm 5-10 ppm >10 ppm	Level D Level C Contact HSM	Initially and periodically during task	Daily
CGI: MSA model 260 or 261 or equivalent		0-10% : 10-25% LEL: >25% LEL:	No explosion hazard Potential explosion hazard Explosion hazard; evacuate or vent	Continuous during advancement of boring or trench	Daily
O_2Meter: MSA model 260 or 261 or equivalent		>25%[c] O_2: 20.9%[c] O_2: <19.5%[c] O_2:	Explosion hazard; evacuate or vent Normal O_2 O_2 deficient; vent or use SCBA	Continuous during advancement of boring or trench	Daily
Dust Monitor: Miniram model PDM-3 or equivalent		mg/m^3 mg/m^3	Level D Level C	Initially and periodically during tasks	Zero Daily
Detector Tube: Drager benzene specific 0.5/c (0.5 to 10 ppm range) with pre-tube, or equivalent		<0.5 ppm 0.5-1 ppm >1 ppm	Level D Level C Level B	Initially and periodically when PID/FIB >1 ppm	Not applicable
Colormetric Tube: Drager vinyl chloride specific (0.5 to 30 ppm range) with pre-tube, or equivalent		<0.5 ppm 0.5 ppm	Level D Level B	Initially and periodically when PID/FID >1 ppm	Not applicable
Radiation Meter [d]: Ludlum Model 2 with GM probe model 44-9, or equivalent		Background: >3x Background: >2 mR/Hr:	Continue work Consult RHM Establish REZ	Initially, periodically, and at end of task	Daily
Nose-Level Monitor [e]:		<85 dB(A) 85-120 dB(A) 120 dB(A)	No action required Hearing protection required Stop; re-evaluate	Initially and periodically during task	Daily

[a] Action levels apply to sustained breathing-zone measurements above background.
[b] The exact frequency of monitoring depends on field conditions and is to be determined by the SHSS; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3", "at surface/SB-2", etc.).
[c] If the measured percent of O_2 is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O_2 action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O_2 action levels are required for confined-space entry (refer to Section 2).
[d] Refer to SOP HS-10 for instructions and documentation on radiation monitoring and screening.
[e] Noise monitoring and audiometric testing also required.

6.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Air Monitoring equipment calibration specifications are listed in Table 6-2.

TABLE 6-2
Air Monitoring Equipment Specifications

Instrument	Gas	Span	Reading	Method
PID: OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
PID: TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing
FID: OVA	100 ppm methane	3.0 $\pm$ 1.5	100 ppm	1.5 lpm reg T-tubing
FID: TVA 1000	100 ppm methane	NA	100 ppm	2.5 lpm reg T-tubing
Dust Monitor: Miniram-PDM3	Dust-free air	Not applicable	0.00 mg/m^3 in "Measure" mode	Dust-free area OR Z-bag with HEPA filter
CGI: MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL $\pm$ 5% LEL	1.5 lpm reg direct tubing

6.3 Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

Results must be sent immediately to the HSM. Regulations may require reporting to monitored personnel.

7.0 Decontamination

(Reference CH2M HILL- SOP HS-13, *Decontamination*)

The SHSS must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SHSS. The SHSS must ensure that procedures are established for disposing of materials generated on the site.

7.1 Decontamination Specifications

Decontamination specifications are listed in Table 7-1.

TABLE 7-1
Decontamination Specifications

Personnel	Sample Equipment	Heavy Equipment
• Boot wash/rinse • Glove wash/rinse • Outer-glove removal • Body-suit removal • Inner-glove removal • Respirator removal • Hand wash/rinse • Face wash/rinse • Shower ASAP • Dispose of PPE in municipal trash, or contain for disposal • Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal	• Wash/rinse equipment • Solvent-rinse equipment • Contain solvent waste for offsite disposal	• Power wash • Steam clean • Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal

7.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SHSS should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 7-1 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SHSS to accommodate task-specific requirements.

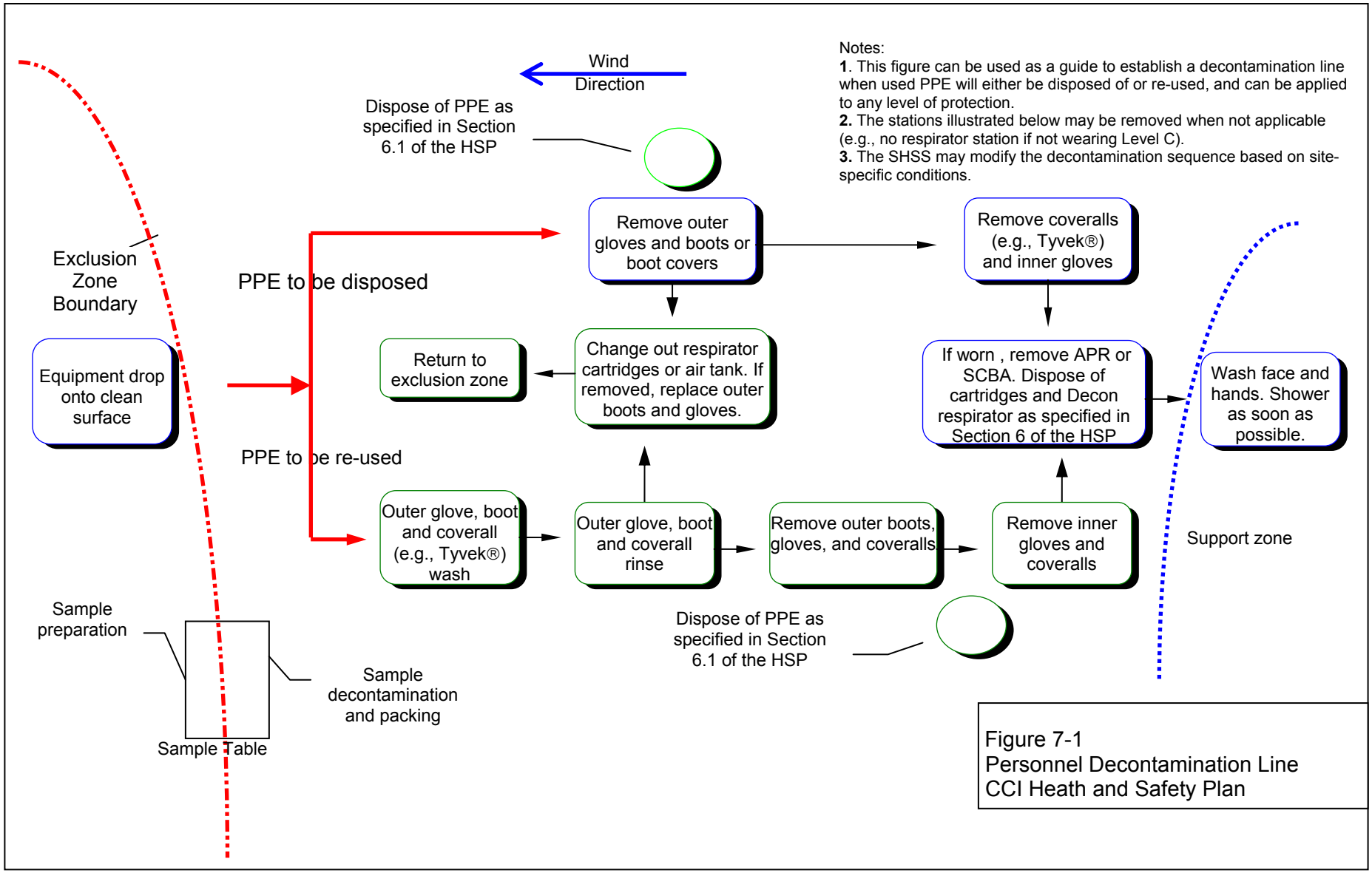


Figure 7-1
Personnel Decontamination Line
CCI Heath and Safety Plan

8.0 Spill-Containment Procedures

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and disposed of properly.

9.0 Site Control Plan

9.1 Site Control Procedures

(Reference CH2M HILL- SOP HS-11, *Site Control)*

- The SHSS will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of Health and Safety Plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SHSS records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location in accordance with CH2M HILL- SOP HS-71, OSHA Postings.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Initial air monitoring is conducted by the SHSS in appropriate level of protection.
- The SHSS is to conduct periodic inspections of work practices to determine the effectiveness of this plan – refer to Sections 2 and 3. Deficiencies are to be noted, reported to the HSM, and corrected.

9.2 Hazwoper Compliance Plan

(Reference CH2M HILL- SOP HS-19, *Site-Specific Written Safety Plans)*

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks might occur consecutively or concurrently with respect to non-Hazwoper tasks. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff are working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data.
- When non-Hazwoper-trained personnel are at risk of exposure, the SHSS must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
  - nature of the existing contamination and its locations
  - limitations of their access
  - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
- Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hours of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.

10.0 Emergency Response Plan

(Reference CH2M HILL- SOP HS-12, *Emergency Response*)

10.1 Pre-Emergency Planning

The SHSS performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CCI onsite parties, the facility, and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital.
- Brief new workers on the emergency response plan.

The SHSS will evaluate emergency response actions and initiate appropriate follow-up actions.

10.2 Emergency Equipment and Supplies

The SHSS should mark the locations of emergency equipment on the site map and post the map. Emergency equipment is listed in Table 10-1.

TABLE 10-1
Emergency Equipment

Emergency Equipment and Supplies	Location
20 LB (or two 10-lb) fire extinguisher (A, B, and C classes)	Support Zone/Heavy Equipment
First aid kit	Support Zone/Field Vehicle
Eye Wash	Support & Decon Zone/Field Vehicle
Potable water	Support & Decon Zone/Field Vehicle
Bloodborne-pathogen kit	Support Zone/Field Vehicle
Additional equipment (specify):	

10.3 Incident Reporting, Investigation and Response

According to Southern Division, NAVFAC Incident Reporting requirements, all incidents involving personal injury, and property damage greater than $1,000 incidents involving CCI or subcontractor project personnel must be reported to Southern Division, NAVFAC within 24 hours of incident occurrence. As such, the Site Manager must report the following incident information to the HSM immediately after incident occurrence:

- Date and time of mishap
- Project name and project number
- Name and worker classification
- Extent of known injuries
- Level of medical attention
- Injury cause

According to CCI requirements, all personal injuries, near-misses, or property damage incidents require involving CCI or subcontractor project personnel must be reported immediately to the HSM. An incident investigation will be performed and submitted to the HSM within 24 hours of incident occurrence by the completing the Incident Report, Near Loss Investigation and Root Cause Analysis provided in Attachment 7.

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CCI operations and evacuate the immediate work area.
- Notify appropriate response personnel.
- Account for personnel at the designated assembly area(s).
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

10.4 Emergency Medical Treatment

The procedures listed below may also be applied to non-emergency incidents. CCI and J.A. Jones employee injuries and illnesses (including overexposure to contaminants) must be reported to their respective Human Resource contacts in Attachment 4. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact either the CCI or J.A. Jones medical consultant, depending on whose employee is injured. During non-emergencies, follow these procedures as appropriate.

- Notify appropriate emergency response authorities listed in Section 10.8 (e.g., 911).
- The SHSS will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Make certain that the injured person is accompanied to the emergency room.
- When contacting the medical consultant, give your name and telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Report incident as outlined in Section 10.7.

10.5 Evacuation

- Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the SHSS before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The SHSS and a "buddy" will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The SHSS will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).

- The SHSS will write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety.

10.6 Evacuation Signals

Evacuation signals are listed in Table 10-2.

TABLE 10-2
Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

10.7 Incident Notification and Reporting

- Upon any project incident (fire, spill, injury, near miss, death, etc.), immediately notify the PM and HSM. Call emergency beeper number if HSM is unavailable.
- For CCI work-related injuries or illnesses, contact the respective Human Resources contact listed in Attachment 4. For CCI incidents the HR administrator will complete an Incident Report Form (IRF). IRF must be completed within 24 hours of incident.
- For CCI subcontractor incidents, complete the Subcontractor Accident/Illness Report Form (Attachment ?) and submit to the HSM.
- Notify and submit reports to client as required in contract.

11.0 Approval

This site-specific Health and Safety Plan has been written for use by CCI only. CCI claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

11.1 Original Plan

Written By: Rich Rathnow **Date: 5-28-03**

Approved By: Rich Rathnow **Date: 5-28-03**

11.2 Revisions

Revisions Made By: **Date:**

Revisions Approved By: **Date:**

Attachment 1

Employee Signoff Form

EMPLOYEE SIGNOFF FORM

- The CCI project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

Project Name: **Project Number:**

EMPLOYEE NAME (Please print)	**EMPLOYEE SIGNATURE**	**COMPANY**	**DATE**

Attachment 2

Project-Specific Chemical Product Hazard Communication Form

Project-Specific Chemical Product Hazard Communication Form

This form must be completed prior to performing activities that expose personnel to hazardous chemicals products. Upon completion of this form, the SHSS will verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CCI and subcontractor personnel. Labeling and MSDS systems will also be explained.

Project Name: **Project Number:**

MSDSs will be maintained at the following location(s):

Hazardous Chemical Products Inventory

Chemical	Quantity	Location	MSDS Available	Container labels	
				Identity	Hazard
Methane	1 liter, compressed	Support Zone			
Isobutylene	1 liter, compressed	Support Zone			
Pentane	1 liter, compressed	Support Zone			
Hydrochloric acid	< 500 ml	Support Zone / sample bottles			
Nitric acid	< 500 ml	Support Zone / sample bottles			
Sulfuric Acid	< 500 ml	Support Zone / sample bottles			
Sodium hydroxide	< 500 ml	Support Zone / sample bottles			
Methanol	< 1 Gallon	Support/Decon Zones			
Hexane	< 1 Gallon	Support/Decon Zones			
pH buffers	< 500 ml	Support Zone			
MSA Sanitizer	< 1 liter	Support/Decon Zones			
Alconox/Liquinox	< 1liter	Support/Decon Zones			

Refer to SOP HS-05 *Hazard Communication* for more detailed information.

Attachment 3

Chemical specific Training Form

CHEMICAL-SPECIFIC TRAINING FORM

Location:	Project # :
HCC:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC will use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants will have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CCI's written hazard communication program will be made available for employee review in the facility/project hazard communication file.

Attachment 4

Emergency Contacts

Emergency Contacts

24-hour CCI Emergency Beeper – 888/444-1226

Medical Emergency – 911
Facility Medical Response #:
Local Ambulance #:

CH2M HILL- Medical Consultant
Dr. Jerry H. Berke, M.D., M.P.H.
Health Resources
600 West Cummings Park, Suite 3400
Woburn, MA 01801-6350
1-781-938-4653
1-800-350-4511

Fire/Spill Emergency -- 911
Facility Fire Response #:
Local Fire Dept #:

Local Occupational Physician

Security & Police – 911
Facility Security #:
Local Police #:

Navy RAC Program Manager
Name: Scott Newman/ATL
Phone: 770/604/9182

Utilities Emergency
Water:
Gas:
Electric:

CCI Health and Safety Manager (HSM)
Name: Rich Rathnow/ORO
Phone: 865/483-9005 (Office); 865/607-6734 (Cell)
865/531-2933(Home)

Designated Safety Coordinator (SHSS)
Name: TBD
Phone:

CCI Regional Human Resources Department
Name: Nancy Orr/COR
Phone: 303/771-0900

Navy RAC Project Manager
Name: Greg Wilfley/ATL
Phone: 770/604-9182

CH2M HILL Corporate Human Resources Department
Name: John Monark/COR
Phone: 303/771-0900

Federal Express Dangerous Goods Shipping
Phone: 800/238-5355

Emergency Number for Shipping Dangerous Goods
Phone: 800/255-3924

CH2M HILL Worker's Compensation and Auto Claims
Sterling Administration Services
Phone: 800/420-8926 After hours: 800/497-4566

Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.

Facility Alarms:

Evacuation Assembly Area(s):

Facility/Site Evacuation Route(s):

Hospital Name/Address:
Baptist Hospital
1000 W. Moreno St.
Pensacola, FL 32501

Hospital Phone #:
(850) 434-4011

Directions to Hospital

Include written directions here, and attach or post a highlighted map if needed.

From the site, turn right onto John H. Tower Road, then turn right onto Taylor Road. Follow ½ mile to Duncan Road (Route SR-295). Turn left and follow to Main Gate of NAS Pensacola. Proceed on SR-295 for 1.5 miles then turn right onto SR-292 and proceed for approximately 4 miles to West Moreno Street. Turn right and proceed for eight blocks to Baptist Medical Center. Refer to next page for map.

Attachment 5

Activity Hazard Analysis Form

Activity Hazard Form

Activity:	**Date:**
	Project:
Description of the work:	**Site Supervisor:**
	Site Safety Officer:
	Review for latest use: Before the job is performed.

Work Tasks	Identify & Analyze the Hazards	Identify Hazard Controls

Work Tasks	Identify & Analyze the Hazards	Identify Hazard Controls

Equipment to be used	Inspection Requirements	Training Requirements

PRINT	SIGNATURE		
Supervisor Name:			Date/Time:
Safety Officer Name:			Date/Time:
Employee Name(s):			Date/Time:
			Date/Time:
			Date/Time:
			Date/Time:
			Date/Time:
			Date/Time:
			Date/Time:
			Date/Time:
			Date/Time:
			Date/Time:
			Date/Time:

Attachment 6

Project Activity Self-Assessment Checklists/Permits

- **Waste Characterization, Sampling, and Analysis**
- **Drilling**
- **Hand and Power Tools**
- **Waste Sampling Analysis**

CH2MHILL

H&S Self-Assessment Checklist - DRILLING

This checklist will be used by CH2M HILL personnel **only** and will be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to hazards associated with drilling operations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of a drilling subcontractor is required (complete entire checklist).

SHSS may consult with drilling subcontractors when completing this checklist, but will not direct the means and methods of drilling operations nor direct the details of corrective actions. Drilling subcontractors will determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) will be corrected immediately or all exposed personnel will be removed from the hazard until corrected.

Completed checklists will be sent to the health and safety manager for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to drilling hazards
☐ Evaluate a CH2M HILL subcontractor's compliance with drilling H&S requirements
Subcontractors Name: _____

Check "Yes" if an assessment item is complete/correct.

Check "No" if an item is incomplete/deficient. Deficiencies will be brought to the immediate attention of the drilling subcontractor. Section 3 must be completed for all items checked "No."

Check "N/A" if an item is not applicable.

Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-35.

SECTION 1	**Yes**	**No**	**N/A**	**N/O**
PERSONNEL SAFE WORK PRACTICES (3.1)				
1. Only authorized personnel operating drill rig	☐	☐	☐	☐
2. Personnel cleared during rig startup	☐	☐	☐	☐
3. Personnel clear of rotating parts	☐	☐	☐	☐
4. Personnel not positioned under hoisted loads	☐	☐	☐	☐
5. Loose clothing and jewelry removed	☐	☐	☐	☐
6. Personnel instructed not to approach equipment that has become electrically energized	☐	☐	☐	☐
7. Smoking is prohibited around drilling operation	☐	☐	☐	☐
8. Personnel wearing appropriate PPE, per HSP/FSI	☐	☐	☐	☐

SECTION 2	Yes	No	N/A	N/O
GENERAL (3.2.1)				
9. Daily safety briefing/meeting conducted with crew	☐	☐	☐	☐
10. Daily inspection of drill rig and equipment conducted before use	☐	☐	☐	☐
DRILL RIG PLACEMENT (3.2.2)				
11. Location of underground utilities identified	☐	☐	☐	☐
12. Safe clearance distance maintained from overhead powerlines	☐	☐	☐	☐
13. Drilling pad established, when necessary	☐	☐	☐	☐
14. Drill rig leveled and stabilized	☐	☐	☐	☐
DRILL RIG TRAVEL (3.2.3)				
15. Rig shut down and mast lowered and secured prior to rig movement	☐	☐	☐	☐
16. Tools and equipment secured prior to rig movement	☐	☐	☐	☐
17. Only personnel seated in cab are riding on rig during movement	☐	☐	☐	☐
18. Safe clearance distance maintained while traveling under overhead powerlines	☐	☐	☐	☐
19. Backup alarm or spotter used when backing rig	☐	☐	☐	☐
DRILL RIG OPERATION (3.2.4)				
20. Kill switch clearly identified and operational	☐	☐	☐	☐
21. All machine guards are in place	☐	☐	☐	☐
22. Rig ropes not wrapped around body parts	☐	☐	☐	☐
23. Pressurized lines and hoses secured from whipping hazards	☐	☐	☐	☐
24. Drill operation stopped during inclement weather	☐	☐	☐	☐
25. Air monitoring conducted per HSP/FSI for hazardous atmospheres	☐	☐	☐	☐
26. Rig placed in neutral when operator not at controls	☐	☐	☐	☐
DRILL RIG MAINTENANCE (3.2.5)				
27. Defective components repaired immediately	☐	☐	☐	☐
28. Lockout/tagout procedures used prior to maintenance	☐	☐	☐	☐
29. Cathead in clean, sound condition	☐	☐	☐	☐
30. Drill rig ropes in clean, sound condition	☐	☐	☐	☐
31. Fall protection used for fall exposures of 6 feet or greater	☐	☐	☐	☐
32. Rig in neutral and augers stopped rotating before cleaning	☐	☐	☐	☐
33. Good housekeeping maintained on and around rig	☐	☐	☐	☐
DRILLING AT HAZARDOUS WASTE SITES (3.2.6)				
34. Waste disposed of according to HSP	☐	☐	☐	☐
35. Appropriate decontamination procedures being followed, per HSP	☐	☐	☐	☐

SECTION 3

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: _____ Project Manager: _____

This checklist will be used by CH2M HILL personnel **only** and will be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are exposed to hand and power tool hazards and/or 2) CH2M HILL provides oversight of subcontractor personnel who are exposed to hand and power tool hazards.

SHSS or SHSS may consult with subcontractors when completing this checklist, but will not direct the means and methods of hand and power tool use nor direct the details of corrective actions. Subcontractors will determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) will be corrected immediately or all exposed personnel will be removed from the hazard until corrected.

Completed checklists will be sent to the HS&E Staff for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposure to hand and power tool hazards.
☐ Evaluate a CH2M HILL subcontractor's compliance with hand and power tool requirements.
Subcontractors Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies will be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-50.

SECTION 1

	Yes	No	N/A	N/O
SAFE WORK PRACTICES (3.1)				
1. All tools operated according to manufacturer's instructions and design limitations.	☐	☐	☐	☐
2. All hand and power tools maintained in a safe condition and inspected and tested before use.	☐	☐	☐	☐
3. Defective tools are tagged and removed from service until repaired.	☐	☐	☐	☐
4. PPE is selected and used according to tool-specific hazards anticipated.	☐	☐	☐	☐
5. Power tools are not carried or lowered by their cord or hose.	☐	☐	☐	☐
6. Tools are disconnected from energy sources when not in use, servicing, cleaning, etc.	☐	☐	☐	☐
7. Safety guards remain installed or are promptly replaced after repair.	☐	☐	☐	☐
8. Tools are stored properly.	☐	☐	☐	☐
9. Cordless tools and recharging units both conform to electrical standards and specifications.	☐	☐	☐	☐
10. Tools used in explosive environments are rated for such use.	☐	☐	☐	☐
11. Knife or blade hand tools are used with the proper precautions.	☐	☐	☐	☐
12. Consider controls to avoid muscular skeletal, repetitive motion, and cumulative trauma stressors.	☐	☐	☐	☐

SECTION 2	Yes	No	N/A	N/O
GENERAL (3.2.1)				
13. PPE is selected and used according to tool-specific hazards anticipated.	☐	☐	☐	☐
14. Tools are tested daily to assure safety devices are operating properly.	☐	☐	☐	☐
15. Damaged tools are removed from service until repaired.	☐	☐	☐	☐
16. Power operated tools designed to accommodate guards have guards installed.	☐	☐	☐	☐
17. Rotating or moving parts on tools are properly guarded.	☐	☐	☐	☐
18. Machines designed for fixed locations are secured or anchored.	☐	☐	☐	☐
19. Floor and bench-mounted grinders are provided with properly positioned work rests.	☐	☐	☐	☐
20. Guards are provided at point of operation, nip points, rotating parts, etc.	☐	☐	☐	☐
21. Fluid used in hydraulic-powered tools is approved fire-resistant fluid.	☐	☐	☐	☐
ELECTRIC-POWERED TOOLS (3.2.2)				
22. Electric tools are approved double insulated or grounded and used according to SOP HS-23.	☐	☐	☐	☐
23. Electric cords are not used for hoisting or lowering tools.	☐	☐	☐	☐
24. Electric tools are used in damp/ wet locations are approved for such locations or GFCI installed.	☐	☐	☐	☐
25. Hand-held tools are equipped with appropriate on/off controls appropriate for the tool.	☐	☐	☐	☐
26. Portable, power-driven circular saws are equipped with proper guards.	☐	☐	☐	☐
ABRASIVE WHEEL TOOLS (3.2.3)				
27. All employees using abrasive wheel tools are wearing eye protection.	☐	☐	☐	☐
28. All grinding machines are supplied with sufficient power to maintain spindle speed.	☐	☐	☐	☐
29. Abrasive wheels are closely inspected and ring-tested before use.	☐	☐	☐	☐
30. Grinding wheels are properly installed.	☐	☐	☐	☐
31. Cup-type wheels for external grinding are protected by the proper guard or flanges.	☐	☐	☐	☐
32. Portable abrasive wheels used for internal grinding are protected by safety flanges.	☐	☐	☐	☐
33. Safety flanges are used only with wheels designed to fit the flanges.	☐	☐	☐	☐
34. Safety guards on abrasive wheel tools are mounted properly and of sufficient strength.	☐	☐	☐	☐
PNEUMATIC-POWERED TOOLS (3.2.4)				
35. Tools are secured to hoses or whip by positive means to prevent disconnection.	☐	☐	☐	☐
36. Safety clips or retainers are installed to prevent attachments being expelled.	☐	☐	☐	☐37.
Safety devices are installed on automatic fastener feed tools as required.	☐	☐	☐	☐
38. Compressed air is not used for cleaning unless reduced to < 30 psi, with PPE, and guarded.	☐	☐	☐	☐
39. Manufacturer's safe operating pressure for hoses, pipes, valves, etc. are not exceeded.	☐	☐	☐	☐
40. Hoses are not used for hoisting or lowering tools.	☐	☐	☐	☐
41. All hoses >1/2-inch diameter have safety device at source to reduce pressure upon hose failure.	☐	☐	☐	☐
42. Airless spray guns have required safety devices installed.	☐	☐	☐	☐
43. Blast cleaning nozzles are equipped with operating valves, which are held open manually.	☐	☐	☐	☐
44. Supports are provided for mounting nozzles when not in use.	☐	☐	☐	☐
45. Air receiver drains, handholes, and manholes are easily accessible.	☐	☐	☐	☐
46. Air receivers are equipped with drainpipes and valves for removal of accumulated oil and water.	☐	☐	☐	☐
47. Air receivers are completely drained at required intervals.	☐	☐	☐	☐
48. Air receivers are equipped with indicating pressure gauges.	☐	☐	☐	☐
49. Safety, indicating, and controlling devices are installed as required.	☐	☐	☐	☐
50. Safety valves are tested frequently and at regular intervals to assure good operating condition.	☐	☐	☐	☐

SECTION 2 (continued)

	Yes	No	N/A	N/O
LIQUID FUEL-POWERED TOOLS (3.2.5)				
51. Liquid fuel-powered tools are stopped when refueling, servicing, or maintaining.	☐	☐	☐	☐
52. Liquid fuels are stored, handled, and transported in accordance with SOP HS-21	☐	☐	☐	☐
53. Liquid fuel-powered tools are used in confined spaces in accordance with SOP HS-17.	☐	☐	☐	☐
54. Safe operating pressures of hoses, valves, pipes, filters, and other fittings are not exceeded.	☐	☐	☐	☐
POWDER-ACTUATED TOOLS (3.2.6)				
55. Only trained employee operates powder-actuated tools.	☐	☐	☐	☐
56. Powder-actuated tools are not loaded until just prior to intended firing time.	☐	☐	☐	☐
57. Tools are not pointed at any employee at any time.	☐	☐	☐	☐
58. Hands are kept clear of open barrel end.	☐	☐	☐	☐
59. Loaded tools are not left unattended.	☐	☐	☐	☐
60. Fasteners are not driven into very hard or brittle materials.	☐	☐	☐	☐
61. Fasteners are not driven into easily penetrated materials unless suitable backing is provided.	☐	☐	☐	☐
62. Fasteners are not driven into spalled areas.	☐	☐	☐	☐
63. Powder-actuated tools are not used in an explosive or flammable atmosphere.	☐	☐	☐	☐
64. All tools are used with correct shields, guards, or attachments recommended by manufacturer.	☐	☐	☐	☐
JACKING TOOLS (3.2.7)				
65. Rated capacities are legibly marked on jacks and not exceeded.	☐	☐	☐	☐
66. Jacks have a positive stop to prevent over-travel.	☐	☐	☐	☐
67. The base of jacks are blocked or cribbed to provide a firm foundation, when required.	☐	☐	☐	☐
68. Wood blocks are place between the cap and load to prevent slippage, when required.	☐	☐	☐	☐
69. After load is raised, it is cribbed, blocked, or otherwise secured immediately.	☐	☐	☐	☐
70. Antifreeze is used when hydraulic jacks are exposed to freezing temperatures.	☐	☐	☐	☐
71. All jacks are properly lubricated.	☐	☐	☐	☐
72. Jacks are inspected as required.	☐	☐	☐	☐
73. Repair or replacement parts are examined for possible defects.	☐	☐	☐	☐
74. Jacks not working properly are removed from service and repaired or replaced.	☐	☐	☐	☐
HAND TOOLS (3.2.8)				
75. Wrenches are not used when jaws are sprung to the point of slippage.	☐	☐	☐	☐
76. Impact tools are kept free of mushroomed heads.	☐	☐	☐	☐
77. Wooden handles of tools are kept free of splinters or cracks and are tightly fitted in tool.	☐	☐	☐	☐

SECTION 3

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: _____ Project Manager: _____

CH2MHILL

HS&E Self-Assessment Checklist—Waste Characterization, Sampling and Analysis

This checklist will be used by CH2M HILL personnel **only** and will be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees will be managing wastes generated on project sites and/or 2) CH2M HILL provides oversight of subcontractor personnel who are managing wastes generated at project sites.

The Safety Coordinator (SC) may consult with subcontractors when completing this checklist, but will not direct the means and methods of waste characterization, sampling and analysis operations nor direct the details of corrective actions. Subcontractors will determine how to correct deficiencies, and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) will be corrected immediately or all exposed personnel will be removed from the hazard until corrected.

Completed checklists will be sent to the HS&E Staff for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Person filling out checklist: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL compliance with its waste characterization, sampling and analysis standard (SOP-79).
☐ Evaluate a CH2M HILL subcontractor's compliance with the waste characterization, sampling and analysis standard and its requirements
Subcontractors Name: _____

Check "Yes" if an assessment item is complete/correct.

Check "No" if an item is incomplete/deficient. Deficiencies will be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked "No."

Check "N/A" if an item is not applicable.

Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-42.

	Yes	No	N/A	N/O
GENERAL WASTE CHARACTERIZATION INFORMATION (6.0)				
1. Personnel told not to sign waste documentation (e.g., manifests) unless specifically authorized by the client in writing.	☐	☐	☐	☐
2. Waste Management Plan developed and available to all project personnel (see HSE-78).	☐	☐	☐	☐
3. Waste characterized before it is generated.	☐	☐	☐	☐
4. Waste characterized by Client using generator information.	☐	☐	☐	☐
5. Waste volumes estimated.	☐	☐	☐	☐
6. Disposal facility sampling and analytical requirements identified.	☐	☐	☐	☐
7. Disposal facility evaluated (see HSE-78).	☐	☐	☐	☐
8. Waste stream characterization documented in project file.	☐	☐	☐	☐
IDENTIFY ANALYTICAL TEST METHODS (7.1)				
9. Nature and quantity of the waste determined.	☐	☐	☐	☐
10. Analyses required for transport, treatment, and disposal determined.	☐	☐	☐	☐
11. Detection limits identified.	☐	☐	☐	☐
12. Provide disposal facility with analytical results.	☐	☐	☐	☐
13. Analytical test methods identified.	☐	☐	☐	☐

	Yes	No	N/A	N/O
SAMPLING (7.2)				
14. Developed a sampling plan.	☐	☐	☐	☐
15. Field activities recorded in a logbook.	☐	☐	☐	☐
16. Exceptions to sampling plan documented in field logbook.				
17. Each container labeled with the project name, number, sample ID number, date and time,	☐	☐	☐	☐
18. The label on the container is covered with clear tape to prevent loss.	☐	☐	☐	☐
collected sampler's name, sample preserves, analysis to be performed.				
CHAIN OF CUSTODY (COC)				
19. Sample shipping containers sealed with two custody seals.	☐	☐	☐	☐
20. Custody seals placed over the left and rights sides of the container's cover (cooler).	☐	☐	☐	☐
21. Each seal signed and dated (with time).	☐	☐	☐	☐
22. Seals are covered with clear tape to prevent loss.	☐	☐	☐	☐
23. Custody seals placed on sample container immediately after collection.	☐	☐	☐	☐
24. Custody seals must be placed in a manner that they must be broken to open sample container.	☐	☐	☐	☐
25. The sample is in custody (in view or physical possession, it has not been tampered with, it is retained in a secured area with restricted access, it is placed in a container and secured with an official seal such that it cannot be reached without breaking the seal).	☐	☐	☐	☐
CHAIN OF CUSTODY FORM INSTRUCTIONS (7.2.5)				
26. Chain of Custody form completed per instructions	☐	☐	☐	☐
RECORDS (7.2.6)				
27. Original COC submitted to the lab along with final data packages.	☐	☐	☐	☐
28. Official copy of COC form sent to the project chemist and lab with sample shipment.	☐	☐	☐	☐
29. Changes to analytical requests on COC form or the PO made in writing to the lab.	☐	☐	☐	☐
30. A copy of written change sent to PM, lab, and placed in project files.	☐	☐	☐	☐
31. Reasons for change are included in sample log and project file.	☐	☐	☐	☐
32. Sample logbooks, sample logs, and COC forms sent to PM at completion of project activities.	☐	☐	☐	☐

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	**Corrective Action Planned/Taken**	**Date Corrected**

Auditor: ________________________________ Project Manager: ____________________________

Appendix A: Waste Characterization, Sampling and Analysis – USA

1.0 Introduction

This appendix provides federal requirements for projects conducted within the U.S. and its territories. Contact the regional ECC for specific state and local requirements.

2.0 Regulatory Review

The Resource Conservation and Recovery Act (RCRA, 40 CFR 258-279) regulates the generation, storage, transportation, treatment and disposal of solid and hazardous waste. States or local agencies may have hazardous waste requirements more restrictive than the Federal standard.

The Toxic Substances Control Act (TSCA, 40 CFR 761) regulates the manufacture, use, storage, treatment, and disposal of toxic substances, including PCBs. States or local agencies may have requirements more restrictive than the Federal standard.

The Clean Air Act (CAA, 40 CFR 61) regulates the emission of hazardous air pollutants, including asbestos and provides management standards to control emissions. States or local agencies may have requirements more restrictive than the Federal standard.

3.0 Responsibilities

3.1 Environmental Compliance Coordinator (ECC)

The ECC is responsible for providing resources to assist Project Managers to interpret environmental requirements and implement the policies and procedures in this appendix.

4.0 CH2M HILL Policy

It is CH2M HILL policy to manage wastes in compliance with applicable regulations. Since waste characterization is the client's legal responsibility, **CH2M HILL will not sign documentation (e.g., manifests) that suggests CH2M HILL is assuming the client's waste characterization responsibility.** If a client requests this service, the approval process described in the Hazardous Waste Policy for U.S. Projects (Attachment A-1) must be followed.

5.0 Definitions

5.1 Acute Hazardous Waste

Acute hazardous waste is designated with an "H" in the *Hazard Code* column in Tables 40 CFR 261.31 (F-list) and 261.33 (P-list).

5.2 Asbestos Containing Material (ACM)

ACM contains greater than 1 percent asbestos determined by polarized light microscopy.

5.3 Container
A container is any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled. Containers include roll-off boxes, drums, and portable tanks.

5.4 Debris
Debris is any solid material exceeding a 60 mm particle size that is intended for disposal and that is a manufactured object, plant or animal matter, or natural geologic material.

5.5 EPA Identification Number
The EPA Identification Number is a unique number assigned by EPA or a state agency to a generator, transporter, and treatment, storage, or disposal facility that manages hazardous waste.

5.6 Environmental Media
Environmental media includes substances occurring in the natural environment, such as groundwater or soil.

5.7 Facility
A facility is all contiguous land, structures, appurtenances, and improvements on the land used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (e.g., one or more landfills, surface impoundments, or combinations of them).

5.8 Hazardous Waste
Hazardous waste is a solid waste that is not excluded from regulation and: 1) is listed as a hazardous waste, and/or 2) exhibits any of the characteristics of hazardous waste, i.e., ignitability, corrosivity, reactivity, and TCLP toxicity. States may have additional wastes or criteria for state-specific "hazardous" wastes.

5.9 Hazardous Waste Manifest
The hazardous waste manifest (Environmental Protection Agency (EPA) Form 8700-22) is the shipping document for tracking shipments of hazardous waste from the generator's facility to the final disposal facility. The manifest is originated and signed by the generator, and must also be signed by transporters and disposal facilities.

5.10 Munitions and Explosives
Munitions and explosives consist of various types of ordnance such as ammunition, ammunition components, chemical or biological warfare materials that have been abandoned, expelled from demolition pits or burning pads, lost, discarded, buried or fired. "Military munitions" are munitions and explosives that are or have been under the control of various federal agencies such as the DOE and DOD.

5.11 Polychlorinated Biphenyls (PCBs)
PCBs are chemicals in which the biphenyl molecule has been chlorinated and are commonly used in electrical equipment. PCBs may be regulated under TSCA, depending upon concentration.

5.12 Solid Waste
Solid waste is any discarded material regardless of physical state (solid, liquid, or containerized gases). Solid wastes are considered discarded if they are abandoned, recycled, or are inherently waste-like.

5.13 State-Regulated/Special/Industrial Wastes

State-regulated/special/industrial wastes are identified by state agencies for regulation separate from wastes identified by EPA.

5.14 Universal Waste

Universal wastes include batteries, agricultural pesticides, thermostats, and mercury-containing lamps. These wastes are subject to less stringent requirements than RCRA hazardous waste if they are managed in a regulation-specified manner.

5.15 Unexploded Ordnance (UXO)

UXO includes military munitions that have been primed, fuzed, armed, or otherwise prepared for action, and have been fired dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material and remain unexploded either by malfunction, design, or any other cause.

6.0 Waste Characterization

This section provides fundamental information on how to characterize wastes in accordance with RCRA, the Toxic Substance Control Act (TSCA), and other applicable laws and regulations. Consult your regional Environmental Compliance Coordinator for specific state and local requirements.

CH2M HILL may assist a client with waste characterization if specified in the project scope of work. The following procedures provide general information to assist with our limited scope. However, **CH2M HILL personnel must not sign documentation (such as manifests) that may indicate that CH2M HILL intends to assume the client's waste characterization responsibilities.** If a client requests this service, the approval process described in the Hazardous Waste Policy for U.S. Projects (Attachment A-1) must be followed.

6.1 Hazardous Waste Determination

Generators must determine if waste is hazardous by using process knowledge (e.g., historical data or information in MSDS) or testing the waste using standard EPA methods. With this information, a waste is characterized by asking the following questions:

- Is it a solid waste?
- Is it excluded?
- Is it a listed hazardous waste?
- Is it "contained in" environmental media or debris?
- Does it exhibit a hazardous characteristic?

Regulated wastes will carry a specific "waste code" for identification. Hazardous wastes are subject to strict management standards as discussed in HSE-80 (Hazardous Waste Management). The following sections discuss each question to characterize waste.

6.1.1 Is it a Solid Waste?

Almost everything is considered solid under RCRA, including liquids and compressed gases. Solid material becomes solid waste when it is discarded by being abandoned through accumulation, storage, disposal, or treatment or by being recycled.

6.1.2 Is it Excluded?

Some wastes are excluded from regulation as solid and hazardous waste. Solid waste exclusions are found in 40 CFR 261.4. Common solid waste exclusions include domestic sewage and industrial wastewater. Materials that are not solid waste *cannot* be hazardous waste.

Hazardous waste exclusions are found in 40 CFR 261.4. Common hazardous waste exclusions include mining overburden returned to the mine, and wastes from extraction or production of crude oil or natural gas. Evaluate all waste streams for a solid or hazardous waste exclusion and document all exclusions in the project file.

6.1.3 Is it Listed Hazardous Waste?

A solid waste is hazardous if it is included on one of three lists: F-list (40 CFR 261.31), K-list (261.32), and P- and U-lists (261.33). The lists are based on the source of the waste as shown in Table 6-1. Evaluate the source of all project waste streams to determine if a listed waste code applies. Document all waste code determinations in the project file.

Table 6-1 Listed Wastes

WASTE CODE	SOURCE OF WASTE	DESCRIPTION
F-list	Non-Specific Source	Generic wastes produced by any industrial manufacturing processes. Examples include spent solvents from degreasing.
K-list	Specific Source	Wastes from specifically identified industries. Examples include petroleum refining wastes or wood preserving wastes.
P- list (acutely hazardous) U-list (toxic)	Commercial Chemical Products	Pure chemical products or manufacturing intermediates listed in 40 CFR 261.33 or are the sole active ingredient in a mixture. Examples include MEK or TCE.

6.1.4 Is it "Contained-in" Environmental Media or Debris?

Environmental media and debris can become a hazardous waste if it "contains" (i.e., is contaminated) with a listed waste. Evaluate all project waste streams to determine if one of the following "contained-in" rules cause the waste stream to be regulated as a listed hazardous waste.

The "contained-in policy" regulates environmental media that contains listed hazardous waste. Environmental media is regulated as hazardous waste if it is contaminated with an F-, K-, P- or U-listed waste, regardless of the amount of contamination. The waste code can be removed from soil or groundwater by demonstrating that contamination is below health-based standards (e.g., following treatment) and obtaining a "contained-in decision" (also known as a "contained-out" decision) from the state or EPA. Document all determinations and contained-in decisions in the project file.

The "contained-in rule" (also known as the debris rule) applies to debris. It states that debris such as concrete, asphalt, or wood is regulated as hazardous waste if it contains listed hazardous waste. This determination can be removed through treatment to the alternative treatment standards for hazardous debris in 40 CFR 268.45. Treatment technologies include surface extraction such as pressure washing or spalling, depending upon the type of debris. Contact the regional ECC for assistance with "contained-in" rules.

6.1.5 Does it Exhibit a Hazardous Characteristic?

A solid waste is a hazardous waste if it exhibits the following four characteristics:

- Ignitability (D001)
- Corrosivity (D002)
- Reactivity (D003)
- Toxicity (D004-43)

Ignitable wastes (D001) are generally liquids with a flash point of less than 140 degrees F, such as mineral spirits. Other ignitable wastes are non-liquids that can cause fire under standard temperature and pressure, ignitable compressed gases, and ignitable oxidizers (chlorates).

Corrosive wastes (D002) are liquids with a pH < 2 or > 12.5, such as lead acid batteries, hydrochloric acid or sodium hydroxide. Soil cannot be a corrosive waste because it is not aqueous. Note however, that some states regulate corrosive solids.

Reactive wastes (D003) are wastes that are normally unstable and react violently such as a lithium sulfur dioxide battery, heated aerosol cans, or ordnance.

Toxic wastes are liquids or solids that contain a regulated amount of any one of 39 toxic compounds; the waste codes assigned to these compounds are D004 through D043. This determination is usually made by sampling and analysis using the Toxicity Characteristic Leaching Procedure (TCLP). Waste leachate concentrations exceeding the regulatory limits are assigned the corresponding D004 through D043 waste code(s). Table 6-2 lists the constituents applicable to the toxicity characteristic. Evaluate all project waste streams to determine if a D-code will apply.

Table 6-2 Toxicity Characteristic Criteria

Waste Code	Constituent	TCLP Maximum (mg/l)
D004	Arsenic	5.0
D005	Barium	100.0
D006	Cadmium	1.0
D007	Chromium (total)	5.0
D008	Lead	5.0
D009	Mercury	0.2
D010	Selenium	1.0
D011	Silver	5.0
	ides/Herbicides	
D012	Endrin	0.02
D013	Lindane	0.4
D014	Methoxychlor	10.0
D015	Toxaphene	0.5
D016	2,4-D	10.0
D017	2,4,5-TP Silvex	1.0
	s	
D018	Benzene	0.5
D019	Carbon tetrachloride	0.5
D020	Chlordane	0.03
D021	Chlorobenzene	100

D022	Chloroform	6.0
Waste Code	**Constituent**	**TCLP Maximum (mg/l)**
D023	o-Cresol*	200.0
D024	m-Cresol*	200.0
D025	p-Cresol*	200.0
D026	Cresols*	200.0
D027	1,4-Dichlorobenzene	7.5
D028	1,2-Dichloroethane	0.5
D029	1,1-Dichloroethylene	0.7
D030	2,4-Dinitrotoluene	0.13
D031	Heptachlor (and epoxide)	0.008
D032	Hexachlorobenzene	0.13
D033	Hexachlorobutadiene	0.5
D034	Hexachloroethane	3.0
D035	Methyl ethyl ketone	200.0
D036	Nitrobenzene	2.0
D037	Pentachlorophenol	100.0
D038	Pyridine	5.0
D039	Tetrachloroethylene	0.7
D040	Trichloroethylene	0.5
D041	2,4,5-Trichlorophenol	400.0
D042	2,4,6-Trichlorophenol	2.0
D043	Vinyl chloride	0.2

6.2 Underlying Hazardous Constituents

Wastes that are determined to be hazardous under Section 6.1 must also be evaluated for the presence of underlying hazardous constituents. These must be evaluated so that the waste can be fully treated to meet the Land Disposal Restrictions (LDRs, 40 CFR 268). The presence of underlying hazardous constituents can be determined through process knowledge, MSDS review, or sampling and analysis. Consult the regional ECC for assistance in determining if your project waste stream contains underlying hazardous constituents.

6.3 State-Specific Wastes

Many states have more stringent requirements than EPA and regulate additional wastes as hazardous or special wastes. Some examples include low-level PCB waste or petroleum-contaminated soil. Contact the regional ECC to evaluate state regulations and guidance to determine if project waste streams are regulated as state-specific wastes.

6.3 TSCA Waste Classification

PCB wastes are regulated under the Toxic Substances Control Act (TSCA, 40 CFR 761). As a general rule, if the concentration of PCBs in the waste is greater than 50 ppm, or if the original PCB source has a concentration greater than 50 ppm, the waste is regulated under TSCA. Refer to the PCB Management SOP (HSE-82) for more information.

6.4 Universal Waste Determination

Universal wastes include batteries, agricultural pesticides, thermostats, and mercury-containing lamps, and are regulated under 40 CFR 273. These wastes are subject to less stringent requirements than RCRA hazardous waste if they are managed in the regulatory specified manner. Refer to the Universal Waste SOP (HSE-83) for these requirements.

6.5 Asbestos

Asbestos is regulated under the Clean Air Act National Emission Standards for Hazardous Air Pollutants (NESHAPs). Waste asbestos or wastes containing asbestos must be removed, packaged, labeled and managed of in accordance with 40 CFR 61, Subpart M. Refer to the Asbestos SOP (HSE-42).

6.6 UXO/OEW

Unexploded ordnance/ordnance explosive waste (UXO/OEW) is regulated under RCRA. See the UXO/OEW SOP (HSE-91) for more information.

6.7 Radioactive Waste

If radioactive wastes will potentially be generated at a client site, contact the CH2M HILL Radioactive Waste Expert, Dave McCormack/SEA.

7.0 Waste Sampling and Analysis

This section identifies the requirements for sampling and analysis for wastes generated on U.S. projects. The following should be considered for sampling and analysis activities:

- Avoid resampling by evaluating regulatory and treatment, storage, or disposal facility (TSDF) requirements during project planning
- Ensure that test method detection levels meet regulatory limits
- Supplement laboratory testing with field test kits
- Use total constituent data where possible instead of TCLP to reduce costs
- Develop a sampling and analysis plan for the collection of representative samples

7.1 Identifying Analytical Test Methods

Potential analyses include:

- Totals
- TCLP
- Paint filter test
- Ignitability
- Corrosivity
- Reactivity
- PCBs

7.1.1 Waste Nature and Quantity

Under RCRA Land Disposal Restrictions (LDRs), underlying hazardous constituents must also be identified in a hazardous waste. Underlying hazardous constituents must also be treated to meet LDRs prior to land disposal. Therefore, any inquiries into the nature of the waste should identify underlying constituents that may not cause the waste to be hazardous. Also evaluate the waste to determine if listed hazardous waste is "contained-in" environmental media or debris (See Section 6.1.4). This determination can greatly effect the volume of hazardous waste generated.

7.1.2 Legal Requirements

RCRA requires that samples be representative of the waste stream. Representative sampling is easily accomplished in homogenous waste streams such as no-phase liquids. However, determining representative samples in a heterogeneous waste stream such as contaminated soil is more difficult. The following are EPA resources for determining representative sampling:

- Samplers and Sampling Procedures for Hazardous Waste Streams. 1980. U.S. EPA, Municipal Environmental Research Laboratory, Cincinnati, Ohio 45268, EPA-600/2-80-018. 70 pp. Publication is free. Order by calling EPA, Cincinnati Environmental Research Information Center (513) 569-7562.
- Sampling and Sampling Plans. Test Methods for Evaluating Solid Waste, Volume II: Field Manual, Physical/Chemical Methods, 3rd Edition, SW-846, Part III, Chapter 9, pp. 9-1 to 9-79. November 1986. EPA, Office of Solid Waste and Emergency Response, Washington, D.C. 20460.
- Characterization of Hazardous Waste Sites—A Methods Manual: Volume II. Available Sampling Methods, 2nd Edition. December 1984. EPA, Environmental Monitoring Systems Laboratory, Las Vegas, Nevada 89114, EPA 600/4-84-076.
- Characterizing Heterogeneous Wastes: Methods and Recommendations. February 1992. EPA, Office of Research and Development, Washington, D.C. 20460, EPA/600/R-92/033.

Commercial laboratories should be used for waste analyses. Field test kits may be used to minimize the cost of screening waste streams in the field. However, these *test kits should not be used as a sole source for hazardous waste determination*.

In some cases, total concentration analysis may be used to characterize a waste stream for the toxicity characteristic (D004-43) instead of running TCLP analysis. To use totals analysis, the waste must be entirely solid, or must contain less than 0.5 percent liquid. For ***solids*** with no liquid fraction, the TCLP leaches 100 grams of sample with 2,000 grams of leaching solution, providing a maximum of 20 times dilution of constituents in the sample. Therefore the conservative "20-Times" rule is to compare total constituent results to the TCLP regulatory limit times 20 to determine if the waste is hazardous. If less than 20x, the waste is below the regulatory limit, if above 20x, you must assume it is a hazardous waste for that constituent, or perform TCLP to make a final determination. For ***liquid*** wastes which have less than 0.5 percent solids, compare the results directly to the TC regulatory limit, with no multiplier. Note that for both liquids and solids, total constituent data can be more conservative than TCLP, especially for metals.

7.1.3 Detection Limits

Consult with the laboratory to identify the detection limits of the proposed test methods and compare them to the corresponding regulatory level, such as the TCLP limit. Although most detection limits will meet TCLP levels, some test methods cannot meet some regulatory levels, such as PCB concentrations in drinking water.

7.1.4 Disposal Facility Requirements

All facilities require waste characterization whether it be by analyses such as Toxicity Characteristic Leaching Procedure (TCLP) or by generator knowledge. Some facilities will also require additional analyses, such as total organic carbon (TOC) or chemical oxygen demand (COD), while others require testing only to meet certain permit requirements or no testing at all. Contact the proposed treatment/disposal facilities to determine their specific requirements.

Attachment A-1

HAZARDOUS WASTE POLICY for U.S. PROJECTS

Revision 2.0, January 1996

INTRODUCTION

This document presents the CH2M HILL policy for pursuing and performing projects involving hazardous and toxic wastes, and is effective on the date of issue. It applies to all projects involving the management or remediation of hazardous wastes or toxic substances that are governed by U.S. federal and state laws or regulations. This policy replaces the CH2M HILL, INC. policy issued in May 1993, and presents the prescribed process to follow for screening project opportunities involving hazardous or toxic materials. ***This policy is applicable to all project opportunities pursued or performed in all business groups.***

Properly done, hazardous and toxic waste work is challenging, profitable business and represents an investment in our firm's future success. Because this work can involve higher risks and exposures than most of our other work, we must use great care in marketing our services, screening potential projects, negotiating our contracts, and performing our work. We should accept only project work for which we are qualified and for which we have qualified and available people. We should not accept work for which the risks are too great. Most importantly, we must make sure that the health and safety of our employees is not compromised.

This policy represents a significant departure from its earlier versions. It reflects the competitive forces we encounter in the marketplace on a daily basis, and also considers the current legal and practice environment in which we pursue and perform project work involving hazardous and toxic materials. This hazardous waste policy makes the assignment of stewardship and the decision-making process for projects pursuit, except where special approval is required, similar to the decision-making process for pursuing other types of projects.

The policy requires careful screening of all opportunities involving hazardous or toxic materials. The screening process triggers one of several formal bid/no-bid or go/no-go assessments and assigns stewardship depending on the issues identified in the evaluation of the specific project opportunity.

PROJECTS REQUIRING SPECIAL APPROVAL

As a matter of policy, the following types of projects may not be undertaken without special approval as described below:

- **Hazardous Waste Generator or Transporter.** We will not accept projects or conduct tasks that will cause us to be classified as a generator or transporter of hazardous wastes. For example, we will not sign hazardous waste manifests.
- **Environmental Impairment Liability (EIL) Insurance Investigations.** We will not accept projects involving EIL investigations or assessments.
- **Standard Setting.** We will not accept projects that require us to certify, or to express an opinion regarding "safe" levels of contamination; i.e., we will not become "standard setters."

- **Asbestos Remediation Work.** We will not accept projects involving "stand-alone" asbestos remediation. We can accept assignments involving asbestos remediation that is performed by qualified subcontractors.

Special approval may be obtained from a team comprising the following people:

- A lawyer from the Legal & Insurance Department.
- The Regional Manager from the affected region.
- The Project Delivery Director or Director of Operations from the appropriate business group.
- If the project opportunity is from a multi-regional client, then the Operations Manager from the appropriate business group will be added to the special approval team.

If you have questions, or you need additional information, contact Dan Smith in the Legal & Insurance Department/COR ext. 2452, David Miller/COR ext. 2411, or Bill Dehn/FGL/COR ext. 2315.

Attachment 7

Incident Reporting Forms

- **Incident Report Form**
- **Near Loss Investigation Form**
- **Root Cause Analysis Form**

Incident Report Form

Fax completed form to:
425.462.5957
CH2M HILL Seattle Office
Attention: Corporate HS&E Department

Type of Incident (Select at least one)

☐ Injury/Illness ☐ Property Damage ☐ Spill/Release
☐ Environmental/Permit Issue ☐ Near Miss ☐ Other

General Information (Complete for all incident types)

Preparer's Name: _____ Preparer's Employee Number: _____
Date of Report: _____ Date of Incident: _____ Time of Incident: _____ am/pm

Type of Activity (Provide activity being performed that resulted in the incident)

☐ Asbestos Work
☐ Confined Space Entry
☐ Construction Mgmt- Haz Waste
☐ Construction Mgmt - Non-Haz Waste
☐ Demolition
☐ Drilling-Haz Waste
☐ Drilling-Non Haz Waste
☐ Drum Handling
☐ Electrical Work
☐ Excavation Trench-Haz Waste
☐ Excavation Trench-Non Haz
☐ Facility Walk Through
☐ General Office Work
☐ Keyboard Work
☐ Laboratory
☐ Lead Abatement
☐ Motor Vehicle Operation
☐ Moving Heavy Object
☐ Other (Specify) _____
☐ Process Safety Management
☐ Tunneling
☐ Welding
☐ Wetlands Survey
☐ Working from Heights
☐ Working in Roadways
☐ WWTP Operation

Location of Incident (Select one)

☐ Company Premises (CH2M HILL Office: _____)
☐ Field (Project #: _____ Project/Site Name: _____ Client: _____)
☐ In Transit (Traveling from: _____ Traveling to: _____)
☐ At Home

Geographic Location of Incident (Select region where the incident occurred)

☐ Northeast ☐ Southwest ☐ Asia Pacific
☐ Southeast ☐ Corporate ☐ Europe Middle East
☐ Northwest ☐ Canadian ☐ Latin America

If a CH2M HILL subcontractor was involved in the incident, provide their company name and phone number: _____

Describe the Incident (Provide a brief description of the incident): _____

_____

Injured Employee Data (Complete for Injury/Illness incidents only)

If CH2M HILL employee injured

Employee Name: _____ Employee Number: _____

If CH2M HILL Subcontractor employee injured

Employee Name: _____ Company: _____

Injury Type

- ☐ Allergic Reaction
- ☐ Amputation
- ☐ Asphyxia
- ☐ Bruise/Contusion/Abrasion
- ☐ Burn (Chemical)
- ☐ Burn/Scald (Heat)
- ☐ Cancer
- ☐ Carpal Tunnel
- ☐ Concussion
- ☐ Cut/Laceration
- ☐ Dermatitis
- ☐ Dislocation
- ☐ Electric Shock
- ☐ Foreign Body in eye
- ☐ Fracture
- ☐ Freezing/Frost Bite
- ☐ Headache
- ☐ Hearing Loss
- ☐ Heat Exhaustion
- ☐ Hernia
- ☐ Infection
- ☐ Irritation to eye
- ☐ Ligament Damage
- ☐ Multiple (Specify)

  _____
- ☐ Muscle Spasms
- ☐ Other (Specify)

  _____
- ☐ Poisoning (Systemic)
- ☐ Puncture
- ☐ Radiation Effects
- ☐ Strain/Sprain
- ☐ Tendonitits
- ☐ Wrist Pain

Part of Body Injured

- ☐ Abdomen
- ☐ Ankle(s)
- ☐ Arms (Multiple)
- ☐ Back
- ☐ Blood
- ☐ Body System
- ☐ Buttocks
- ☐ Chest/Ribs
- ☐ Ear(s)
- ☐ Elbow(s)
- ☐ Eye(s)
- ☐ Face
- ☐ Finger(s)
- ☐ Foot/Feet
- ☐ Hand(s)
- ☐ Head
- ☐ Hip(s)
- ☐ Kidney
- ☐ Knee(s)
- ☐ Leg(s)
- ☐ Liver
- ☐ Lower (arms)
- ☐ Lower (legs)
- ☐ Lung
- ☐ Mind

- ☐ Multiple (Specify)

  _____
- ☐ Neck
- ☐ Nervous System
- ☐ Nose
- ☐ Other (Specify)

  _____
- ☐ Reproductive System
- ☐ Shoulder(s)
- ☐ Throat
- ☐ Toe(s)
- ☐ Upper Arm(s)
- ☐ Upper Leg(s)
- ☐ Wrist(s)

Nature of Injury

- ☐ Absorption
- ☐ Bite/Sting/Scratch
- ☐ Cardio-Vascular/Respiratory System Failure
- ☐ Caught In or Between
- ☐ Fall (From Elevation)
- ☐ Fall (Same Level)
- ☐ Ingestion
- ☐ Inhalation
- ☐ Lifting
- ☐ Mental Stress
- ☐ Motor Vehicle Accident
- ☐ Multiple (Specify)

  _____
- ☐ Other (Specify)

  _____
- ☐ Overexertion
- ☐ Repeated Motion/Pressure
- ☐ Rubbed/Abraded
- ☐ Shock
- ☐ Struck Against
- ☐ Struck By
- ☐ Work Place Violence

Initial Diagnosis/Treatment Date: _____

Type of Treatment

- ☐ Admission to hospital/medical facility
- ☐ Application of bandages
- ☐ Cold/Heat Compression/Multiple Treatment
- ☐ Cold/Heat Compression/One Treatment
- ☐ First Degree Burn Treatment
- ☐ Heat Therapy/Multiple treatment
- ☐ Multiple (Specify)

  _____
- ☐ Heat Therapy/One Treatment
- ☐ Non-Prescriptive medicine
- ☐ None
- ☐ Observation
- ☐ Other (Specify)

  _____
- ☐ Prescription- Multiple dose
- ☐ Prescription- Single dose
- ☐ Removal of foreign bodies
- ☐ Skin Removal
- ☐ Soaking therapy- Multiple Treatment
- ☐ Soaking Therapy- One Treatment
- ☐ Stitches/Sutures
- ☐ Tetanus
- ☐ Treatment for infection
- ☐ Treatment of 2nd /3rd degree burns
- ☐ Use of Antiseptics – multiple treatment
- ☐ Use of Antiseptics – single treatment
- ☐ Whirlpool bath therapy/multiple treatment
- ☐ Whirlpool therapy/single treatment
- ☐ X-rays negative
- ☐ X-rays positive/treatment of fracture

Number of days doctor required employee to be off work: _____
Number of days doctor restricted employee's work activity: _____
Equipment Malfunction : Yes ☐ No ☐ Activity was a Routine Task: Yes ☐ No ☐
Describe how you may have prevented this injury: _____
_____

Physician Information
Name: _____
Address: _____
City: _____
Zip Code: _____
Phone: _____

Hospital Information
Name: _____
Address: _____
City: _____
Zip Code: _____
Phone: _____

Property Damage (Complete for Property Damage incidents only)

Property Damaged: _____ Property Owner: _____
Damage Description: _____
Estimated Amount: $ _____

Spill or Release (Complete for Spill/Release incidents only)

Substance (attach MSDS): _____ Estimated Quantity: _____
Facility Name, Address, Phone No.: _____
Did the spill/release move off the property where work was performed?: _____
Spill/Release From: _____ Spill/Release To: _____

Environmental/Permit Issue (Complete for Environmental/Permit Issue incidents only)

Describe Environmental or Permit Issue: _____
Permit Type: _____
Permitted Level or Criteria (e.g., discharge limit): _____
Permit Name and Number (e.g., NPDES No. ST1234): _____
Substance and Estimated Quantity: _____
Duration of Permit Exceedence: _____

Verbal Notification (Complete for all incident types)(Provide names, dates and times)

CH2M HILL Personnel Notified: _____
Client Notified: _____

Witnesses (Complete for all incident types)

Witness Information (First Witness)
Name: _____
Employee Number (CH2M HILL):_____
Address: _____
City: _____
Zip Code:_____
Phone: _____

Witness Information (Second Witness)
Name: _____
Employee Number (CH2M HILL: _____
Address: _____
City: _____
Zip Code:_____
Phone :_____

Additional Comments:
_____
_____

NEAR LOSS INVESTIGATION FORM

Employer Information

Company Name: _____

Project Name: _____ Project Number: _____

Project Location: _____

CHIL Project? Yes ☐ No ☐

Task Location: _____

Job Assignment: _____ Business Group: _____

Preparer's Name: _____ Preparer's Employee Number: _____

Near Loss Incident Specific Information

Date of Incident: _____ Time of Incident: _____ a.m./p.m.

Location of incident:
☐Company premises ☐Field ☐In Transit ☐Other:_____

Address where the incident occurred: _____

Equipment Malfunction : Yes ☐ No ☐ Activity was a Routine Task: Yes ☐ No ☐

Describe any property damage: _____

Specific activity the employee was engaged in when the incident occurred:

_____

_____

All equipment, materials, or chemicals the employee was using when the incident occurred:

_____

_____

Describe the specific incident and how it occurred:

_____

_____

_____

_____

Describe how this incident may have been prevented:
_____
_____
_____

Contributing Factors (Describe in detail why incident occurred):
_____
_____
_____

Date employer notified of incident: _____ To whom reported: _____

NEAR LOSS INVESTIGATION FORM

Witness Information (First Witness)

Name: _____
Employee Number (for CH2M HILL employees):_____
Address: _____
City: _____
Zip Code : _____
Phone: _____

Witness Information (Second Witness)

Name: _____
Employee Number (for CH2M HILL employees): _____
Address: _____
City: _____
Zip Code: _____
Phone : _____

Additional information or
comments:_____
_____

Root Cause Analysis Form

Root Cause Analysis (RCA)

1. Lack of skill or knowledge
2. Lack of or inadequate operational procedures or work standards
3. Inadequate communication of expectations regarding procedures or work standards
4. Inadequate tools or equipment
5. Correct way takes more time and/or requires more effort
6. Short cutting standard procedures is positively reinforced or tolerated
7. Person thinks there is no personal benefit to always doing the job according to standards
8. Uncontrollable

RCA #	Solution(s): How to Prevent Loss From Occurring	RC[1]	CF[2]	Corrective Action Lead	Due Date	Completion Date	Date Verified

[1] RC = Root Cause; [2] CF = Contributing Factors (check which applies)

Investigation Team Members

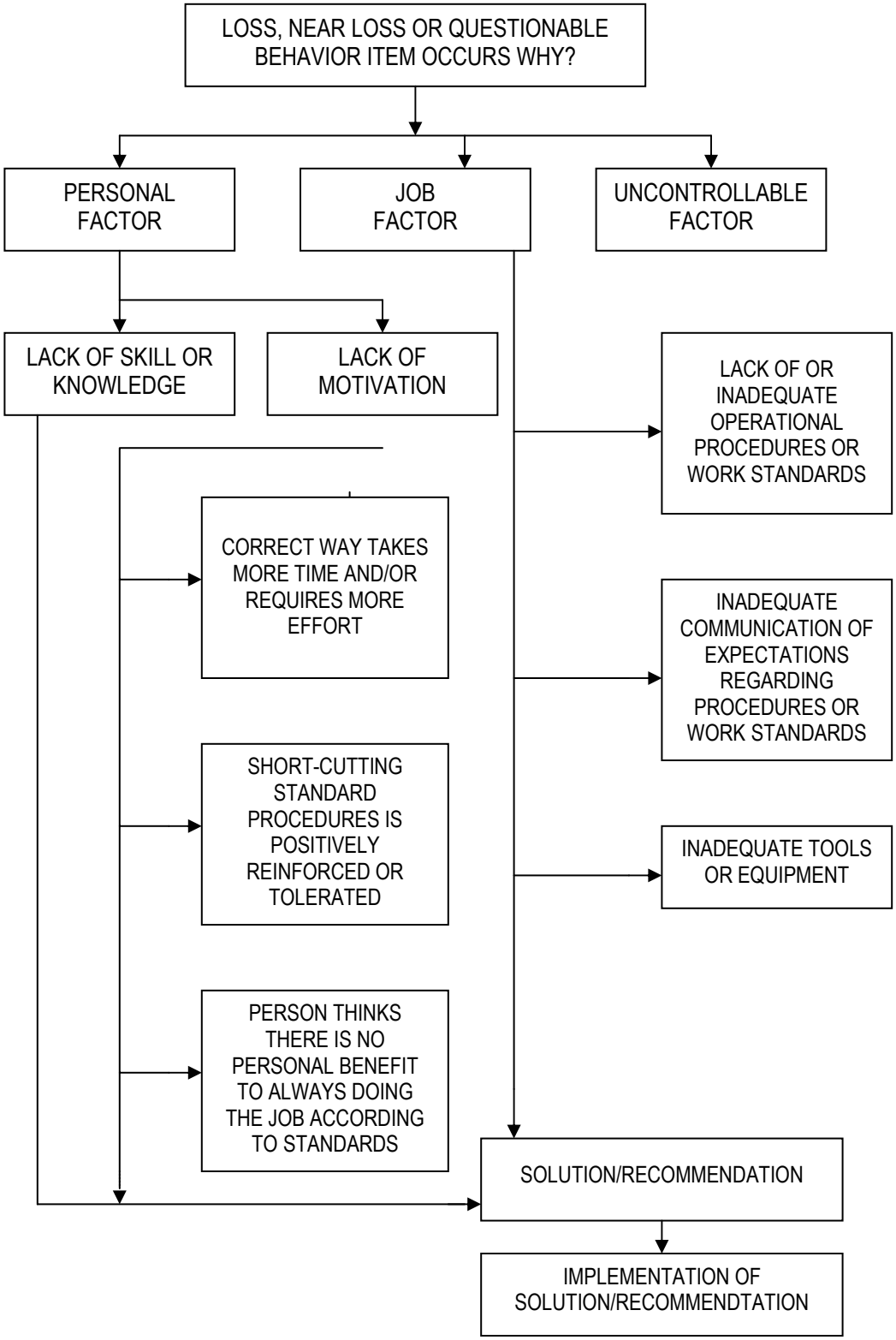
Name	Job Title	Date

Results of Solution Verification and Validation

Reviewed By

Name	Job Title	Date

Root Cause Analysis Flow Chart



Determination of Root Cause(s)

For minor losses or near losses the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, to determine the root cause, and to develop recommendations. More complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This point is especially important when the investigation team will not be able to review the loss scene.

The investigation team must use the Root Cause Analysis Flow Chart to assist in identifying the root cause(s) of a loss. Any loss may have one or more "root causes" and "contributing factors". The "root cause" is the primary or immediate cause of the incident, while a "contributing factor" is a condition or event that contributes to the incident happening, but is not the primary cause of the incident. Root causes and contributing factors that relate to the *person* involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors". Causes that pertain to the *system* within which the loss or injury occurred should be referred to as "job factors".

<u>Personal Factors</u>

- Lack of skill of knowledge
- Correct way takes more time and/or requires more effort
- Short-cutting standard procedures is positively reinforced or tolerated
- Person thinks that there is no personal benefit to always doing the job according to standards

<u>Job Factors</u>

- Lack of or inadequate operational procedures or work standards.
- Inadequate communication of expectations regarding procedures or standards
- Inadequate tools or equipment

The root cause(s) could be any one or a combination of these seven possibilities or some other "uncontrollable factor". In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be used rarely and only after a thorough review eliminates "all" seven other factors.

Attachment 8

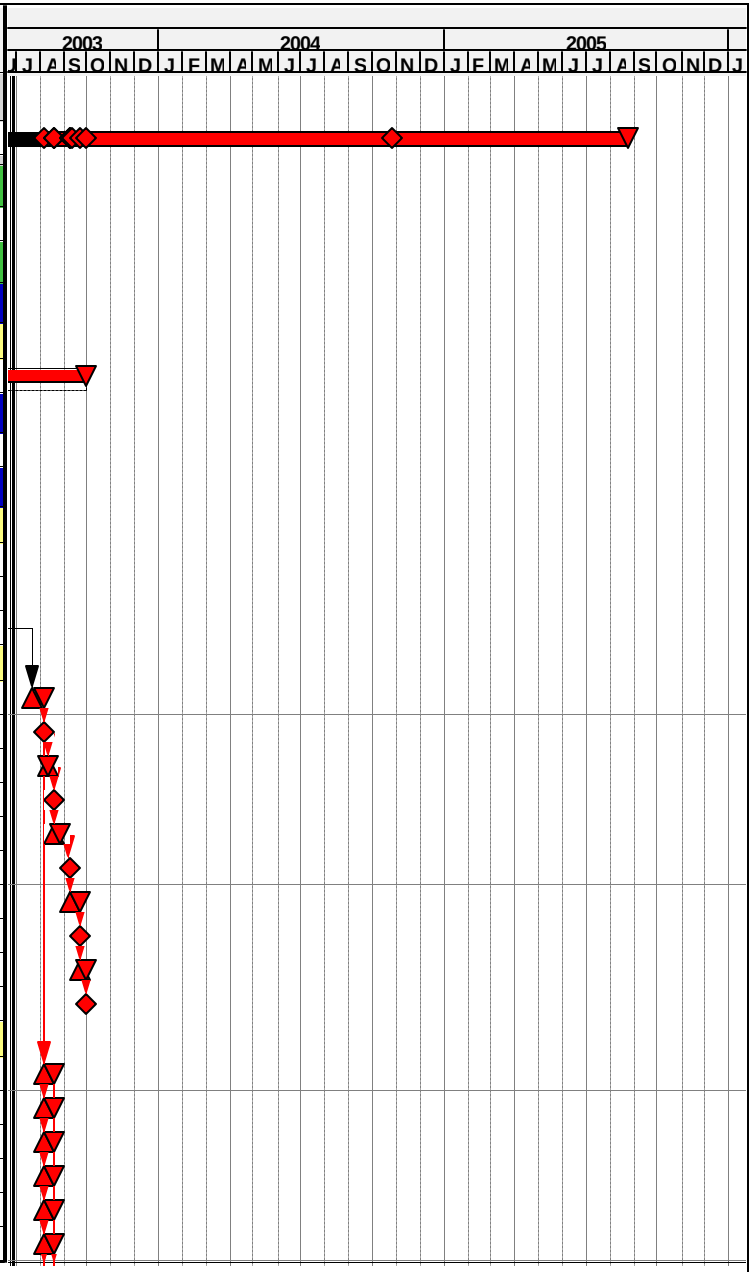
Material Safety Data Sheets

Appendix C

Project Schedule

CTO #0071 - NAS PENSACOLA, FL

Activity ID	WBS CHARGE #	% Comp	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
Subtotal		50		1,047	551	17JUL01A	23AUG05
+ PHASE 1							
		100		17	0	17JUL01A	08AUG01A
PHASE 2							
PROJECT MANAGEMENT							
PROJECT MANAGEMENT							
B820010399	20.01.03.99	69	PROJECT MANAGEMENT	211	65	17JUL01A	29SEP03
+ UST 18 GROUNDWATER MONITORING							
		100		81	0	22JAN02A	14MAY02A
UST SITE 1159							
COST PROPOSAL PREPARATION							
B821010326	21.01.03.26	100	Develop Cost Estimate/Schedule	25	0	20MAR03A	17APR03A
B821010327		100	Submit Cost Proposal to Client	0	0		17APR03A
B82100001		100	Phase 3 Award	0	0		02MAY03A
BID PACKAGE PREP/AWARD							
B821010391	21.01.03.91	0	Prepare Bid Packages	10	10	24JUL03*	06AUG03
B821150		0	Issue RFB to Subcontractors	0	0		06AUG03
B821010392	21.01.03.92	0	Subcontractor Pre-Bid Meeting/Site Visit	2	2	11AUG03	12AUG03
B821165		0	Subcontractor Bids Due	0	0		19AUG03
B821010393	21.01.03.93	0	Evaluate Bid Packages	5	5	20AUG03	26AUG03
B821188		0	Issue Letter of Intent to Award	0	0		08SEP03
B821181		0	Submit Subcontractor Plans & Submittals	10	10	09SEP03	22SEP03
B821180		0	Subcontractor Plans Due	0	0		22SEP03
B821189		0	Review Subcontractor Plans & Submittals	5	5	23SEP03	29SEP03
B821210		0	Award Subcontracts	0	0		29SEP03
WORK PLANS PREPARATION							
B821010301	21.01.03.01	0	Sampling and Analysis Plan	10	10	07AUG03	20AUG03
B821010304	21.01.03.04	0	Environmental Protection Plan	10	10	07AUG03	20AUG03
B821010306	21.01.03.06	0	Pollution Control Plan	10	10	07AUG03	20AUG03
B821010308	21.01.03.08	0	Site - Specific H&S Plan	10	10	07AUG03	20AUG03
B821010313	21.01.03.13	0	General Site Work Plan	10	10	07AUG03	20AUG03
B821010314	21.01.03.14	0	Quality Control Plan	10	10	07AUG03	20AUG03



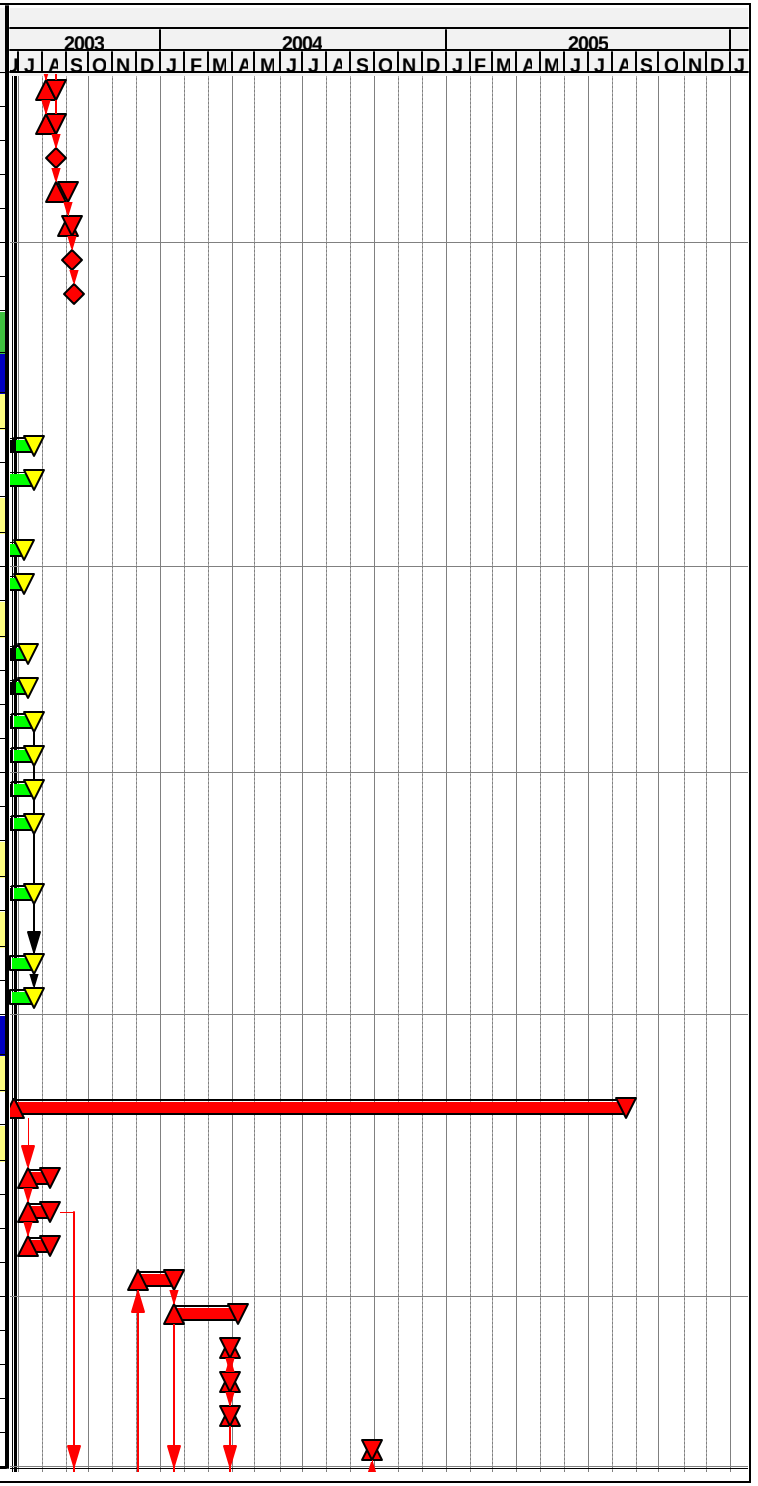
Start Date 22AUG98
Finish Date 23AUG05
Data Date 27JUN03
Run Date 30JUN03 15:37

Early Bar
Progress Bar
Critical Activity

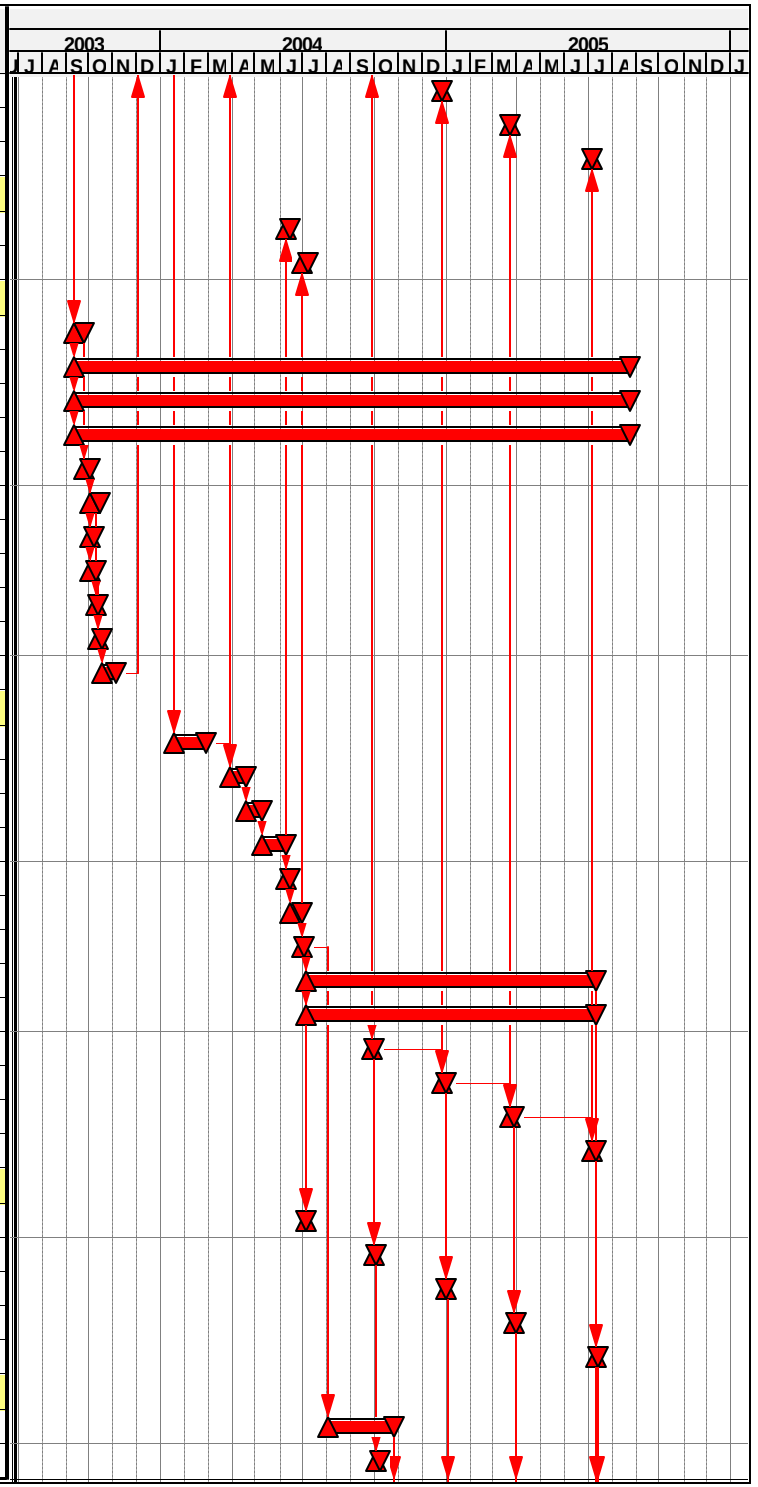
CTO #0071 - NAS Pensacola, FL
CTO COMPLETION SCHEDULE
NAVY RAC SOUTHERN DIVISION

CH2MHILL Constructors, Inc.

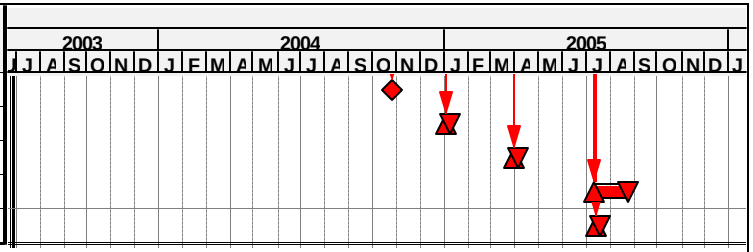
Activity ID	WBS CHARGE #	% Comp	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
B821010315	21.01.03.15	0	Transportation & Disposal Plan	10	10	07AUG03	20AUG03
B821010390	21.01.03.90	0	Hazardous Waste Mgmt Plan	10	10	07AUG03	20AUG03
B821290		0	Submit Draft Work Plans	0	0		20AUG03
B821185		0	Southern Division WP Comment Period	10	10	21AUG03	04SEP03
B821190		0	Incorporate WP Comments	3	3	05SEP03	09SEP03
B821191		0	Submit Final WP to Southern Division	0	0		09SEP03
B82195		0	Work Plan Approval Received	0	0		12SEP03
PHASE 3							
UST 18 GROUNDWATER MONITORING							
PROJECT MANAGEMENT							
B899220101	99.22.01.01	94	PROJECT MANAGEMENT	277	18	31MAY02A	23JUL03
B899220426	99.22.04.26	91	Project QA/QC Audit	252	18	31MAY02A	23JUL03
MOBILIZATION & PREPARATORY WORK							
B831010291	31.01.02.91	92	Mobilization of Sampling Crew	252	8	04JUN02A	09JUL03
B899010291	99.01.02.91	92	CCI Mobilization	252	8	04JUN02A	09JUL03
SAMPLING & ANALYSIS							
B831020502	31.02.05.02	96	QUARTERLY SAMPLING EVENT	252	11	06JUN02A	14JUL03
B831020503	31.02.05.03	96	QUARTERLY SAMPLING EVENT	252	11	06JUN02A	14JUL03
B831020504	31.02.05.04	93	Quarterly Reporting	252	18	17JUL02A	23JUL03
B831020905	31.02.09.05	93	Waste Characterization	252	18	17JUL02A	23JUL03
B831021490	31.02.14.90	93	Independent Data Validation	252	18	17JUL02A	23JUL03
B831021491	31.02.14.91	93	Data Evaluation & Management	252	18	17JUL02A	23JUL03
TRANSPORTATION AND DISPOSAL							
B831192292	31.19.22.92	93	T&D Liquids, Non-Haz Drums	252	18	17JUL02A	23JUL03
DEMOBILIZATION							
B831210591	31.21.05.91	93	Demobilization of Sampling Crew	268	18	07JUN02A	23JUL03
B899210590	99.21.05.90	93	CCI Demobilization	268	18	07JUN02A	23JUL03
SITE 1159							
PROJECT MANAGEMENT							
B898220101	98.22.01.01	0	Project Management	549	549	27JUN03*	19AUG05
MOBILIZATION & PREPARATORY WORK							
B832010391	32.01.03.91	0	POTW Discharge Permit	20	20	16JUL03	12AUG03
B832010394	32.01.03.94	0	ECO Impact/Public Affairs	20	20	16JUL03	12AUG03
B832010396	32.01.03.96	0	Gopher Tortoise Permit	20	20	16JUL03	12AUG03
B832010330	32.01.03.30	0	RA Work Plan/Final RD	30	30	04DEC03	16JAN04
B832010331		0	Navy & Regulatory Review	60	60	19JAN04	09APR04
B832010292	32.01.02.92	0	Subcontractor Mobilization	1	1	29MAR04	29MAR04
B832221209	32.22.12.09	0	Subcontractor's P&P Bond	1	1	29MAR04	29MAR04
B898010291	98.01.02.91	0	CCI Mobilization	1	1	29MAR04	29MAR04
B832010291	32.01.02.91	0	Mobilization of Sampling Crew	1	1	27SEP04	27SEP04



Activity ID	WBS CHARGE #	% Comp	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
B832010293	32.01.02.91	0	Mobilization of Sampling Crew	1	1	27DEC04	27DEC04
B832010294	32.01.02.91	0	Mobilization of Sampling Crew	1	1	24MAR05	24MAR05
B832010295	32.01.02.91	0	Mobilization of Sampling Crew	1	1	07JUL05	07JUL05
ENGINEERING, SURVEY & QC							
B898220426	98.22.04.26	0	Project QA/QC Audit	5	5	09JUN04	15JUN04
B832210606	32.21.06.06	0	As-Built Survey	5	5	30JUN04	06JUL04
MONITORING, SAMPLING, TEST & ANALYSIS							
B832020490	32.02.04.90	0	DPT Well Installation	10	10	11SEP03	24SEP03
B832020905	32.02.09.05	0	Waste Characterization	499	499	11SEP03	23AUG05
B832021490	32.02.14.90	0	Independent Data Validation	499	499	11SEP03	23AUG05
B832021491	32.02.14.91	0	Data Evaluation & Management	499	499	11SEP03	23AUG05
B832020492	32.02.04.92	0	HSA Well Installation	5	5	25SEP03	01OCT03
B832020590	32.02.05.90	0	GW Sampling & Analysis	10	10	02OCT03	15OCT03
B832021106	32.02.11.06	0	Data Collection Tests	3	3	02OCT03	06OCT03
B832029090	32.02.90.90	0	Recovery Well Test	7	7	02OCT03	10OCT03
B832020592	32.02.05.92	0	Aquifer Sampling & Analysis	3	3	09OCT03	13OCT03
B832029092	32.02.90.92	0	Bail Down Test	4	4	13OCT03	16OCT03
B832029094	32.02.90.94	0	Bioslurping Test	12	12	17OCT03	03NOV03
PHYSICAL TREATMENT							
B832139090	32.13.90.90	0	Bioslurping Procurement	30	30	19JAN04	27FEB04
B832139092	32.13.90.92	0	Well Installation	15	15	30MAR04	19APR04
B832139094	32.13.90.94	0	Collection System	15	15	20APR04	10MAY04
B832139096	32.13.90.96	0	Treatment System	20	20	11MAY04	08JUN04
B832139290	32.13.92.90	0	Baseline Sampling	5	5	09JUN04	15JUN04
B832139291	32.13.92.91	0	System Start-Up	10	10	16JUN04	29JUN04
B832139292	32.13.92.92	0	Start-Up Sampling	3	3	30JUN04	02JUL04
B832139295	32.13.92.95	0	System O&M	262	262	05JUL04	12JUL05
B832139296	32.13.92.96	0	System Monitoring	262	262	05JUL04	12JUL05
B832139297	32.13.92.97	0	GW Monitoring	3	3	28SEP04	30SEP04
B832139298	32.13.92.97	0	GW Monitoring	3	3	28DEC04	30DEC04
B832139299	32.13.92.97	0	GW Monitoring	3	3	25MAR05	29MAR05
B832139300	32.13.92.97	0	GW Monitoring	3	3	08JUL05	12JUL05
DEMOBILIZATION							
B898210590	98.21.05.90	0	CCI Demobilization	1	1	05JUL04	05JUL04
B832210591	32.21.05.91	0	Demobe of Sampling Crew	1	1	01OCT04	01OCT04
B832210592	32.21.05.91	0	Demobe of Sampling Crew	1	1	31DEC04	31DEC04
B832210593	32.21.05.91	0	Demobe of Sampling Crew	1	1	30MAR05	30MAR05
B832210594	32.21.05.91	0	Demobe of Sampling Crew	1	1	13JUL05	13JUL05
POST CONSTRUCTION							
B832210605	32.21.06.05	0	Construction Documentation Report	60	60	02AUG04	25OCT04
B832210607	32.21.06.07	0	Quarterly Report	5	5	04OCT04	08OCT04



Activity ID	WBS CHARGE #	% Comp	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
B832210610		0	Submit Construction Documentation Report	0	0		25OCT04
B832210608	32.21.06.07	0	Quarterly Report	5	5	03JAN05	07JAN05
B832210611	32.21.06.07	0	Quarterly Report	5	5	31MAR05	06APR05
B832210609	32.21.06.09	0	O&M Manual	30	30	13JUL05	23AUG05
B832210612	32.21.06.07	0	Quarterly Report	5	5	14JUL05	20JUL05



Appendix D

Submittal Register

Submittal Register

Contract Number: N62467-98-D-0995		CTO No.: 0071			CTO Title: Outlying Landing Field Bronson					Location: Pensacola, FL				Contractor: CH2M HILL Constructors, Inc.		
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Spec Section	Item Description	Para. Number	Approving Authority	Other Reviewers	Submittal Number	Scheduled Submission Date	CCI Review Date	CCI Disposition	CCI Transmit Date	QC Admin Received Date	QC Disposition	QC Admin Transmit Date	Contracting Officer Received	Contracting Officer Disposition	Contracting Officer Return	Remarks
	SD-07 **Schedules**															
	Project Schedule															
	SD-09 **Reports**															
	Analytical Laboratory Reports															
	Soil Sampling															
	Soil Proctor															
	Waste Characterization Sampling															
	Completion Report															
	SD-12 **Field Test Reports**															
	Bioslurper Data Sheets															
	Well Completion Report															
	Well Construction Diagram															
	Water Levels															
	OVA/FID Calibration Records															
	SD-13 **Certificates**															
	Analytical Lab Certification															
	Disposal Facility Permit															
	Transporter Permit															
	Land Surveyor Certification															
	Licensed Well Driller															
	SD-18 **Records**															
	Contaminated Soil Disposal Manifests															
	Contaminated Water Disposal Manifests															
	Certificates of Disposal															
	List of Contractor Personnel															
	Surveyors Notes															

Appendix E

Project QC Manager Resume and Appointment Letter

Phyllis A. Zerangue
Project QC Manager

Ms. Zerangue is QA/QC Manager and task manager for CTOs 071 and 088 for the Navy RAC. As task manager she is responsible for organizing and supervising a variety of tasks which include sampling, drilling, excavation and remediation system installation. She is Property Control Manager and Data Base Manager for AFCEE contracts managed in the Navarre office. Ms. Zerangue coordinates all field work on Eglin AFB, Hurlburt AFB, NAS Pensacola, and any other field work supported by the Navarre, Florida, office. The CH2M HILL Navarre office provides environmental, engineering, construction and management services for Eglin Air Force Base, Hurlburt Air Force Base, NAS Pensacola, and other government and private-sector clients in North West Florida. Environmental work accounts for a significant portion of the Navarre office's business base in the local area providing environmental restoration services.

Ms. Zerangue has experience in groundwater, surface water, soil, sediment and benthic sampling using a variety of techniques and equipment. In the past two years, she gained experience working on construction sites as QA/QC Manager assisting CCI Site Supervisors. Work included site sampling, excavation, remediation and restoration.

Prior to joining CH2M HILL, Ms. Zerangue was an Environmental Specialist with a manufacturer of acrylic fibers. This position included duties as laboratory manager (primary) and industrial permitting and safety management (secondary). The primary functions of the environmental laboratory were to analyze the wastewater and soil for contaminants produced in the production process. As laboratory manager for an industrial wastewater laboratory facility, Ms. Zerangue was responsible for organizing, operating and maintaining laboratory equipment for the environmental laboratory. Training new lab personnel, purchasing, and writing lab procedures were also included in the duties. The lab participated in split sampling with FDEP and other local labs as part of its Quality Assurance/Quality Control (QA/QC) practice. Parameters tested for include the following:

Nutrient Concentrations
Phosphates
Ammonia
Nitrate
Nitrite

Water Quality
pH
conductivity/salinity
turbidity
temperature
dissolved oxygen (DO)

Solids
dissolved
total

Others

Total Organic Carbon (TOC)
Total Inorganic Carbon (TIC)
Chlorides
Oil & Grease
Sulfates
Alkalinity
Cyanide

Dissolved oxygen testing included chemical oxygen demand (COD) and biological oxygen demand (BOD) of lagoon-water used in the biological treatment system.

Ms. Zerangue received training in industrial permitting (RCRA, Title V, and drinking water permitting) and safety management.

Education

B.S., Environmental Science, 1999
University of West Florida, Pensacola, Florida
Graduated Magna Cum Laude

A.A., Natural Resource Conservation
Pensacola Junior College, Pensacola, Florida

Training Courses

2003 – Fire Training
2002/03 - 8 hour refresher
2002/03 - First Aid and CPR
2002 – Hydric Soils and Wetland Delineation Conference
2001 – FDEP workshop, Freshwater Sediment Quality Assessment
2001 – Quality Control Orientation (NRAC)
2001 – Environmental Sampling and Testing (NRAC)
2001 – Environmental Regulations Course, Lion Technology Inc.
2001 – 40 Hour HAZWOPER Certified
2001 – Risk Management and Quality Control
2001 – First Aid and CPR trained, American Red Cross
2000 – ISO 9000
1999 – EPA Safety Training
1999 – Wetland Plant Identification
1999 - Co-writer of an Environmental Impact Study of the Fort Pickens area
1997 – Statistical Analysis

Lab Equipment Experience

Total Organic Carbon Analyzer (TOC)
TOC and TIC
Nitrogen Analyzer
pH Meter
Spectrophotometer

Analytic Balance
Turbidity Meter
Flowcytometer
Gas Chromatograph
Autoclave
Centrifuge
Stirring plates and burners
Dissolved Oxygen Meter (BODs)
Microscopes
*Stero
*compound
Pipettes and Pipettors

Methodology

Winkler titration
Kjeldahl Digestions
Nesslerization

Field Equipment Experience

Organic Vapor Analyzer (OVA)
Water Quality Meter: Horiba U-22 & U-10
Oxygen Meter: YSI
Water Level Indicator
Turbidity Meter (HACH)
Peristaltic & Submersible Pumps
Gas Monitor: GasTech
Global Positioning System (GPS)
Data Logger
Oil/Water Interface Probe
Ponar Dredgr
Sieves and Augers

CH2M HILL
115 Perimeter Center Place, N.E.
Suite 700
Atlanta, GA
30346-1278
Tel 770.604.9095
Fax 770.604.9282

March 29, 2002

Ms. Phyllis Zerangue
CH2M HILL
1766 Sea Lark Lane
Navarre, FL 32566-7472

RE: Contract No. N62467-98-D-0995
Contract Task Order No. 0071
Naval Air Station (NAS) Pensacola – Pensacola, Florida
Project Quality Control Manager Letter of Appointment

Dear Ms. Zerangue:

Herein describes the responsibilities and authority delegated to you in your capacity as the Project QC Manager on the NAS Pensacola site, Contract Task Order (CTO) 0071 under the Navy RAC Contract # N62467-98-D-0995.

In this position, you assist and represent the Program QC Manager in continued implementation and enforcement of the Project QC Plans. Your primary role is to ensure all requirements of the contract are met. Consistent with this responsibility, you will: (i) implement the QC program as described in the Navy RAC contract; (ii) manage the site-specific QC requirements in accordance with the Project QC Plans; (iii) attend the coordination and mutual understanding meeting; (iv) conduct QC meetings; (v) oversee implementation of the three phases of control; (vi) perform submittal review and approval; (vii) ensure testing is performed; (viii) prepare QC certifications and documentation required in the Navy RAC Contract; and, (ix) furnish a Completion Certificate to the Contracting Officer or designated representative, upon completion of work under a contract task order , attesting that "the work has been completed, inspected, and tested, and is in compliance with the contract."

Your responsibilities further include identifying and reporting quality problems, rejecting nonconforming materials, initiating corrective actions, and recommending solutions for nonconforming activities.

You have the authority to control or stop further processing, delivery, or installation activities until satisfactory disposition and implementation of corrective actions are achieved. You have the authority to direct the correction of non-conforming work. All work requiring corrective action will be documented on daily reports, and, in the event non-conforming work is not immediately corrected you are required to submit a non-conformance report to the PM and copy the Program QC Manager. A status log will be kept of all non-conforming work. You shall immediately notify the Program QC Manager in the event of any stop work order.

It is imperative that you comply with all terms of the basic contract. In particular, Section C, Paragraph 6.5.2, which states:

> *"No work or testing may be performed unless the QC Program Manager or Project QC Manager is on the work site."*

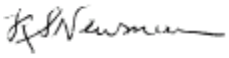
In the event that you are not able to be at the work site when work or testing is to be performed, it is your responsibility to inform the Program QC Manager and Project Manager, in advance, so that other arrangements can be made.

Further, if you are requested to perform the duties of the Site Supervisor, it is your responsibility to inform the Program QC Manager so that approval can be obtained in advance from the Contracting Officer or designated representative, in accordance with Section C Paragraph.6.2.1of the contract.

You are a key member of the Project Manager's team. You ensure that work meets the specific requirements and intent of the work plan, the Navy's scope of work and the basic contract. Should you have any questions regarding this role, you should immediately contact the Program QC Manager, Theresa Rojas. Your day-to-day activities on the site should be coordinated with all site personnel and the Project Manager. In event of any deficient items, the Superintendent and Project Manager should be advised immediately so they have opportunity to remedy the situation.

Sincerely,

CH2M HILL Constructors, Inc.



R. Scott Newman
Program Manager

cc: Greg Wilfley/ATL
Scott Smith/ATL
Theresa Rojas/ATL
CCI Project File No. 166690

Appendix F

Testing Plan and Log

Testing Plan and Log

CH2M HILL Constructors, Inc.

Contract Number: N62467-98-D-0995	CTO No.: 0071	CTO Title: Outlying Landing Field Bronson	Location: Pensacola, FL

A	B	C	D	E	F	G	H	I	J	K
Spec Section and Paragraph	Test Required	Testing Lab	Sampled By	Date Collected	Test Location	Frequency	Date Tested	Date Reported	Results	Remarks
	Field Testing - Site Assessment									
WPA	water levels									
	acquifer pump tests									
	baildown tests									
Analytical - Soil sampling										
SAP	OVA/FID					area				Soil Screening
SAP	soil/drill cuttings					per 6 drums				Waste Characterization
SAP	waste water					per 6 drums				Waste Characterization