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WORK PLAN FOR CONSTRUCTION AND OPERATION AIR SPARGE REMEDIATION SYSTEM OPERABLE UNIT 7 (OU7) SITE 7 MCAS CHERRY POINT NC

1/1/1999

OHM REMEDIATION SERVICES CORP

WORK PLAN
CONSTRUCTION AND OPERATION
AIR SPARGE REMEDIATION SYSTEM
AT OPERABLE UNIT 3, SITE 07
MCAS CHERRY POINT, NORTH CAROLINA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000
Delivery Order 0010

Atlantic Division
Naval Facilities Engineering Command
6500 Hampton Boulevard
Building A (South East Wing) 3rd Floor
Norfolk, VA 23508

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January 1999; Rev. 6/99, 12/99
OHM/IT Project No. 920694

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LIST OF ACRONYMS

2nd FSSG	Second Force Service Support Group
2nd MAW	Second Marine Aircraft Wing
acfm	actual cubic feet per minute
ARARs	Applicable or Relevant and Appropriate Requirements
AS	Air Sparge
BLS	Below Land Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
cfm	Cubic feet per minute
CO_2	Carbon dioxide
COC	Constituent of Concern
DRMO	Defense Reutilization and Marketing Office
EAD	Environmental Affairs Department
ESD	Explanation of Significant Differences
FMF	Fleet Marine Force
FS	Feasibility Study
GC	Gas Chronograph
GW	Ground Water
HI	Hazard Index
HRS	Hazard Ranking System
IAG	Interagency Agreement
IAS	Initial Assessment of Sites
ICR	Incident Cancer Rate
ID	Inside Diameter
LA	Lead Agency
LANTDIV	Navy Atlantic Division
LSI	Listing Site Investigation
MCAS	Marine Corps Air Station
MSL	Mean Sean Level
MW	Monitoring Well
NADEP	Naval Aviation Depot
NEMA	National Electric Manufacturers Association
NPL	National Priorities List
O&M	Operation and Maintenance
O_2	Oxygen
OHM/IT	OHM Remediation Services Corporation (member of the IT Group, Inc.)
OU	Operable Unit
P&ID	Process and Instrumentation Diagrams
PA	Preferred Alternative
PAH	Polynuclear Aromatic Hydrocarbon
PID	Photoionization Detector
POL	Petroleum, Oil, and Lubricants
PP	Proposed Plan
ppb	parts per billion
PRP	Potentially Responsible Party
PVC	Polyvinyl Chloride
QC	Quality Control
RA	Remedial Action
RAR	Remedial Action Report

RA/RD	Remedial Action/Remedial Design
RD	Remedial Design
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facilities Investigation
RI	Remedial Investigation
RI/FS	Remedial Investigation / Feasibility Study
RIIR	Remedial Investigation Interim Report
RMP	Remedial Project Manager
ROD	Record of Decision
ROICC	Resident Officer in Charge of Construction
SA	Support Agency
SARA	Superfund Amendments and Reauthorization Act of 1986
SSI	Screening Site Investigation
SVE	Soil Vapor Extraction
STP	Sewage Treatment Plant
SMOA	Superfund Memorandum of Agreement
SVOC	Semi-Volatile Organic Compounds
TDM	Technical Direction Memorandum
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

This RD/RA work plan presents the OHM Remediation Services Corporation (a member of The IT Group, Inc.) (OHM/IT) approach to implement the scope of work for OU 3, Site 07 under Delivery Order Number 0010, Navy Atlantic Division (LANTDIV), Contract N62470-97-D-5000. Several other plans have been developed for this delivery order and are considered to be a part of this Work Plan. They include:

- Site-Specific Health and Safety Plan
- Sampling and Analysis Plan
- Environmental Protection Plan with Erosion and Sediment Control Plan
- Quality Control Plan

This Work Plan identifies and describes how OHM/IT will implement the major tasks associated with supplying, installing, and operating an enhanced bioremediation to remediate Benzene and 2-methylnapthalene in soils located at OU3, Site 7. Air sparging will be implemented to physically remove Benzene and 2-methylnapthalene while simultaneously promoting the growth of indigenous, contaminate utilizing bacteria.

This RD/RA is specific to soils at Site 7 as part of the overall remedy that is to be applied at Operable Unit 3. Several previous investigations and some ongoing remedial actions are all part of the process for implementing the overall remedial strategy for OU3.

The typical process of which this RD/RA is a part includes the Remedial Investigation (RI), Feasibility Study (FS), Engineering Evaluation Cost Analysis (EE/CA) and Remedial Design (RD), Remedial Action (RA) workplan development applied to a particular environmental site following the CERCLA Process.

In this specific case the site is OU 3 with a focus on Site 7 soils within OU3. Upon completion of the RD/RA a Remedial Action Report (RAR) will be prepared detailing the implementation of this RD/RA through start up. A post RAR document, a Long Term Remedial Action (LTRA) report will be prepared detailing the operations and maintenance over the long term necessary to carry on this remedial action.

Concurrent with this RD/RA workplan for OU3 Site 7 Soils a parallel document specific to groundwater at OU3 is being prepared by another contractor. The separate workplans and

associated elements together in the framework of CERCLA process for remedial action to meet ROD requirements comprise and document the total "Action".

1.1 SITE BACKGROUND

Marine Corps Air Station (MCAS) Cherry Point is part of a military installation in southeastern Craven County, North Carolina, just north of the town of Havelock. The Air Station encompasses approximately 11,485 acres and is situated on a peninsula north of Core and Bogue Sounds and south of the Neuse River. It is bounded on the east by Hancock Creek, on the south by North Carolina Highway 101, on the west by an irregular boundary line approximately three-quarters of a mile west of Slocum Creek, and on the north by the Neuse River. The location of MCAS Cherry Point is shown in Figure 1.

The Air Station was commissioned in 1942 to maintain and support facilities, services, and material of a Marine Aircraft Wing and other activities and units as designated by the Commandant of the Marine Corps. Occupants of the Air Station include the Second Marine Aircraft Wing (2nd MAW), the Naval Aviation Depot (NADEP), the combat Service Support Detachment 21 of the Second Force Service Support Group (2nd FSSG), the Naval Hospital, the Dental Clinic, the Naval Air Maintenance Training Group Detachment, and the Defense Reutilization and Marketing Office (DRMO). The Air Station has facilities for training and support of the Fleet Marine Force (FMF) Atlantic aviation units and is also designated as a primary aviation supply point.

OU 3 consists of two sites (Sites 06 and 07) that were identified in the Initial Assessment of Sites (IAS). These sites were also included in a multi-task Resource Conservation and Recovery Act (RCRA) Section 3008(h) Administrative Order on Consent signed by the Navy and the USEPA in December 1989. MCAS Cherry Point was placed on the National Priorities List (NPL) in December 1994.

A 30-year residential exposure scenario was evaluated for Site 07 by the LANTDIV CLEAN Contractor. The Incident Cancer Rate (ICR) for the adult receptor at Site 07 under this scenario exceeds the USEPA target risk range. The Hazard Index (HI) for both the child and adult receptor also exceeded 1. The cumulative risks to both trespassers and recreational users due to exposure to surface water and sediment were within the USEPA range of "acceptable" risks. The CLEAN Contractor also noted that lead is present in the soil at Site 07 at levels above recommended screening levels (both residential and industrial). The CLEAN Contractor is planning to provide a

program of long-term monitoring designed to monitor plume migration over time and to verify that natural attenuation is occurring at rates sufficient to protect potential down-gradient receptors.

1.2 SITE DESCRIPTION

The nature and extent of contamination at OU 3 have been under investigation since 1984. The investigations at OU 3 were conducted using a phased approach that was based on the availability of funding and the prioritization of sites in terms of potential environmental impacts. The work was conducted under several environmental programs according to regulatory requirements in effect at the time.

The fill material found throughout OU 3 consists of reworked natural material and waste debris. The waste debris consists of black silty fly ash, charred wood, metal fragments, and glass fragments. Site 07 is divided into two portions, the western and the eastern portions. The western portion of Site 07 is the suspected area of fly ash disposal and open burning. The eastern portion, although not used as extensively for fly ash disposal as the western portion, also had fly ash deposited in places. A black fill material was encountered at Site 07 from the ground surface to a depth of 10-feet bgs in soil borings believed to be at the boundary separating the suspected fly ash disposal and open burning area from the remainder of the site. Because soil borings were terminated at the water table, the full vertical extent of fill material is not known at these locations. However, based on other borings at Site 07, up to 15-feet of fill material may be present. Fly ash was also found in some of the soil borings on the eastern portion of the site.

The following reports contain detailed information pertaining to these investigations:

- NUS Corporation, *Remedial Investigation Interim Report (RIIR)*, October 1988
- Halliburton NUS Environmental Corporation, *RCRA Facilities Investigation (RFI) - 21 Units*, June 1993
- Halliburton NUS Corporation, *Technical Direction Memorandum (TDM) - 10 Units*, August 1993
- Brown & Root Environmental, *Remedial Investigation (RI) Report for Operable Unit 3*, December 1996
- Brown & Root Environmental, *Feasibility Study (FS) Report for Operable Unit 3*, December 1996

The only past remediation performed at OU 3 was the closure of the former fly ash ponds within Site 06 in the summer of 1997. Closure involved removal of the lime-alum sludge, stabilization of the remaining material, re-grading the area, and the planting of trees.

The following subsections summarize the cumulative results of the investigation activities conducted at OU 3. The majority of this information has been summarized from the Remedial Investigation (RI), Brown & Root Environmental, December 1996a and the Feasibility Study (FS), Brown & Root Environmental, December 1996b reports.

OU 3 is located in the west central portion of the Air Station on the east bank of Slocum Creek. OU 3 is bounded by the MCAS Cherry Point Sewage Treatment Plant (STP) to the south, Roosevelt Boulevard to the east, Slocum Creek Road to the north, and Slocum Creek to the west. There are two sites within the boundaries of OU 3:

- Site 06 – Fly Ash Ponds
- Site 07 – Old Incinerator and Adjacent Area

These sites have been grouped into one operable unit because of their proximity to each other.

SITE 07

Site 07 was an incinerator and open burning ground that encompassed approximately 5 acres. Site 07 is bounded by the STP to the south, Luke Rowe's Gut to the north, and Slocum Creek to the west. The former incinerator was located adjacent to Luke Rowe's Gut in the eastern portion of the site. The open burning area lies on the southern bank of the confluence of Luke Rowe's Gut and Slocum Creek. From 1949 until 1955, waste petroleum, oil, and lubricants (POL), NADEP wastes, and other wastes such as municipal refuse were burned either in the incinerator or on the ground adjacent to the incinerator. No records were kept as to the types or quantities of waste disposed of at this unit. Fly ash was also disposed of at this site but is mixed with other waste/fill material. The fly ash is believed to have originated from the incinerator. The site is currently vegetated with grass, brush, and trees, with the heaviest vegetation along the stream banks. Aerial photographs of the site indicate the incinerator was not removed from the site until sometime between 1981 and 1984.

Site 07 is divided into two portions, the western portion and the eastern portion. The western portion of Site 07 is the suspected area of fly ash disposal and open burning (as shown in Figure 2).

The eastern portion, although not used as extensively for fly ash disposal as the western portion, also had fly ash deposited in places.

Brown and Root presented calculations to the State of North Carolina in December 1996 showing required soil concentrations to be protective of the groundwater. Several soil samples contained contaminants above the concentrations calculated for the protection of groundwater. Each soil contaminant exceedence was then compared to exceedences in the groundwater in order to determine if the area had a secondary source of contamination. In 1996 discussions with the State of North Carolina, it was determined that the only constituents of concern (COCs) in soil that were potential secondary sources for groundwater were benzene and 2-metylnaphthalene in the area in the vicinity of sample locations OU3SB02, OU3SB06, and OU3SB10.

Calculations were made to determine soil concentrations that would be protective of the groundwater. These calculations were made for all contaminants detected in the groundwater at levels above State groundwater standards. In addition, soil concentrations were calculated for ethyl benzene and xylenes. These calculations were conducted using the ECTran model that was used in the FS to calculate soil concentrations protective of surface water.

The soil concentrations calculated to be protective of the groundwater were compared to the concentrations detected in the soil at site 7. Several soil samples contained contaminants above the concentrations calculated for the protection of groundwater. In discussions with the State of North Carolina, it was determined that the area in the vicinity of sample locations OU3SB02, OU3SB06 and OU3SB10 would be the area of soil contamination that would have to be addressed as secondary source of groundwater contamination. This area was selected because of the presence of contaminants above the concentrations calculated to be protective of groundwater (benzene – 15ug/kg, 2-methylnaphthalene – 8,570 ug/kg) [at the time of the Feasibility Study (FS)] and it is in an area of groundwater containing those contaminants above the State's groundwater standards. This area measures approximately 200 feet by 70 feet and extends 4 feet below the ground surface.

This area was selected because of the presence of contaminants above the concentrations calculated to be protective of groundwater (benzene 5.6 ug/kg; 2- methylnapthalene – 4,900 ug/kg) and it is in the area of groundwater containing those contaminants above the groundwater standards. This area measures approximately 200 feet by 70 feet and the vadose zone extends an average of 4 feet below the ground surface.

Based on Brown and Root's Figure 1, from the December 1996 Remedial Investigation Plan, sample locations OU3SB02, OU3SB06, and OU3SB10 are found directly east of Monitoring Well OU3-MW03 and Aquifer Monitoring Well OU3-7GW02. The east/west centerline of the Site 07 Hot Spot extends between Monitoring Well OU3-MW03 and Aquifer Monitoring Well OU3-7GW02. The western edge of the Hot Spot starts approximately 80 feet directly east from Monitoring Well OU3-MW03. The eastern edge of the Hot Spot ends approximately 280 feet directly east from Monitoring Well OU3-MW03. The Hot Spot extends 70 feet in the north/south direction (35 feet on each side of the centerline). Figure 2 shows the layout of the Hot Spot area in relation to Monitoring Well OU3-MW03 and Aquifer Monitoring Well OU3-7GW02. Figure 3 presents the air sparge well layout. The exact locations of the wells will be field determined by the on-site hydrogeologist at the time of installation.

1.3 SITE CONDITIONS AND REMEDY SELECTION

1.3.1 Site Conditions

The ground surface elevation at Site 07 varies from about 20 feet MSL in the south central and southeastern portions to about 1.5 feet MSL at Slocum Creek. The ground surface slopes gradually to the north toward Luke Rowe's Gut.

OU 3 is bounded on the west by Slocum Creek, which flows north past the site. Slocum Creek is a tidal, shallow, warm, and brackish creek that is classified by the state as a SC tidal saltwater. Class SC waters are suitable for aquatic life propagation and maintenance of biological integrity, wildlife, secondary recreation, and any other usage except primary recreation and shellfishing for marketing purposes. Luke Rowe's Gut, a small perennial freshwater stream, flows west between Sites 06 and 07 into Slocum Creek. The state surface water classification for Luke Rowe's Gut is Class C freshwater. Class C waters are considered suitable for aquatic life propagation, and maintenance of biological integrity, wildlife, secondary recreation, and any other usage except primary recreation or a source of water supply for drinking, culinary, or food processing purposes.

The soils at the site are generally poorly drained and acidic. They are subject to ponding and seasonal high water tables. Low-lying areas along the streams are also subject to flooding. The site is currently vegetated with grass, brush, and trees with the heaviest vegetation along the stream banks.

Water elevations are presented in the sample log sheets that can be found in the Remedial Investigation, Appendix C.3, dated December 1996. The water elevations range from 2 feet to 6 feet below ground surface near the Site 07 Hot Spot area to accommodate a changing water table; the air sparge wells will be placed 15 feet below the ground surface. The bottom three feet of the well would be screened and a five foot well pack up from the bottom would provide adequate distribution dispersion, and influence of sparge air into the formation.

Maximum contaminant levels for soil at Site 07 (as presented in the Feasibility study) are:

Table 1.1: Summary of Maximum Contamination Levels

Media	*Contaminants*	*Site Conditions (maximum concentrations)*
Soil	Benzene	6,600 ug/kg
Soil	Methylene chloride	7,500 ug/kg
Soil	Ethylbenzene	61,000 ug/kg
Soil	Xylenes	63,000 ug/kg
Soil	2-Methylnapthalene	77,000 ug/kg
Soil	Di-n-butylphthalate	620 ug/kg
Soil	Naphthalene	38,000 ug/kg
Soil	Phenanthrene	3,800 ug/kg

OHM/IT's goal is to address the benzene and 2-methylnapthalene in both soil and groundwater.

1.3.2 Remedy Selection

The Proposed Remedial Action Plan (PRAP) for Operable Unit 3 was released for public comment on August 1, 1996. The PRAP identified Alternative 2, Institutional Controls at Site 6, and Site 7, as the preferred alternative for remediation. The Navy reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that one significant change to the remedy as originally identified in the PRAP was necessary.

The significant change proposed here for the selected remedy is based on comments received from the State of North Carolina during the public comment period. Natural attenuation of the groundwater was an inherent component of Alternative 2. The State of North Carolina noted during the public comment period that in order for natural attenuation of groundwater to be an acceptable option, secondary sources of groundwater contamination (contaminated soil) would be required to be treated, disposed of, or controlled (as required in State regulations).

Furthermore, Section 3 describes in detail the design basis process, the design objectives, and the selection of the best available technology. Upon review by the Cherry Point Partnering Team, the shallow water table was agreed to be negative cause for use of SVE.

Soil vapor extraction (SVE) was selected by Brown and Root Environmental as the best available technology to remediate petroleum-based hydrocarbons from the soil at this site. The introduction of a vacuum delivered to the subsurface will volatilize hydrocarbons from the soil. As a secondary benefit, increasing the oxygen content within the soil by vacuuming in fresh atmospheric air will also promote natural degradation of hydrocarbons by means of in-situ bioremediation.

However, because the water table is so close to the surface, OHM/IT believes the influence of SVE would be limited without large numbers of shallow wells. Further, seasonal groundwater fluctuations can be expected over a range of 2 to 6 feet below ground surface. SVE wells installed (screened) below 2 feet would be useless during a portion of the year or would be a source of large amounts of free water drawn into the system. Under these site conditions, SVE would be limited in effectiveness. Although the performance of SVE and SVE/Sparging Systems are already well demonstrated at a number of sites at MCAS Cherry Point, the groundwater at those locations is deeper. There are two issues to be addressed at the OU3, Site 7. There are traces of benzene and 2-methylnapthalene in groundwater and the presence of the same compounds in soils at concentrations, which could remain a source for groundwater. Thus the remedy must address both soil and groundwater. Both benzene and 2-methylnapthalene are compounds favorable to aerobic biological degradation. An alternative approach would be bioventing, which involves introducing air, or oxygen into the vadose zone at relatively low flow rates (5 to 10 cfm per well) as compared to the high flows typical of an SVE system (75 to 100 cfm per well). The low flow rate stimulates biological activity. Unfortunately, bioventing limited just in the vadose zone at this site would require a large number of wells to achieve the desired degree of influence. Sparging below the water table would produce the same results as bioventing except increasing the effective area of influence of each well because wells could be set deeper down into the saturated zone. Since there is no free product on the water table that could be dispersed into the vadose zone sparging would be less limited at the site by the shallow water table level and range of seasonal fluctuation.

Sparging would have the added benefit of stripping these COCs from groundwater. Air emissions would be diffused and dispersed throughout the entire zone and thus no point source of emissions would result. Also, because the airflows are low, biological degradation of volatile pollutants will occur in the vadose zone before contaminants reach the surface potentially impacting air quality.

Thus due to site specific limitations and extensive experience at MCAS Cherry Point, OHM/IT is proposing that an air sparging system be installed rather than the SVE system as originally proposed by Brown and Root. In summary, the major advantages of OHM/IT's proposed approach is:

OHM/IT has proposed the installation of Air Sparge (AS).

1) A greater radius of influence can be achieved for each well because the wells can be installed deeper without concern about seasonal fluctuations in the water table

2) Air sparging will not generate large amounts of purge water when the water table is high

3) Total O&M time for the project is reduced because the AS system can be operated without interruption during high water tables, heavy rain events; and other anticipated site conditions

4) The AS system will also positively influence groundwater cleanup without impacting the vadose zone significantly

5) The cost for installing an AS is only slightly higher (metal pipe must replace PVC and rotameters are required), but the same blower can be used for vacuum or pressure

6) No air abatement will be required

The following pages detail OHM/IT's proposed AS remediation system for the OU 3, Site 07. OHM/IT plans to install a network of thirty-one vertical AS wells to volatilize hydrocarbons.

The 31 wells to be installed will be separated into six header systems. Each header can be operated simultaneously or independently. This remediation project will be served by a blower that will provide pressure for the wells. Refer to Subsection 3.5 for details of the material selection.

1.4 SITE HYDROGEOLOGY

MCAS Cherry Point is underlain by five non-saline aquifers and four confining units to a depth of approximately 500 feet. These aquifers and confining units in order or increasing depth are: the surficial aquifer, the Yorktown confining unit, the Yorktown aquifer, the Pungo River confining unit, the Pungo River aquifer, the Upper Castle Hayne confining unit, the Upper Castle Hayne aquifer, the Lower Castle Hayne confining unit, and the Lower Castle Hayne aquifer.

The surficial aquifer is the uppermost aquifer at OU 3. It is exposed at the ground surface and in streambeds throughout MCAS Cherry Point. The depth to groundwater in the surficial aquifer at

OU 3 ranged from 2 to 10 feet BLS (Brown & Root Environmental, December 1996a). The groundwater in the surficial aquifer flows toward and discharges into either Slocum Creek or Luke Rowe's Gut. The unlined ponds at Site 6 act as a recharge zone for the surficial aquifer. The shallow groundwater flows in a radial pattern away from the ponds toward Slocum Creek and Luke Rowe's Gut. Historical data collected from nearby Site 5 indicate that the shallow groundwater in the area of Slocum Creek Road flows north toward Slocum Creek.

The Yorktown confining unit underlies the surficial aquifer. The Yorktown confining unit is not present in the southern portion of the Air Station. This hydrogeologic unit represents the uppermost sediments of the Yorktown Formation (USGS, 1994). The Yorktown aquifer, which is below the Yorktown confining unit, varied in thickness from 12 to approximately 70 feet with an average thickness of 35 feet. The groundwater in the Yorktown aquifer beneath OU 3 likely flows west and discharges into Slocum Creek.

An upward gradient was noted at the well cluster of 7GW04, OU3MW04, and OU3MW03, indicating that the groundwater in the Yorktown aquifer is recharging the surficial aquifer through the Yorktown confining unit at this area. The groundwater from the Yorktown aquifer is discharging to the creek through the surficial aquifer.

The Pungo River aquifer and confining unit underlie the Yorktown aquifer throughout the area of the Air Station. The Pungo River confining unit overlies the Pungo River aquifer. The unit is inferred to be missing in the southern portion of the Air Station (USGS, 1994).

The upper Castle Hayne aquifer and confining unit underlie the Pungo River aquifer everywhere beneath the Air Station. The upper Castle Hayne confining unit overlies the upper Castle Hayne aquifer. The lower Castle Hayne aquifer and confining unit underlie the upper Castle Hayne aquifer and are present everywhere beneath the Air Station. The lower Castle Hayne confining unit overlies the lower Castle Hayne aquifer. The observed thickness of the confining unit ranges from about 15 to 50 feet. The confining unit is slightly thicker in the northern part of the Air Station (USGS, 1994).

Potable water used at the Air Station and in the adjacent town of Havelock comes from the Castle Hayne aquifers. These unit lie at depths of approximately 195-feet or more BLS, below the Pungo River aquifer and the Castle Hayne confining unit. All groundwater at the Air Station is classified as GA water by the State of North Carolina (existing or potential source of drinking water for humans).

Cross-sections identifying the hydrogeologic units found at the site were provided in the RI (Brown & Root Environmental, December 1996a). Per Brown and Root Environmental sampling events, the OU 3, Site 07 Hot Spot Area has approximately 17 to 20 feet of fill from incineration activities.

1.5 PERFORMANCE STANDARD STRATEGY

In order to obtain analytical data from the soils being treated by the system outlined in this work plan, sampling and analysis is to be conducted on a periodic basis.

The soil samples collected periodically will provide analytical data that will be compared to the performance standards of benzene and 2-methylnapthalene, 5.6 µg/kg and 4,900 µg/kg respectively.

The Sampling and Analysis Plan (SAP) [Appendix B] provides detail pertaining to necessary sampling for construction and initial start up activities. Appendix A Table A-1 in the SAP provides a summary matrix for monitoring sampling of the soils being treated by this system once installed. The monitoring soil sample schedule depicted provides for two post system construction sample events: one after 3 months of operation and a second event after 15 months of operation.

Soil sampling for performance monitoring beyond 15 months of operation is to be described in the Long Term Remedial Action Plan (LTRA). Within the LTRA multiple sampling event results will be described, and the use of the data from multiple events will be used in comparison with the standard to show that the system has or has not achieved the remedial goals. In essence the exit strategy to be defined in the LTRA will summarily show that after multiple soil sampling events depict analytical result concentrations for benzene and 2-methylnapthalene below the performance standards, then the remedial objective has been achieved. At that time in the future, steps of additional sampling for confirmation and QA/QC will be conducted concurrent with programmatic steps to document achievement of standards. Subsequently leading to the approval for and completion of decommissioning of the remedial system.

2.0 PROJECT SCHEDULE

The following schedule depicts the overall schedule for the project. Dates to certain aspects of the overall schedule (Construction Tasks) are not hard assigned. The dates represented in the Site Management Plan (SMP) dated December 1999 by Tetra Tech NUS, INC. which reflect the dates incorporated into the Federal Facilities Agreement (FFA) are hard dates for specific documents and deliverables. Those dates not assigned fall within assigned dates represented in the FFA for Primary Documents associated with the Remedial Action. The following table represents (December 1999) projected finish dates for key milestone tasks associated with this project.

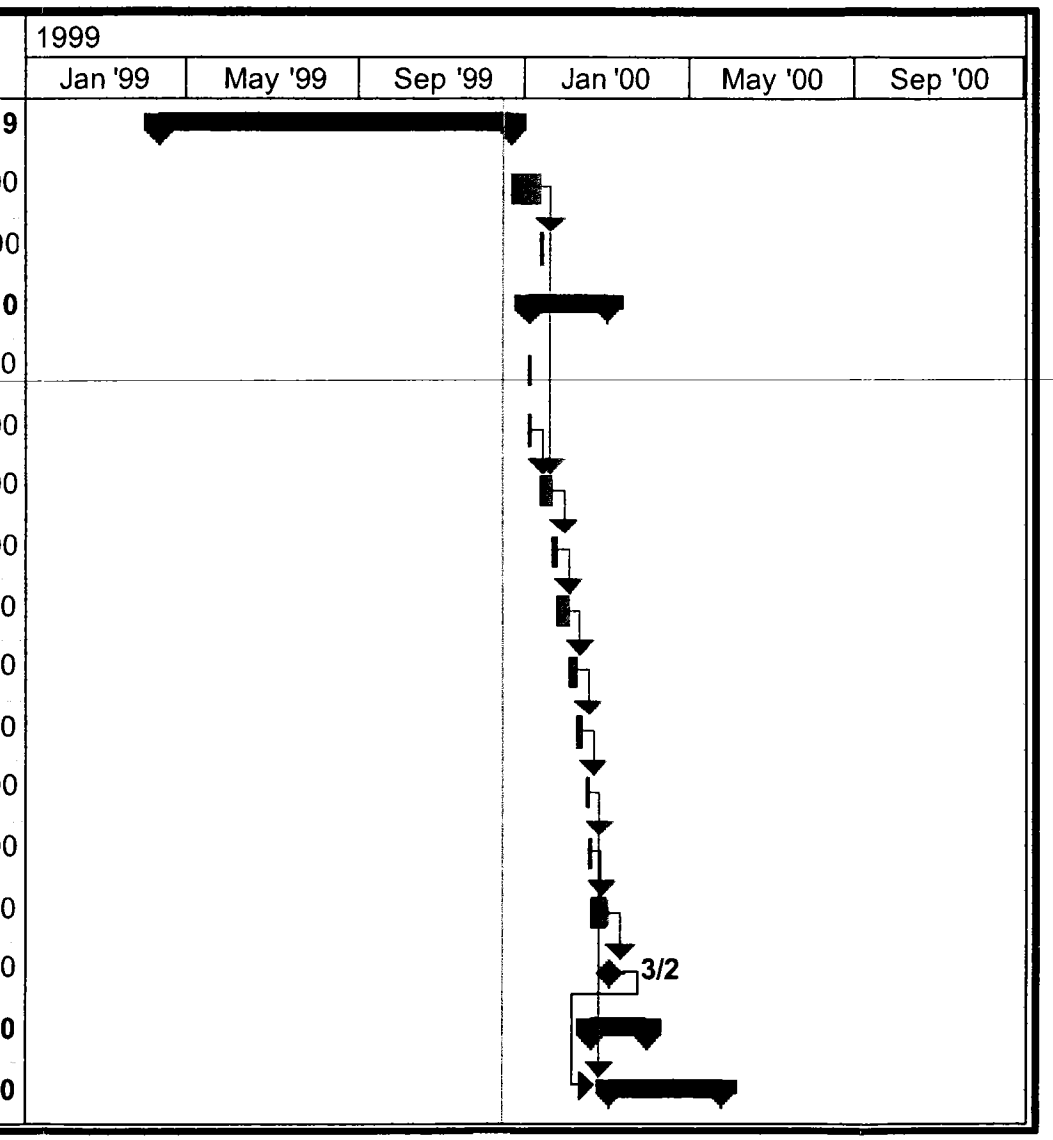
Task Name	Anticipated Start Date	Projected Finish Date	Required FFA Finish Date[1]
RDRA Work Plan OU 3 Site 7 Soils	In Progress	12/21/99	12/14/99[2]
Construction of System	1/4/00	3/2/00	3/7/00
Publication of Draft RAR	2/18/00	3/30/00	5/2/00
Publication of Draft LTRA	3/3/00	5/25/00	5/30/00

[1] As depicted in the Site Management Plan (SMP) schedule published November 1999.

[2] As published in November 1999 SMP Schedule, resolution/ acceptance of response to NCDENR comments were not accepted until 12/14/1999 during partnering meeting.

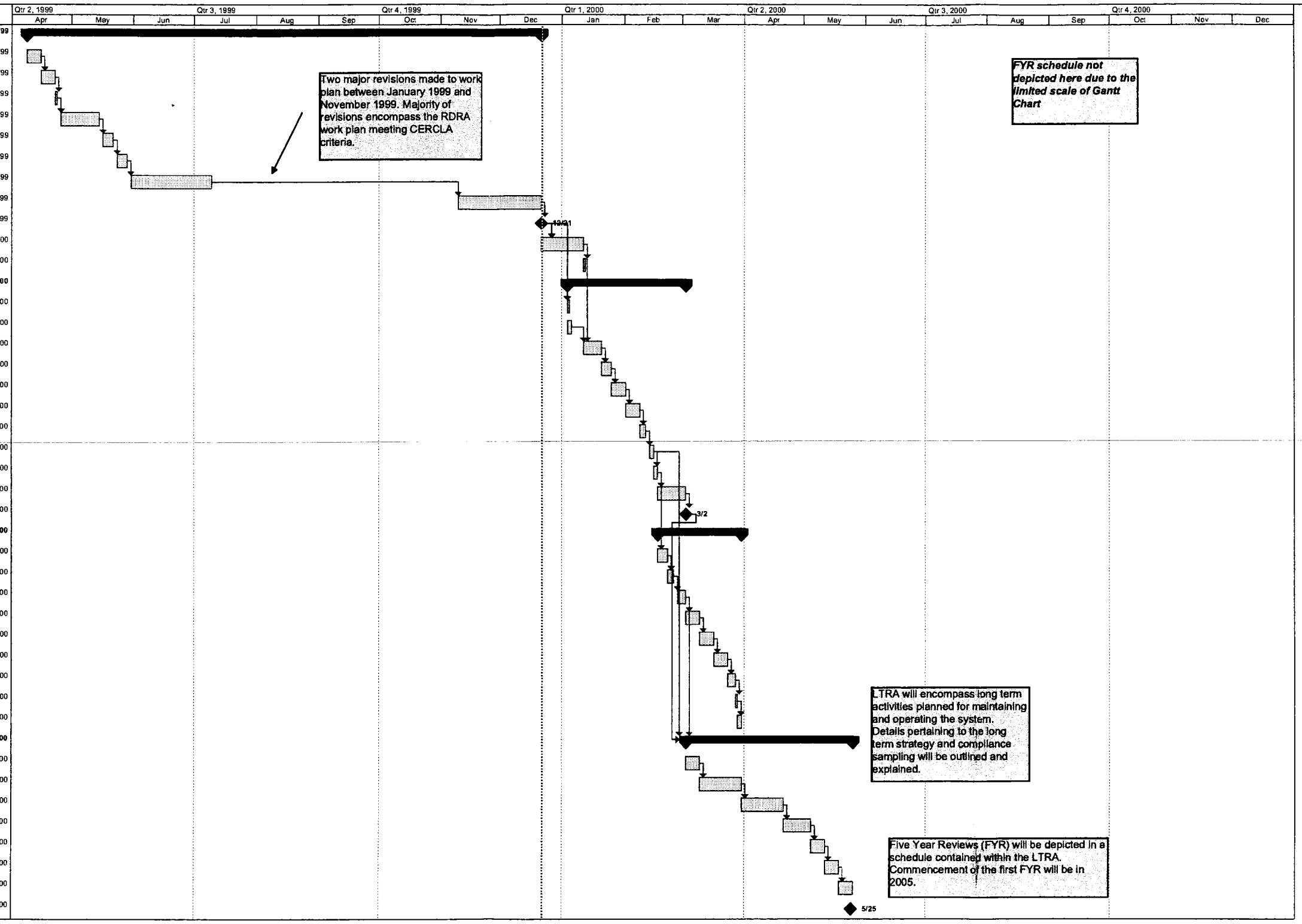
PROJECT SCHEDULE
OU 3 SITE 7 SOILS
CONSTRUCTION –THROUGH COMPLETION OF LTRA

ID	Task Name	Start	Finish
1	**RDRA Workplan OU3 Soils**	**Fri 4/9/99**	**Tue 12/21/99**
11	Initial Procurement	Wed 12/22/99	Tue 1/11/00
12	Procurement Plan	Wed 1/12/00	Wed 1/12/00
13	**PHYSICAL SYSTEM CONSTRUCTION**	**Tue 1/4/00**	**Thu 3/2/00**
14	Preconstruction Meeting	Tue 1/4/00	Tue 1/4/00
15	Project Mobilization	Tue 1/4/00	Wed 1/5/00
16	AS Well Installation	Wed 1/12/00	Thu 1/20/00
17	Presampling soils	Fri 1/21/00	Tue 1/25/00
18	Well Head install	Wed 1/26/00	Tue 2/1/00
19	Electric Install	Wed 2/2/00	Tue 2/8/00
20	AS Distribution piping	Wed 2/9/00	Fri 2/11/00
21	AS system component construction	Mon 2/14/00	Tue 2/15/00
22	Baseline Sampling	Wed 2/16/00	Thu 2/17/00
23	System Start up	Fri 2/18/00	Thu 3/2/00
24	Operations and Maintenance Start	Thu 3/2/00	Thu 3/2/00
25	**Remedial Action Report**	**Fri 2/18/00**	**Thu 3/30/00**
35	**Long Term Remedial Action Plan**	**Fri 3/3/00**	**Thu 5/25/00**



OU3 SITE 7 SOILS
WORK PLAN-CONSTRUCTION-RA
IMPLEMENTATION SCHEDULE

ID	Task Name	Start	Finish
1	**RDRA Workplan OU3 Soils**	**Fri 4/9/99**	**Tue 12/21/99**
2	Introduction	Fri 4/9/99	Thu 4/15/99
3	Project Schedule	Fri 4/16/99	Thu 4/22/99
4	Design Basis and Criteria	Fri 4/23/99	Fri 4/23/99
5	Drawings	Mon 4/26/99	Fri 5/14/99
6	Construction Tasks and Methods	Mon 5/17/99	Fri 5/21/99
7	Reporting	Mon 5/24/99	Fri 5/28/99
8	Govt Review	Mon 5/31/99	Fri 7/9/99
9	Revise and Finalize Plan	Wed 11/10/99	Tue 12/21/99
10	Gov't Approval of RDRA WP	Tue 12/21/99	Tue 12/21/99
11	Initial Procurement	Wed 12/22/99	Tue 1/11/00
12	Procurement Plan	Wed 1/12/00	Wed 1/12/00
13	**PHYSICAL SYSTEM CONSTRUCTION**	**Tue 1/4/00**	**Thu 3/2/00**
14	Preconstruction Meeting	Tue 1/4/00	Tue 1/4/00
15	Project Mobilization	Tue 1/4/00	Wed 1/5/00
16	AS Well Installation	Wed 1/12/00	Thu 1/20/00
17	Presampling soils	Fri 1/21/00	Tue 1/25/00
18	Well Head install	Wed 1/26/00	Tue 2/1/00
19	Electric Install	Wed 2/2/00	Tue 2/8/00
20	AS Distribution piping	Wed 2/9/00	Fri 2/11/00
21	AS system component construction	Mon 2/14/00	Tue 2/15/00
22	Baseline Sampling	Wed 2/16/00	Thu 2/17/00
23	System Start up	Fri 2/18/00	Thu 3/2/00
24	Operations and Maintenance Start	Thu 3/2/00	Thu 3/2/00
25	**Remedial Action Report**	**Fri 2/18/00**	**Thu 3/30/00**
26	Introduction	Fri 2/18/00	Tue 2/22/00
27	Nature and Extent	Wed 2/23/00	Fri 2/25/00
28	Chronology of Events	Mon 2/28/00	Thu 3/2/00
29	Performance Standards	Fri 3/3/00	Thu 3/9/00
30	Construction Activities	Fri 3/10/00	Thu 3/16/00
31	Final Inspection	Fri 3/17/00	Thu 3/23/00
32	Certification of Remedy	Fri 3/24/00	Mon 3/27/00
33	Summary of Costs	Tue 3/28/00	Tue 3/28/00
34	Lessons Learned	Wed 3/29/00	Thu 3/30/00
35	**Long Term Remedial Action Plan**	**Fri 3/3/00**	**Thu 5/25/00**
36	Introduction	Fri 3/3/00	Thu 3/9/00
37	Long Term Monitoring and Field Sampling Plan	Fri 3/10/00	Thu 3/30/00
38	Operations and Maintenance	Fri 3/31/00	Thu 4/20/00
39	Strategy and Optimization Plan	Fri 4/21/00	Thu 5/4/00
40	Treatment System Evaluation	Fri 5/5/00	Thu 5/11/00
41	Summary of Recommendations	Fri 5/12/00	Thu 5/18/00
42	Schedule	Fri 5/19/00	Thu 5/25/00
43	Final LTRA	Thu 5/25/00	Thu 5/25/00



Project: RDRA workplan schedule rev
Date: Wed 12/22/99

Task | Split | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Split | Rolled Up Milestone | Rolled Up Progress | External Tasks | Project Summary

3.0 DESIGN BASIS AND CRITERIA

3.1 INTRODUCTION

This section of the Work Plan provides a detailed description of the overall CERCLA process, the proposed remediation system design, the particular elements of the system, rationale for equipment selection and sizing, supporting calculations, and an overall summary of design criteria for construction of AS remediation system at OU 3, Site 07.

According to the Guidance on Preparing Superfund Decision Documents, EPA/540/G-89/007, July 1989, cleanup authority is specified under the CERCLA program as amended by SARA. There are several key steps in the overall remedial process, which include the following:

- Pre-Remedial
- Remedial Investigation / Feasibility Study
- Selection of Remedy
- Proposed Plan
- Record of Decision
- Post-Record of Decision

Each step is further defined in Figure 11. The Pre-remedial stage includes a Preliminary Assessment (PA) which may further indicate that a Screening Site Investigation (SSI) or a Listing Site Investigation (LSI) is performed. The LSI gives a score to the site under the Hazard Ranking System (HRS). All HRS scores above 28.5 mean that the site is placed on the National Priorities List (NPL) because the identified hazards are sufficient to warrant cleanup under the CERCLA provisions.

A Superfund Memorandum of Agreement (SMOA) is developed to specify which agency (federal, state, etc.) shall act as the Lead Agency and which shall act as the Support Agency. The Lead Agency Remedial Project Manager (RPM) shall oversee all technical, enforcement, and financial aspects of the remedial response. Other responsibilities of each enforcement agency are specified in the developed Interagency Agreement (IAG). The Potentially Responsible Party (PRP) as defined by the Lead Agency may also conduct CERCLA response actions, recommend preferred

alternative for the remedy, and submit comments on the Proposed Plan during the formal public comment period.

The Lead Agency will then perform a Remedial Investigation / Feasibility Study (RI/FS) where Operable Units (OU) are specified as discrete units within a site. An OU may present a temporary remedy. The RI consists of data collection for site characterization, determination of the nature and extent of contamination at each OU, assessment of risks to human health and the environment, and conduction of treatability testing to evaluate the performance and cost of treatment technologies under consideration for the site.

The Feasibility Study involves identification and detailed evaluation of potential remedial alternatives. The analysis gauges the performance of each potentially applicable technological solution.

The Preferred Alternative (PA) is selected and must satisfy the Applicable or Relevant and Appropriate Requirements (ARARs) that is determined to provide the best balance of the five primary balancing criteria. These five criteria include:

- ~~Long-term Effectiveness and Permanence~~
- Reduction of Toxicity, Mobility, or Volume Trough Treatment
- Short Term Effectiveness
- Implementability
- Cost

The PA must also consider Modifying Criteria which includes state and community acceptance.

The Proposed Plan (PP) shall present to the public the PA for the site. This PP summarizes the alternatives studied in the detailed analysis of the RI/FS and highlights the factors that lead to the selection of the PA. The PP shall be prepared by the Lead Agency to include the following schedule of events included in Figure 12.

The public comment period is then allowed for public, PRP, and Support Agency review and comment of the PP.

Once the public comment period has expired, the necessary changes are incorporated by the Lead Agency. An Explanation of Significant Differences (ESD) shall be developed to explain the

significant changes to the overall remedy. The Lead Agency takes into account the effect of the change to the remedy's scope, the performance, and the cost. The ESD is the basis for whether or not an amended ROD is necessary.

The Record of Decision (ROD) is developed to:

- Certify that the selected remedy was carried out in accordance with the CERCLA and NCP,
- Describe the technical parameters of the remedy, treatment method, engineering and institutional components as well as the remediation goals, and
- Provide the public with the chosen remedy and rationale behind the selection.

The Remedial Design (RD) is used to develop technical drawings and specifications from the ROD for the Remedial Action (RA) phase. The RA begins with the actual construction of the remedy or implementation of the site cleanup. As part of the RD/RA work plan as an interim action under the ROD, the system will "be listed as a potential source" in the work plan. An Operation and Maintenance schedule is typically implemented. When all phases of the RA have been completed, the site can be removed from the NPL.

3.2 DESIGN OBJECTIVES

The design objectives for OU 3, Site 07 were derived from Brown and Root Environment's, *Basis of Design Report,* dated April 1997, for OU2, Site 10 and the Scope of Work dated April 23, 1998. Benzene and 2-methylnapthanlene were identified as COCs. The goal of the design is to design and implement a suitable system for the OU 3, Site 07 to actively mitigate the site COCs at the lowest possible costs. This will eliminate the potential human health risk from groundwater.

3.3 SELECTED TECHNOLOGY

SVE was determined by Brown and Root to be the best available technology for remediating soil at this site. The Statement of Work specifications proposed a combination of vertical SVE wells. Equipment selected includes a positive displacement blower system for soil vapor extraction with no off-gas treatment system. The rational to modify the technical recommendation by Brown and Root was provided previously in Section 1.3.2.

Air sparging was selected as the preferred design because the water table is only 2 feet to 6 feet below ground surface. At these water levels, an SVE system would recover excessive quantities of unwanted water and the radius of influence of the wells would be less than 6 feet. Air sparging accomplishes the same goals as an SVE system without the concerns of handling and disposing of water. The benzene and 2-methylnapthalene are stripped from the soil using air sparging and oxygen is provided for bioremediation. Air sparging does not constitute a point source air emissions discharge because any evolved vapors defuse out through and dispenses from the entire impacted area. The rate of mass removal that eventually results in air emissions could be calculated by real time sampling, at multiple locations in the groundwater and vadose zone. However, this calculated rate would only be an approximation and not an actual value.

3.4 MODIFICATIONS TO TECHNICAL SPECIFICATIONS

As a result of estimate/scope negotiations with LANTDIV, several modifications to OU 3, Site 07 specifications were modified and documented as presented in the John Franz letter dated September 17, 1998:

- Up to thirty-one, active one-inch diameter vertical AS wells will be direct pushed or equivalent technology to approximately 15-feet deep with approximately 3-feet of screened interval. The purpose of these AS wells is to remediate soils near source areas.
- Groundwater and soil samples will be collected and analyzed during the installation of monitoring wells OU3-MW11 and OU3-MW12. This will establish a baseline at these locations. Long term groundwater monitoring will also be performed in this area.
- The interconnecting piping network from the equipment compound to each of the AS lines will be placed above grade. All pressure piping will be steel. Distribution piping will be field routed to minimize the amount of clearing and grubbing.
- A vapor barrier for the Hot Spot area will not be installed.
- No sound reduction equipment will be installed other than the discharge silencer. No heat tracing or insulation of piping or tanks will be provided. The existing site fence will secure the site.
- A single AS unit will be used. An overhead electrical drop will be made to provide electricity to the unit.
- The unit specified will be capable of delivering minimum, 7-psig pressure at design flow conditions.

- Air abatement will not be provided during startup or operation as the treatment unit resides in an attainment area. As such abatement is not required. As part of the record under this RD/RA work plan as an interim action exercised as part of the ROD this system is listed as a potential source.

- Automatic controls are not included or provided in the Brown and Root AS pilot unit provided by the Navy. System controls are noted in the Design Specifications.

- A telephone auto dialer will not be provided to notify operating personnel in the event of a system failure. Routine inspection will verify ongoing performance and continuous operations.

- Soil sampling will be conducted as outlined in the Sampling and Analysis Plan presented in *Appendix B.*

This Work Plan proposes a design that assumes a placement location and pattern based on information known to date. The Work Plan provides for additional assessment activities by field screening of soils in the vicinity of the hot spot to be remediated. It is assumed that the described number, location, pattern, and size for the proposed system is a maximum. If this field screening determines otherwise a modification will be pursued. If the field screening justifies suitable design changes that can be readily accommodated in the field during construction they will be pursued and implemented after receiving appropriate navy authority.

3.5 EQUIPMENT AND MATERIALS SELECTION

This section provides detailed information of the particular elements of the system along with rationale for equipment selection. Included as a part of this section are Tables 3.1, 3.2, and 3.3. Table 3.1 summarizes key design parameters for the AS systems, while Table 3.2 includes equipment specifications for the AS system. The basic design as proposed is consistent with existing systems operating at MCAS Cherry Point and standard OHM/IT and industry practice. Finally, Table 3.3 includes ground level monitoring criteria.

AS Wells and Piping System

Each AS well consists of a one-inch diameter, schedule 80 PVC riser and includes a minimum of three feet of 0.010 flush-threaded schedule 80 PVC slotted well screen. The screened interval will be maximized to the extent possible to an approximate depth of 15-feet BLS. Figure 5 shows the typical well construction. PVC is selected due to demonstrated performance in AS/SVE applications, and ease of installation for smaller diameters. All pressure pipes to be used above ground will be steel or other suitable metal.

The annular space shall be filled with clean quartz sand from the bottom of the boring to 10 feet BLS. A two-feet thick layer of 3/8-inch diameter bentonite pellets will be placed above this sand layer. The bentonite will be hydrated per the Subsection 5.4.1 procedure.

AS header piping shall be two-inch diameter pipe designed to withstand 10-psi pressure. Piping from the individual wells to the header piping will be one-inch diameter metal tubing or pipe. The piping has been sized to minimize pressure drop to the equipment compound and meet performance requirements. The plan view of the total AS distribution piping, which terminates at the lobe blower system, is shown on Figure 4. As needed, the header piping in low laying areas will be tapped for installation of water drain lines.

The AS wells and header are designed to handle the designed 7 acfm of gas flow rate from each of the wells.

AS Blower Skid

A rotary lobe positive displacement blower was selected to supply pressure for the AS system. This unit is capable of approximately 240 cfm at 7 psig as shown in the performance curve presented in *Appendix E.* This blower was selected based on meeting the appropriate design requirements and availability as already owned pilot study equipment from OU-2. Using this equipment provides significant cost savings to the project (see Table 3.3 for design specifications).

Primary components of the skid-mounted positive displacement blower system includes:

- 10 HP, 480V electric drive motor
- Interconnecting piping
- Valving
- Instrumentation
- Gauges
- Control panel

This positive displacement blower is an existing unit at the Base. If the blower is under sized, wells will be manually cycled to provide required flow rates. Expected noise levels from the rotary lobe blower on the AS skid are below 85-dB at a three-foot distance from the skid unit. Weather protection or sound attenuation will not be provided with the unit.

Well Heads, Vaults, and Instrumentation

AS well heads will include a rotameter, valve, pressure/vacuum gauge, and a flow port for measuring airflow rates. Figure 7 shows the proposed detail for the air sparging well head flow meter panel.

Air Emissions Abatement

Emissions abatement is not anticipated to be necessary. During AS operations, dragger tubes will be used to monitor ground level ambient air quality in the general Hot Spot areas, and other areas as necessary to confirm the operation of the system does not present a human health or environmental threat.

Equipment Compound

The AS unit is currently in storage at the job site. A six-inch thick gravel pad will be created to provide an elevated area for the AS unit. The remediation equipment will be anchored and grounded.

3.6 PERMITS

OHM/IT will obtain all construction permits/approvals required for the performance of the project. OHM/IT will retain photocopies of all permits on site with Work Plans and as-built drawings. OHM/IT will confirm there is no requirement to obtain air emissions permits since this operation will constitute a non-point source. OHM/IT will monitor the as appropriate to confirm the system operates under permissible ceilings and that ambient air quality parameters are not elevated so as to create a human health or environmental threat. Should OHM/IT determine either before the part of operation or as a result of a change in conditions after operations begin, that a permit is necessary, OHM/IT would work with MCAS Cherry Point to obtain all required permits.

3.7 SYSTEM CONTROL LOGIC

Instrumentation and controls for the integrated AS system is based on standard system control logic used for other similar as installation. The process and instrumentation diagrams (P&IDs), shown as Figure 6, delineate the instrumentation and controls for this system.

The AS blower for this operation is expected to be the pilot SVE blower used by Brown and Root as OU2, Site 10. Baseline sampling will help determine the size of the Hot Spot area and if a larger or smaller blower is required.

The AS blower operation will be controlled by series of timer controlled solenoid inline valves to cycle air alternatively throughout the six distribution headers. A relief/regulator valve will control maximum blower header pressure. Rotameters will be provided to measure airflow to each sparge well.

Table 3.1
Key Design Parameters for AS System
OU 3, Site 07

Design Parameter	*Design Specification*	*Comments*
VAPOR RECOVERY SYSTEM		
Number of Well Fields	1	
Number of Wells	31	
Well Diameter (in.)	1	
Well Piping Material	Steel or SS	SCH 40 or tubing PVC
Well Screen Pipe Schedule	40	
Depth (ft)	15	
Screen Interval (ft)	3	
Slot Size (in)	0.010	
AS Pressure at each well (psig)	5	
Flow per well (acfm)	7	
Radius of Influence (ft)	15	
Total Flow all Wells(acfm)	217	31 wells at 7 acfm
AS Pressure needed at Blower (psig)	7	
Number of AS Skids	1	
Controls and Control Panel	NEMA 4	
Distribution Piping	metal	Safety requirement for pressure
Barrier Material	No	Minimize disturbance to area
Electrical Power Source	Overhead line	
Sand Pack / Filter Pack Sand Size	No. 2 size Morie	For use with 10-slot screen size
Bentonite Pellets	3/8" diameter	

Table 3.2
Equipment Specifications for AS System
OU 3, Site 07

Blower and Motor	– Capacity needed: 250 cfm @ 5"Hg vacuum – Rotron – Regenerative type – Service factor≤ 80% of max speed – 10 HP, 460 volt/3 phase/60 Hz, continuous Duty – Air inlet dilution valve – Skid mounted
Vapor/Liquid Separator (not required for AS operation)	– Centrifugal type knockout tank – Removable demister – Steel construction, Rated at full vacuum service – Automatic 1 point level control (Level Switch High Shutoff)
Liquid Transfer Pump Motor	– No transfer pump
Particulate Filter	– Particulate removal @ 98% or greater – 10 um or suitable size – Inline filter, Stoddard
Discharge Silencer	– Discharge silencer downstream of blower – Flanged connection
Gauges	– Liquid filled pressure/vacuum gauges – 0-20 inches Hg range – See P&ID for location and number
Liquid Holding Tank	– Not included
Blower Acoustic Enclosure	– Not Included
Main Control Panel	– On-off switch for blower
Autodialer	– None Provided
Electrical	– NEMA 4 panel mounted on skid – Unit is not explosion proof
Vapor-phase Carbon Vessel	– No abatement required
Heat Exchanger	– Not required

Table 3.3
Ground Level Monitoring Criteria
OU 3, Site 07

This table shows the constituents to be monitored in ground level ambient air. Benzene Drager tubes should be used for real time monitoring.

Other approved methods including collection of air samples in tedlar bags or SUMMA canisters will be performed as appropriate for the other constituents.

Contaminant	Maximum Range for Ground Level Concentration (ppmv)
Vinyl Chloride	10 to 21
Chloroethane	1040 to 2080
Methylene Chloride	520 to 1040
1,1 Dichloroethane	1040 to 2080
1,2 cis Dichloroethane	2037 to 4073
Benzene	**5 to 10***
Trichloroethane	520 to 1040
Chlorobenzene	103 to 207
Ethylbenzene	1040 to 2080
Xylene (o&p)	1040 to 2080
Xylene (m)	1040 to 2080
MIBK	520 to 1040
Toluene	520 to 1040
2-Methylnapthalene	**Not determined***

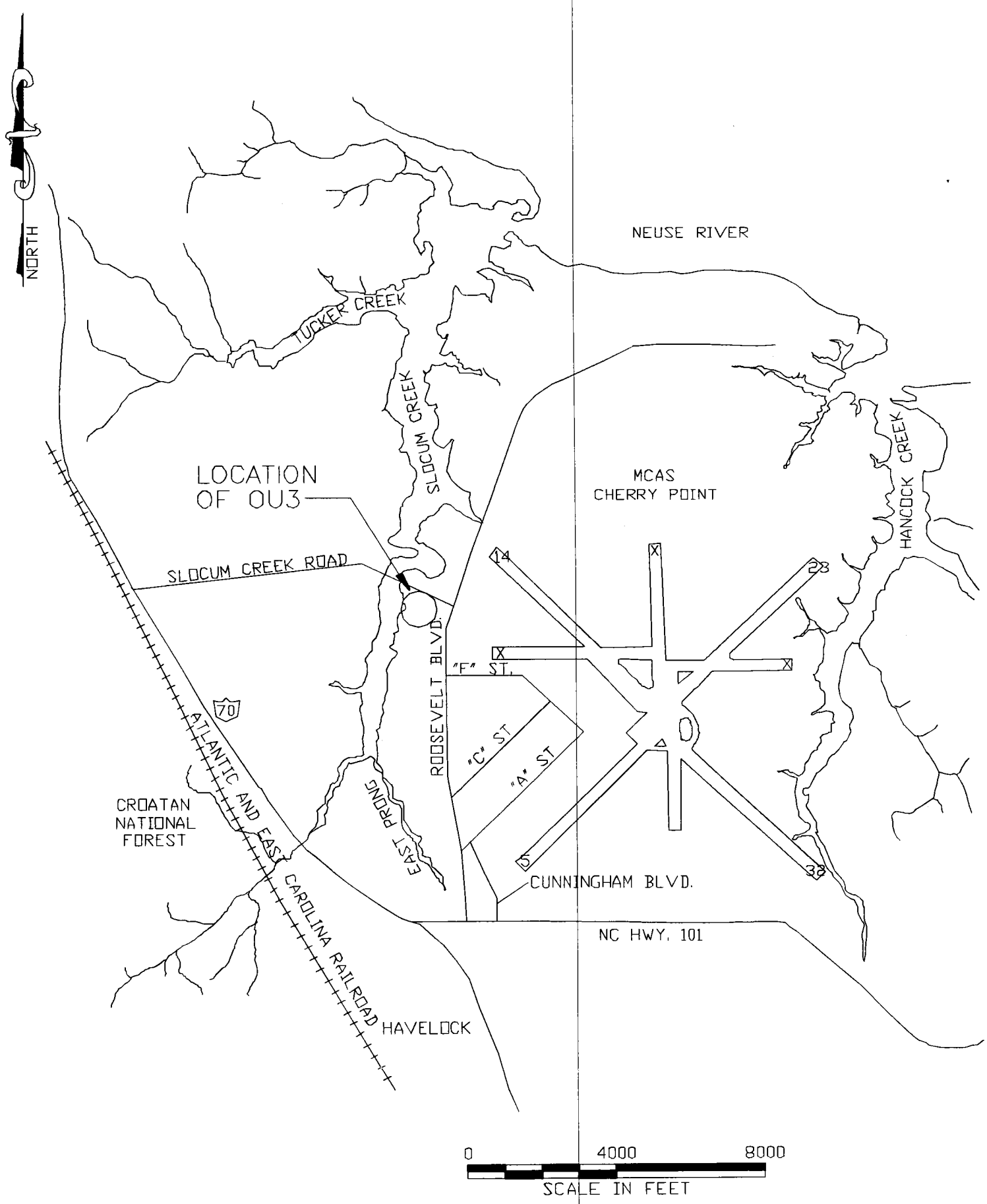
* Remediation is specifically for benzene and 2-methylnapthalene in groundwater. Groundwater limit for benzene is 1 parts per billion (ppb) and 28 ppb for 2-methylnapthalene. These two containment concentrations are above the groundwater standard. Groundwater samples collected periodically will provide for the measurement of success of the system for treating those compounds in groundwater.

4.0 DRAWINGS

Several construction drawings, which have been referred to earlier, have been developed, based on the OHM/IT's understanding of the scope of work for OU 3, Site 07. The following list of drawings and provides sufficient detail for constructing the proposed remediation system at the site. Some modifications to the construction drawings presented (i.e. equipment layout) will be field modified based on-site conditions. Each of the drawings is also referenced in Section 5.0, during the discussion of installation tasks.

DRAWINGS

Figure 1 Vicinity Map
Figure 2 Site Plan
Figure 2A Wetlands Location
Figure 3 Well Location and Well Radii of Influence
Figure 4 Air Sparging / Distribution Piping
~~Figure 5 Well and Well Head Piping Details~~
Figure 6 Air Sparging / Unit P&ID
Figure 7 Well Head Flow Meter Panel
Figure 8 Electrical Site Plan
Figure 9 Main Electrical Distribution Details
Figure 10 The Remedial Process
Figure 11 Public Comment and Revised ROD



OHM Remediation Services Corp.
NORCROSS, GEORGIA

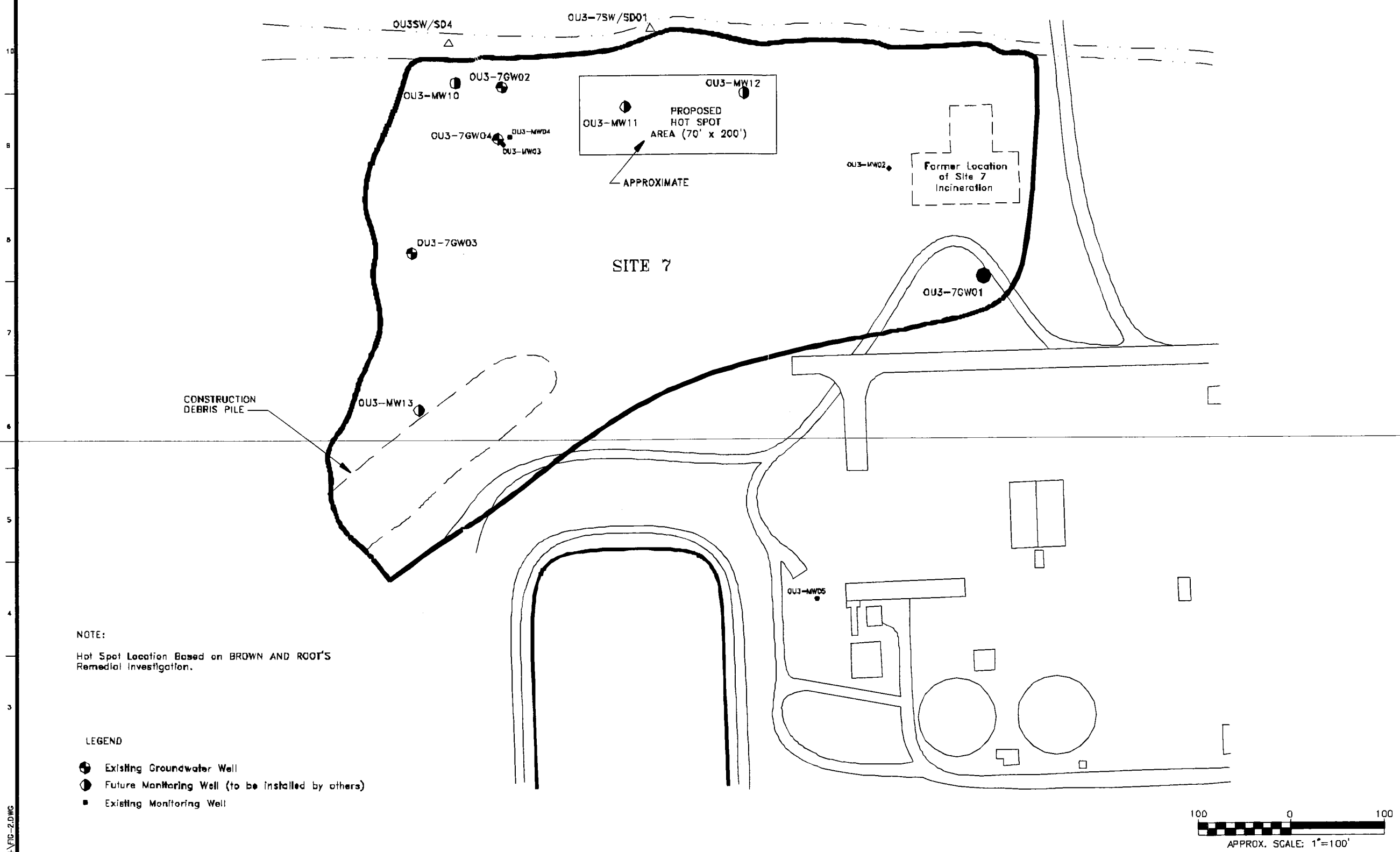
DRAWN BY	L. SHULMAN	12/30/98
CHECKED BY	M. GROSTICK	12/30/98
APPROVED BY	S. BIVONE	12/30/98
REV. 0	SHEET # –	PROJECT NO. 920694

FIGURE 1

VICINITY MAP
OU3-SITE 7

PREPARED FOR
CHERRY POINT
NORTH CAROLINA

J:\LANTDM\CHERRYPT\920694\VINCIT.DWG



NOTE:

Hot Spot Location Based on BROWN AND ROOT'S Remedial Investigation.

LEGEND

- Existing Groundwater Well
- Future Monitoring Well (to be installed by others)
- Existing Monitoring Well

J:\LANTDIV\CHERRYPT\920694\FIG-2.DWG

OHM Remediation Services Corp.
Norcross, Georgia

SUBMITTED: _____ DATE: _____
PROJECT MANAGER
APPROVED: _____ DATE: _____
SR. PROJECT ENGINEER
APPROVED: _____ DATE: _____
DEPT. MANAGER

AT FULL SCALE
(IF NOT 2"-SCALE ACCORDINGLY)
CADD FILE: _____
DRAWN: J. LANGE
DESIGNED: M. GROSTICK
CHECKED: S. BIVONE
CHECKED: _____

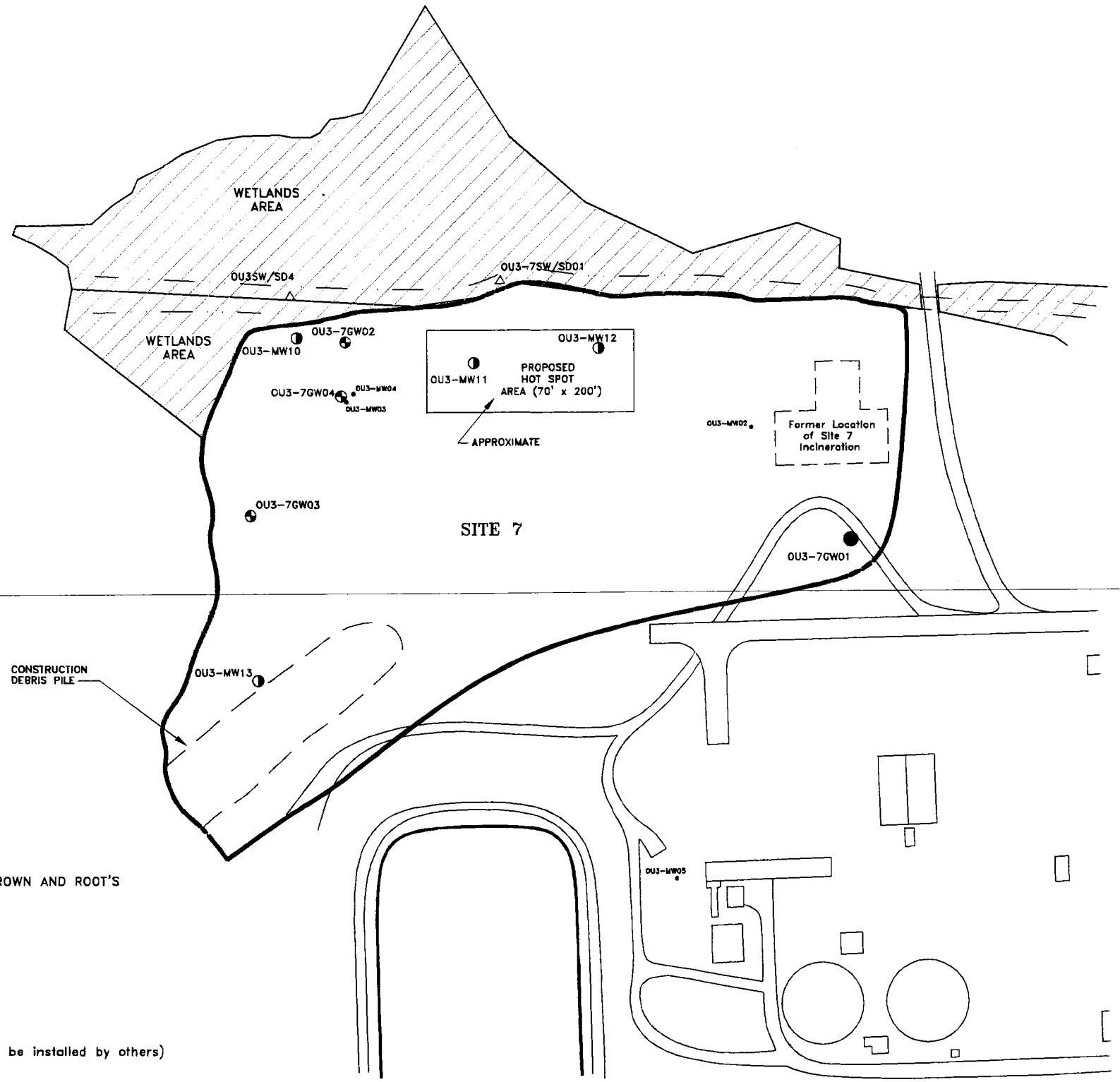
REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.
	-	-		-	

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NAVAL STATION — NORFOLK, VIRGINIA
CONTRACT N62470-97-D-5000 — DELIVERY ORDER NO. 0010
OHM PROJECT No. 920694 — MARINE CORPS AIR STATION, CHERRY POINT, N.C.

FIGURE 2
SITE PLAN
OU3 SITE 7

DRAWING NUMBER: —
SHEET NUMBER: of
DATE: 8/7/99



NOTE:

Hot Spot Location Based on BROWN AND ROOT'S Remedial Investigation.

LEGEND

- Existing Groundwater Well
- Future Monitoring Well (to be installed by others)
- Existing Monitoring Well

125 0 125 feet

APPROX. SCALE: 1"=125'

J:\LANTDIV\CHERRYPT\920694\FIG-2.DWG

OHM Remediation Services Corp.
Norcross, Georgia

SUBMITTED: PROJECT MANAGER DATE:
APPROVED: SR. PROJECT ENGINEER DATE:
APPROVED: DEPT. MANAGER DATE:

AT FULL SCALE (IF NOT 2"-SCALE ACCORDINGLY)
CADD FILE:
DRAWN: J. LANGE
DESIGNED: M. GROSTICK
CHECKED: S. BIVONE
CHECKED:

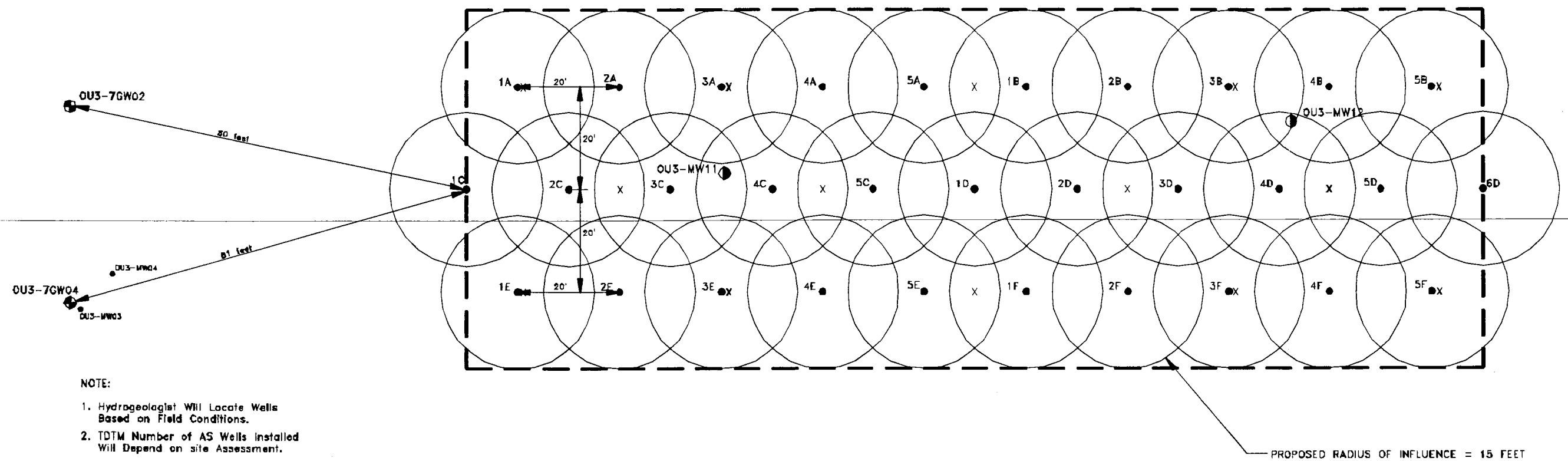
REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.
	-	-		-	

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NAVAL STATION NORFOLK, VIRGINA
CONTRACT N62470-97-D-5900 DELIVERY ORDER NO. 0010
OHM PROJECT No. 920694 MARINE CORPS AIR STATION, CHERRY POINTR, N.C.

FIGURE 2A
WETLANDS LOCATION PLAN
OU3 SITE 7

DRAWING NUMBER: —
SHEET NUMBER: of
DATE: 6/7/99



NOTE:

1. Hydrogeologist Will Locate Wells Based on Field Conditions.
2. TOTM Number of AS Wells Installed Will Depend on site Assessment.
3. A 15 foot Average Radius of Influence is Expected/Typical Based on Other Air Sparge Installations at MCAS CHERRY POINT with similar Geology and Conditions.

LEGEND

- Existing Groundwater Well
- Future Monitoring Well (to be installed by others)
- Existing Monitoring Well
- 3E ● New AS/SVE Well (may change based on samples)
- X Proposed Contamination Area verification samples for PAHs & BTEX

20 0 20

SCALE: 1"=20'

OHM Remediation Services Corp.
Norcross, Georgia

SUBMITTED: _____ PROJECT MANAGER DATE: _____
APPROVED: _____ SR. PROJECT ENGINEER DATE: _____
APPROVED: _____ DEPT. MANAGER DATE: _____

AT FULL SCALE (IF NOT 2"-SCALE ACCORDINGLY)
CADD FILE:
DRAWN: J. LANGE
DESIGNED: M. GROSTICK
CHECKED: S. BYONE
CHECKED:

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.
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DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NAVAL STATION NORFOLK, VIRGINIA
CONTRACT N62470-97-D-5000 DELIVERY ORDER NO. 0010
OHM PROJECT No. 920694 MARINE CORPS AIR STATION, CHERRY POINTE, N.C.

FIGURE 3
WELL LOCATION AND WELL RADII OF INFLUENCE
OU3 SITE 7

DRAWING NUMBER: -
SHEET NUMBER: of
DATE: 8/7/99

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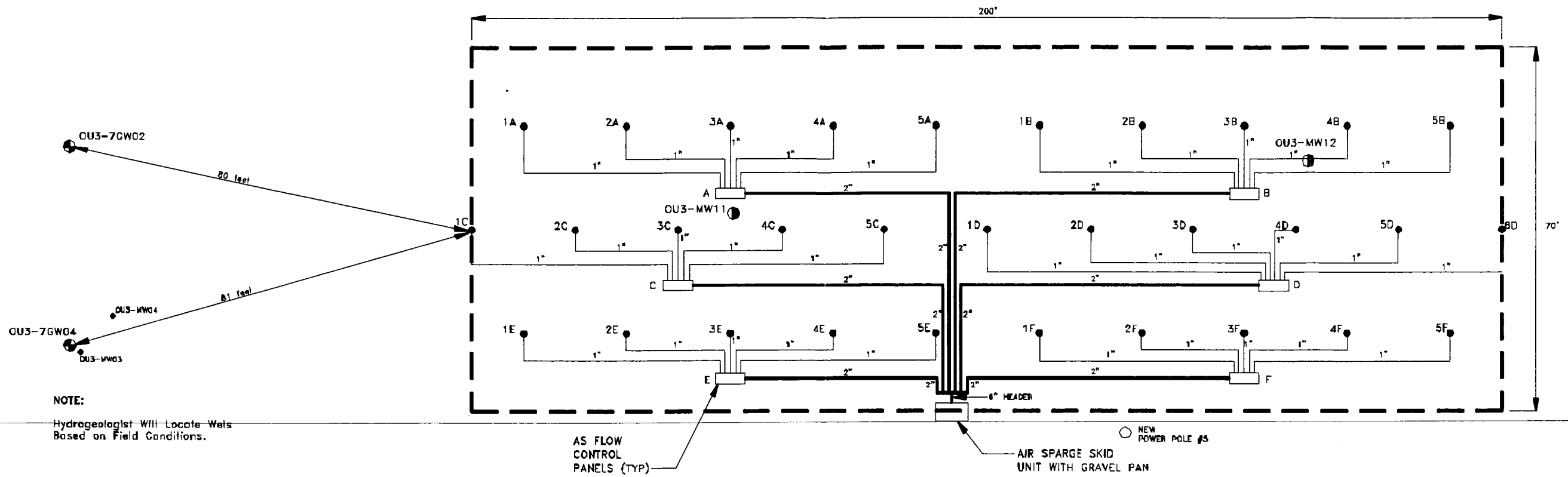

NOTE:

Hydrogeologist Will Locate Wells Based on Field Conditions.

NOTES:

1. Cycling of Air Sparge Wells will be Performed to optimize treatment and Minimize Preferential Flow Pathways From Being Established

2. Optimization of cycling Time Will be Based on Experience From Operating other Sites/Systems at MCAS CHERRY POINT and Best Engineering Judgment. Achieving an optimum Cycling Frequency/Duration is not as Critical as Maintaining a Consistant Cycling Frequency; the Cycling Frequency will be Determined by Measuring the Duration for the Mounded Water Table to Recover and Other Hydraulic Factors. Other Parameters will be Considered Including Insitu monitoring of Soil Gas for Benzene, 2-Methyl Napthalene, O_2 and CO_2, Also Visual Observation of the Surface for Evidence of Gas Bubbling and Evolution of soil Gases.

3. Each Well Head will have an Individual Air Flow/Process Indicator to Assure Proper Distribution of Air Throughout the Piping Header and Include Individual Manual Control Valves on each Well Head Air Sparge Supply Line.

LEGEND

- Existing Groundwater Well
- Future Monitoring Well (to be installed by others)
- Existing Monitoring Well
- 1E New AS/SVE Well

20 0 20

SCALE: 1"=20'

NOTE: PIPING ROUTES WILL BE FIELD MODIFIED TO MINIMIZE DISTURBANCE OF SOIL.

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PROJECT MANAGER
APPROVED: _____ DATE: _____
SR. PROJECT ENGINEER
APPROVED: _____ DATE: _____
DEPT. MANAGER

AT FULL SCALE (IF NOT 2"-SCALE ACCORDINGLY)
CADD FILE:
DRAWN: J. LANGE
DESIGNED: M. GROSTICK
CHECKED: S. BIVONE
CHECKED:

REVISIONS

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DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

ATLANTIC DIVISION

NAVAL STATION — NORFOLK, VIRGINIA

CONTRACT N62470-97-D-5000 — DELIVERY ORDER NO. 0010

OHM PROJECT No. 920694 — MARINE CORPS AIR STATION, CHERRY POINTR, N.C.

FIGURE 4

AIR SPARGING DISTRIBUTION PIPING

OU3 SITE 7

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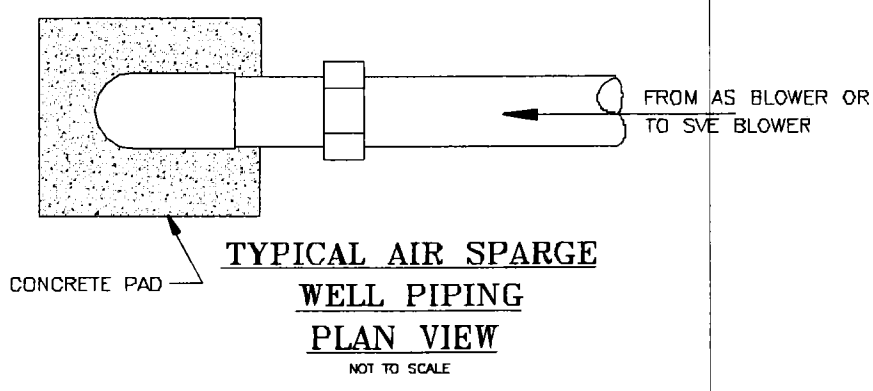
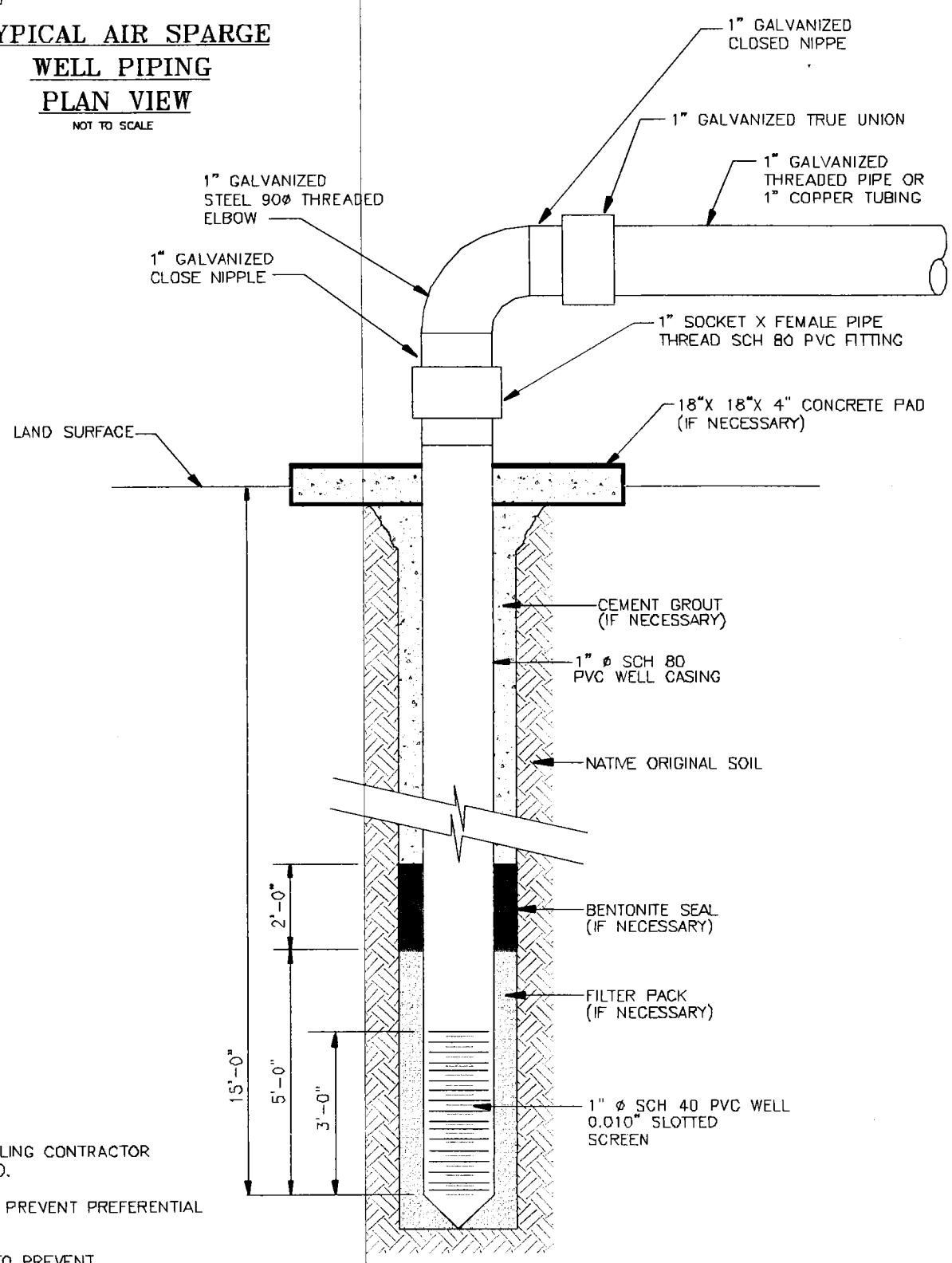
SHEET NUMBER: of

DATE: 8/7/99



TYPICAL AIR SPARGE WELL PIPING PLAN VIEW

NOT TO SCALE



TYPICAL AIR SPARGE WELL

NOT TO SCALE

NOTES:

1. WELLS TO BE INSTALLED BY DRILLING CONTRACTOR USING HYDRAULIC PUNCH METHOD.
2. WELLS TO BE GROUT SEALED TO PREVENT PREFERENTIAL FLOW ALONG CASTING.
3. CYCLING OF AIR WILL BE DONE TO PREVENT ESTABLISHING PREFERENTIAL FLOW PATHWAYS.
4. PERIODIC WATER QUALITY SAMPLING AND SOIL GAS SAMPLING WILL BE PERFORMED TO VERIFY PERFORMANCE. (SEE WORK PLAN SAMPLING AND ANALYSIS PLAN)

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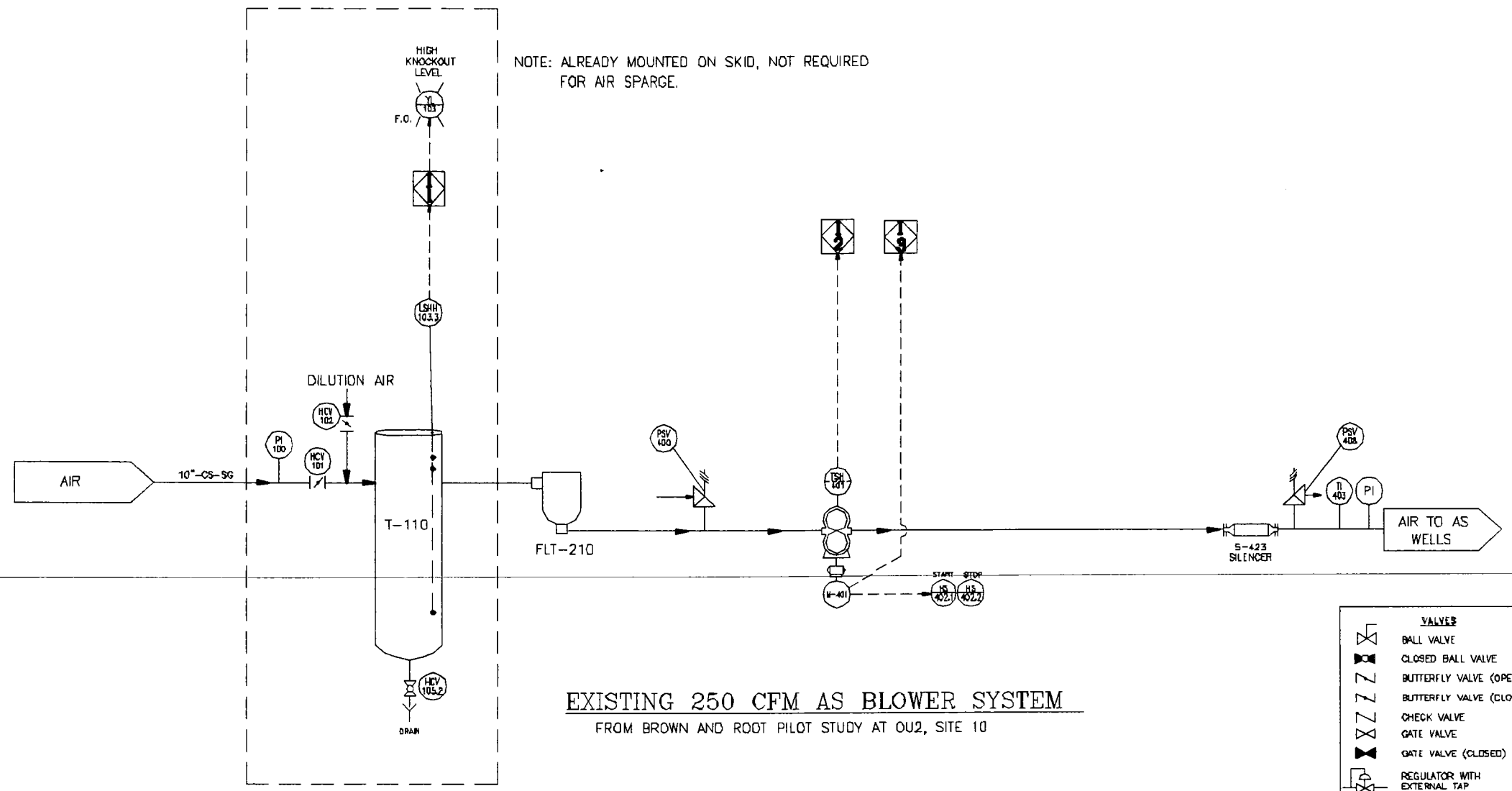
CHECKED BY	T. McCRORY	6/7/99
APPROVED BY	S. BIVONE	6/7/99
REV. 0	SHEET # –	PROJECT NO. 920694

FIGURE 5

WELL AND WELL HEAD PIPING DETAILS
OU3-SITE 7

PREPARED FOR
CHERRY POINT
NORTH CAROLINA

J:\LANTDIV\CHERRYPT\920694\FIG5.DWG



NOTE: ALREADY MOUNTED ON SKID, NOT REQUIRED FOR AIR SPARGE.

EXISTING 250 CFM AS BLOWER SYSTEM

FROM BROWN AND ROOT PILOT STUDY AT OU2, SITE 10

LEGEND

VALVES

- BALL VALVE
- CLOSED BALL VALVE
- BUTTERFLY VALVE (OPEN)
- BUTTERFLY VALVE (CLOSED)
- CHECK VALVE
- GATE VALVE
- GATE VALVE (CLOSED)
- REGULATOR WITH EXTERNAL TAP
- SELF CONTAINED REGULATOR
- 2-WAY SOLENOID NORMALLY OPEN
- AIR ACTUATED VALVE
- SAMPLE PORT
- FLOW INDICATOR
- REDUCER

SAFETY RELIEFS

- PRESSURE RELIEF VALVE
- VACUUM SAFETY VALVE (PSV)
- COMPRESSOR
- MOTOR
- AIR FILTER (FLT)
- PUMP

INSTRUMENTS

- PRV — PRESSURE RELIEF VALVE
- STR — STRAINER
- MTR — MOTOR
- LS — LEVEL SWITCH
- VB — VACUUM BREAK
- FI — FLOW METER
- FS — FLOW SWITCH
- SG — SIGHT GAUGE
- SP — SAMPLE PORT
- FT — FLOW TOTALIZER

INSTRUMENTS

- PI — PRESSURE INDICATOR
- PS — PRESSURE SWITCH
- PI 210 — LOCAL MOUNTED INSTRUMENTS
- PDI — PRESSURE DIFFERENTIAL INDICATOR
- PSH — PRESSURE SWITCH HIGH
- PHA — PRESSURE HIGH ALARM
- HS — PANEL MOUNTED INSTRUMENT HAND-OFF-AUTO
- TI — TEMPERATURE INDICATOR
- TS — TEMPERATURE SWITCH
- TSH — TEMPERATURE SWITCH HIGH
- THA — TEMPERATURE HIGH ALARM
- LSL — LEVEL SWITCH LOW
- LSH — LEVEL SWITCH HIGH
- LSA — LEVEL ALARM

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APPROVED: _____ DATE: _____ DEPT. MANAGER

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CADD FILE:
DRAWN: J. LANGE
DESIGNED: M. GROSTICK
CHECKED: S. BIVONE
CHECKED:

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CONTRACT N62470-97-D-5000 — DELIVERY ORDER NO. 0010
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FIGURE 6

AIR SPARGE/SVE UNIT PID

OU3 SITE 7

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SHEET NUMBER: of
DATE: 8/7/00

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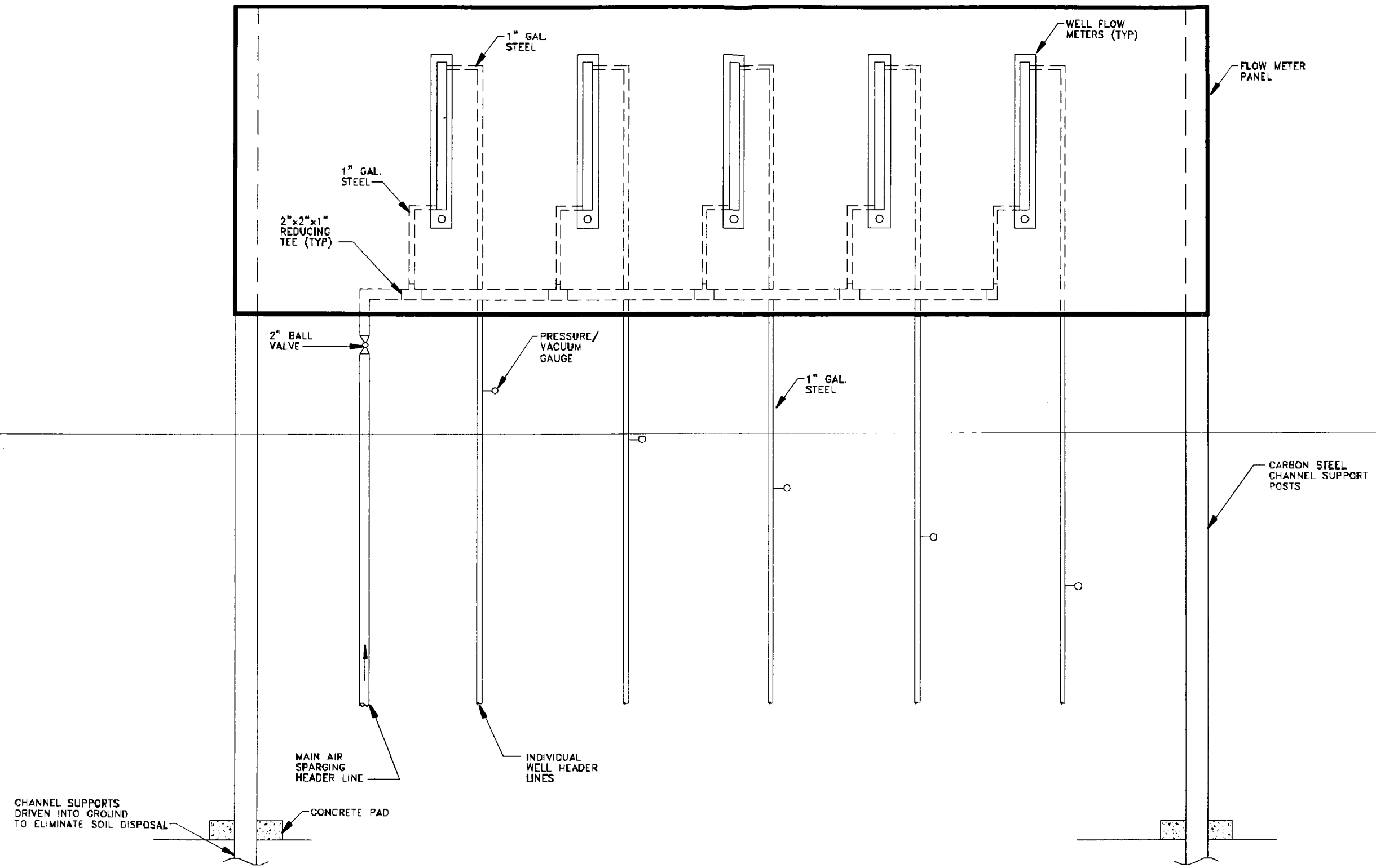

J:\LANTDIV\CHERRYPT\920694\FIG-7.DWG

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CADD FILE:
DRAWN: J. LANGE
DESIGNED: M. GROSTICK
CHECKED: S. BIVONE
CHECKED:

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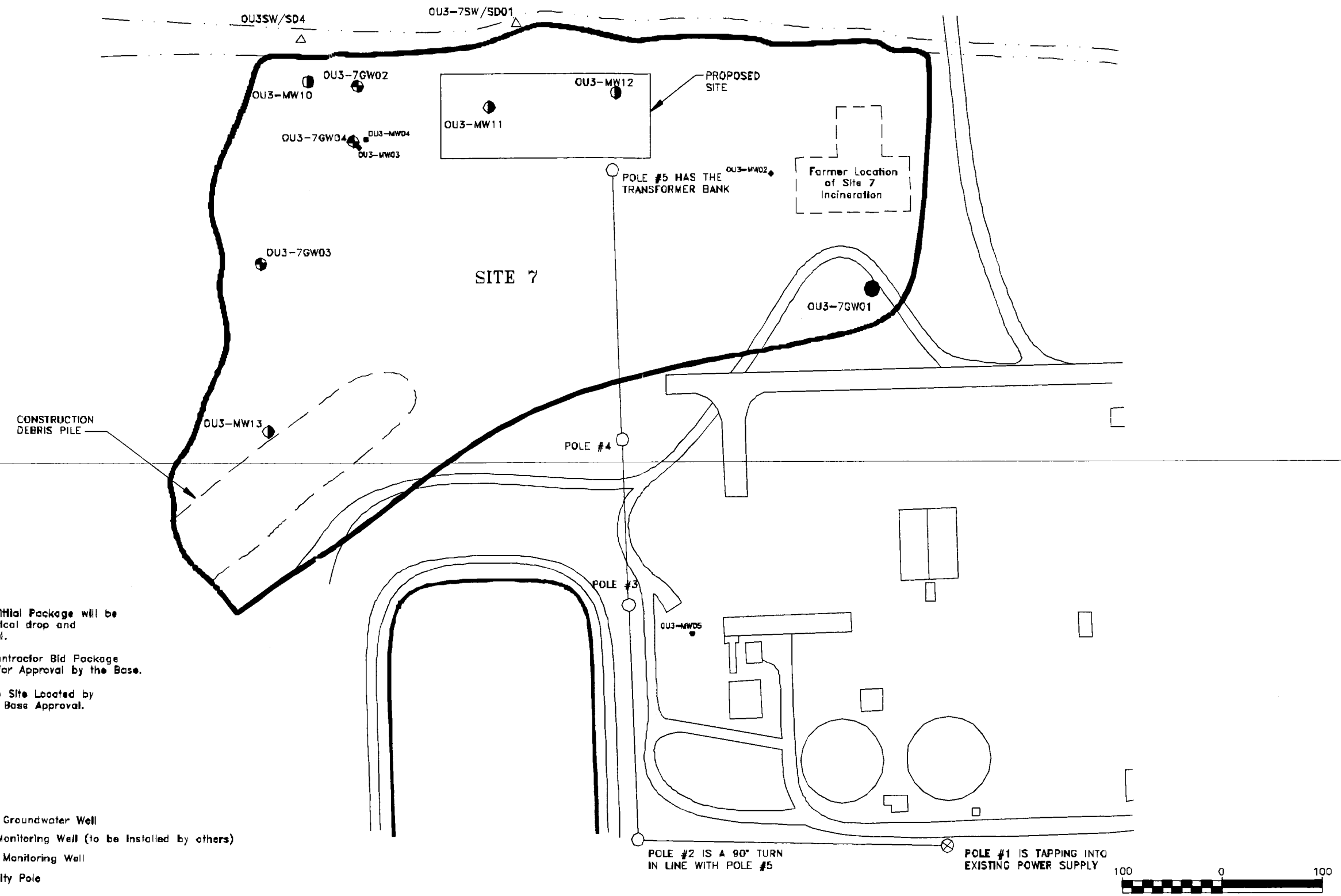
FIGURE 7
WELL HEAD FLOW METER PANEL
OU3 SITE 7

DRAWING NUMBER: –
SHEET NUMBER: of
DATE: 8/7/99



NOTES:

1. An Electrical Submittial Package will be Prepared for Electrical drop and Installation Approval.
2. An Electrical Subcontractor Bid Package will be Developed for Approval by the Base.
3. Utility Poles Will be Site Located by Subcontractor with Base Approval.

LEGEND

- Existing Groundwater Well
- Future Monitoring Well (to be Installed by others)
- Existing Monitoring Well
- New Utility Pole
- Existing Utility Pole

OHM Remediation Services Corp.
Norcross, Georgia

SUBMITTED: _____ PROJECT MANAGER DATE: _____
APPROVED: _____ SR. PROJECT ENGINEER DATE: _____
APPROVED: _____ DEPT. MANAGER DATE: _____

AT FULL SCALE (IF NOT 1"-SCALE ACCORDINGLY)
CADD FILE:
DRAWN: J. LANGE
DESIGNED: M. GROSTICK
CHECKED: S. BIVONE
CHECKED:

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FIGURE 8
ELECTRICAL SITE PLAN
OU3 SITE 7

DRAWING NUMBER: –
SHEET NUMBER: of
DATE: 8/7/99

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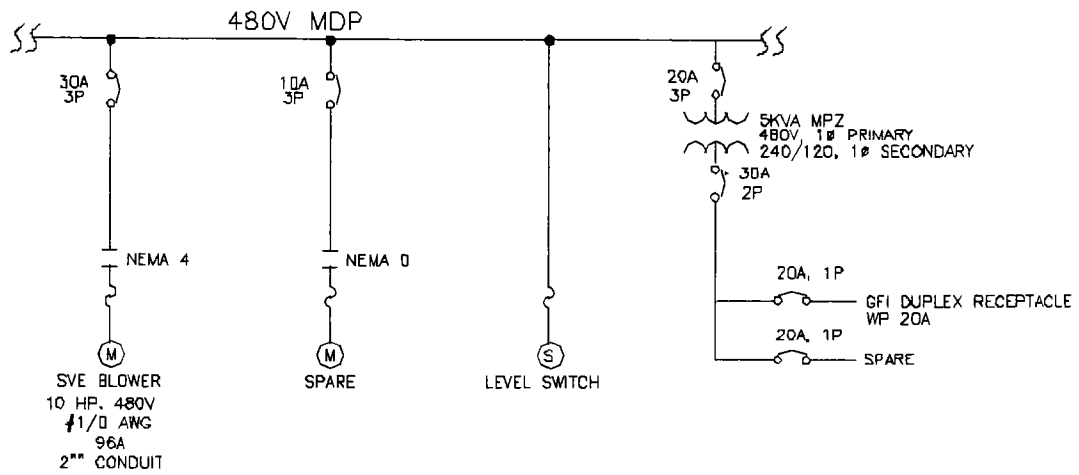
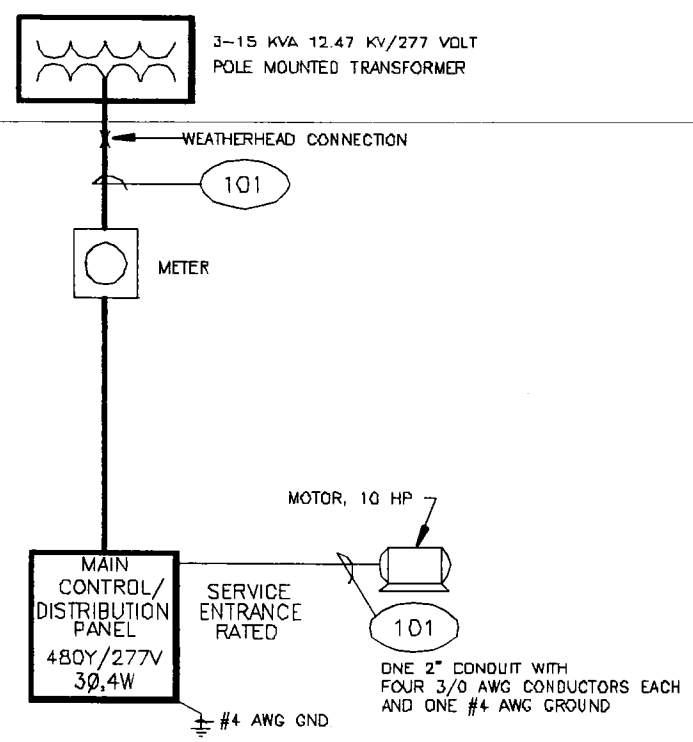


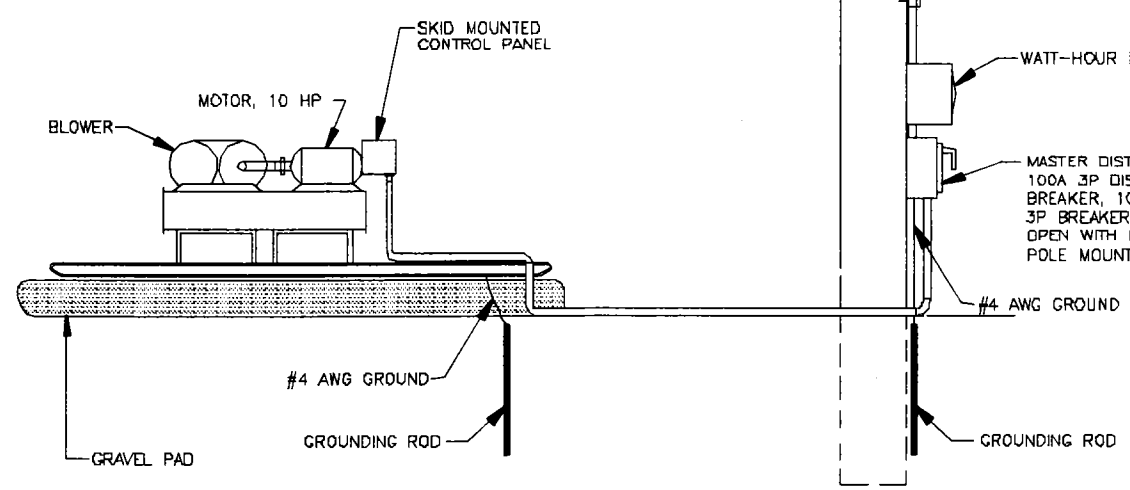
ONE LINE DIAGRAM

N.T.S.



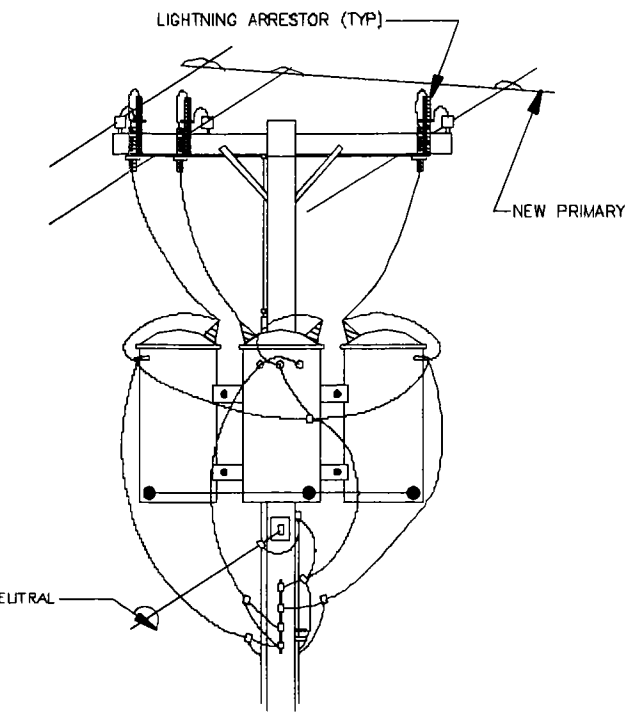
POWER DISTRIBUTION BLOCK DIAGRAM

N.T.S.



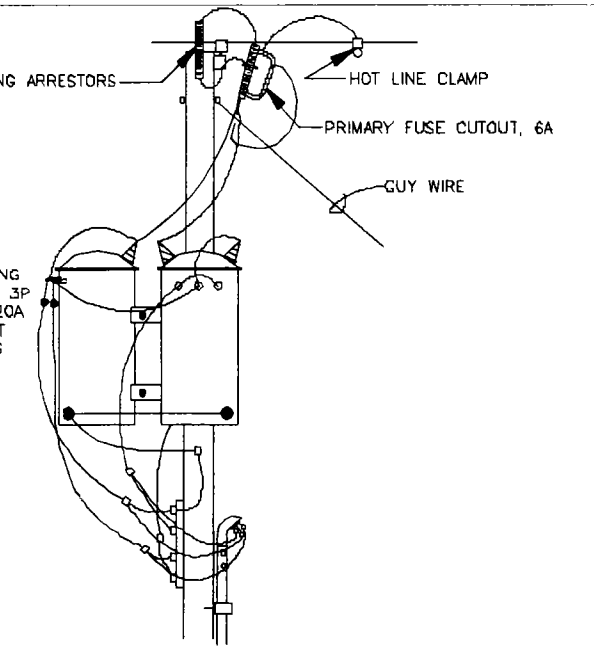
MAIN DISTRIBUTION PLAN

N.T.S



ELEVATION

N.T.S.



SIDE ELEVATION

N.T.S.

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Norcross, Georgia

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APPROVED: _____ DEPT. MANAGER DATE: _____

AT FULL SCALE (IF NOT 1"-SCALE ACCORDINGLY)
CADD FILE:
DRAWN: L. SHULMAN
DESIGNED: M. GROSICK
CHECKED: S. BIVONE
CHECKED:

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.

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ATLANTIC DIVISION
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CONTRACT N62470-97-D-5000 — DELIVERY ORDER NO. 0010
OHM PROJECT No. 920694 — MARINE CORPS, CAMP LEJEUNE, N.C.

FIGURE 9
MAIN ELECTRICAL DISTRIBUTION DETAILS
OU3-SITE 7
CHERRY POINT, N.C.

DRAWING NUMBER:
SHEET NUMBER: of
DATE: 12/29/98

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Figure 10 Public Comment and Revised ROD

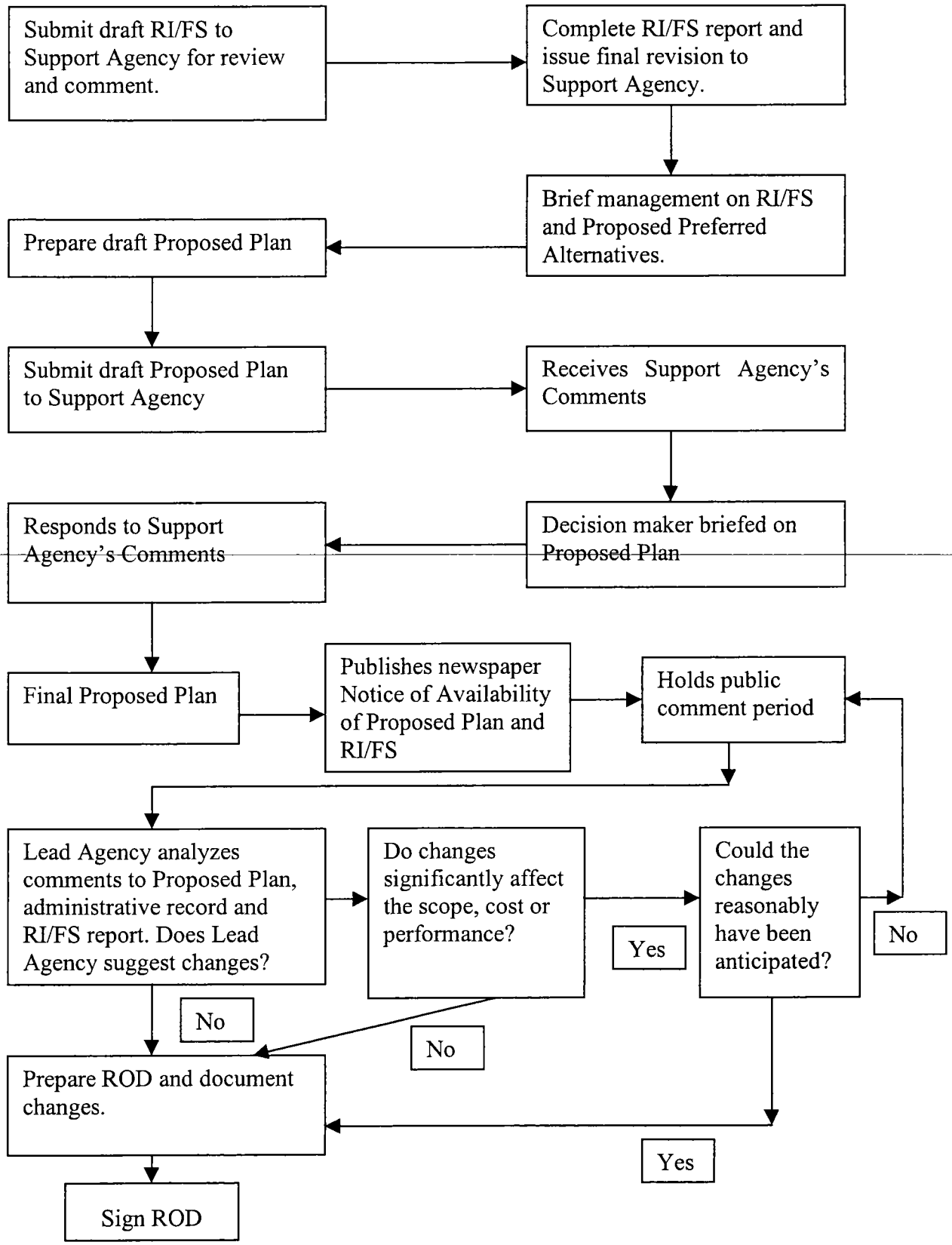


Figure 11: The Remedial Process

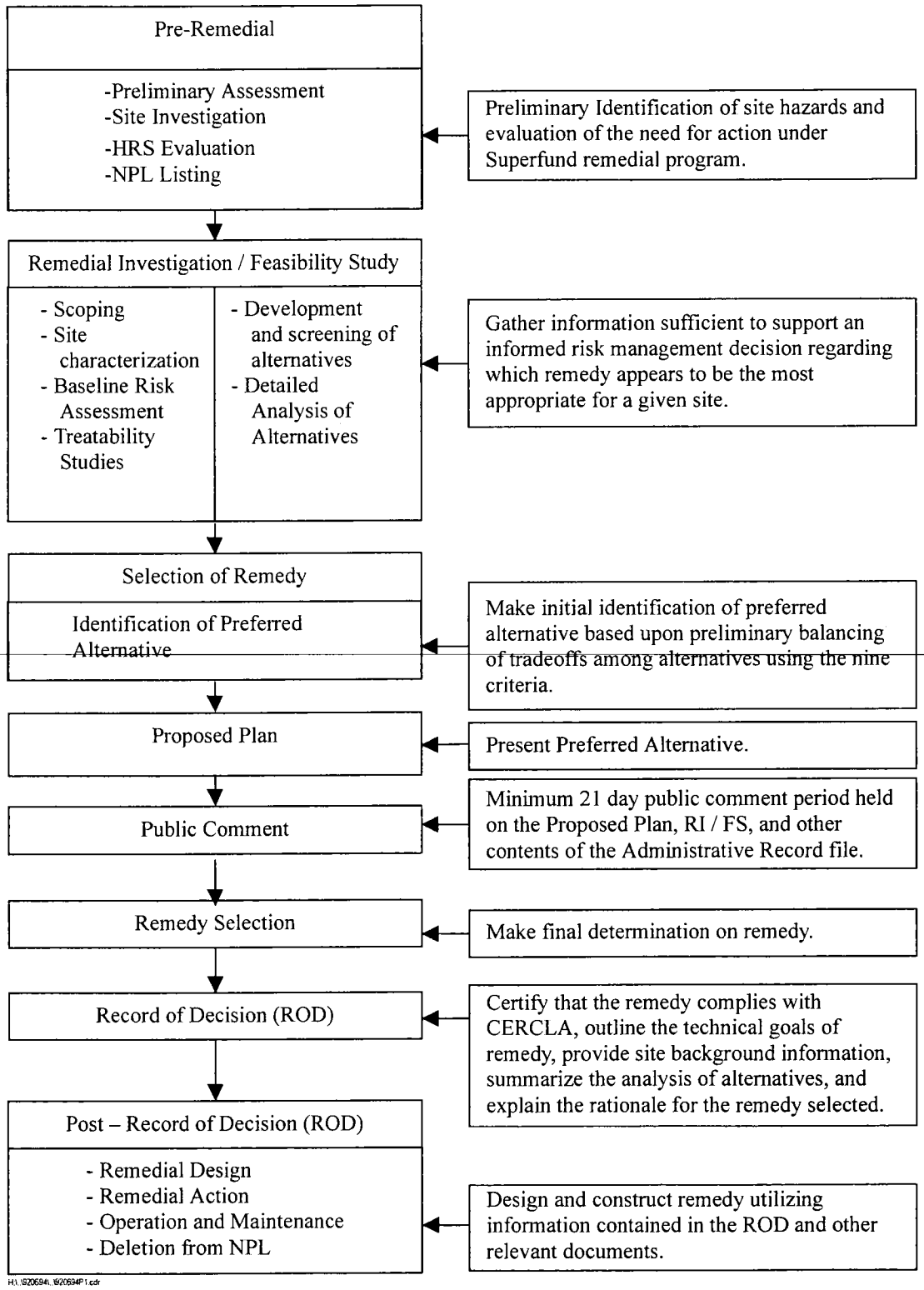


Figure 11 is a summary of Figure 1-1 of EPA document EPA/540/G-89/007, July 1989, Guidance on Preparing Superfund Decision Documents

5.0 CONSTRUCTION TASKS AND METHODS

5.1 MOBILIZATION

Equipment and personnel to perform this remedial project will be mobilized to the site as required from other projects at MCAS Cherry Point, other project sites or regional offices.

5.2 SITE PREPARATION AND SITE CLEARING/GRUBBING

Figure 1 is the site vicinity map. The initial site preparation activities will include:

- The delineation of the job site perimeter and work zones
- Location of all utilities within the project area
- Installation of overhead electrical lines
- Staking or marking the location of the equipment compound
- Improving access roads as required
- Use of the existing security fencing to limit access to the site

Exclusion zones will be established in accordance with the health and safety plan and storage and laydown areas defined. Erosion and sedimentation control measures such as silt fence and hay bale placement will be instituted as required. New regulations may change the location of the wells. As currently designed, the nearest well to Luke Rowe's Gut is approximately 30 feet. Well header piping will be above ground to minimize the disturbance to the soil.

Since construction will disturb vegetation within 30 feet of Luke Rowe's Gut, EAD is currently investigating the applicability and impact of the Riparian and Coastal Zone Consistency Rules. If further determination deems that additional mitigation be taken, the steps of implementation will be outlined at that time. Currently (December 1999) it is assumed that no further mitigation steps are required. Final determination is being sought, and will be amended into this workplan as required.

EAD is addressing wetland concerns by looking at the placement of the remediation system just out side of the designated wetlands zone as delineated during the most recent wetlands survey. This wetlands area was defined by the Air Station, EAD/MCAS Cherry Point. This placement is depicted on Figure 10. At this juncture, the information available suggests that none of the wetlands will be disturbed through execution of this work plan. The Air Station is also conducting an

evaluation to determine the impact and applicability of the Riparian and Coastal Zone Consistency Rules.

An attempt will be made to have a minimal impact on trees and grass areas by using above ground piping and construction for this project. OHM/IT will complete grubbing only as necessary to install piping. Because of the high lead concentrations in this Hot Spot area, minimal soil disturbance is required for construction activities.

5.3 BASELINE SAMPLING

A portable purge and trap gas chronograph (GC) will be used to screen the site for the horizontal extent of the Hot Zone for the treatment system installation. Soil borings with a hand auger will be utilized on a sampling grid to obtain soil samples. The grid will be expanded until the compounds are below the action levels established.

The detection limits for the on-site screening will be less than 1ppm and of the semi-volatile PAH(s), only Naphthalene can only be detected with the field GC system.

The grid sampling will begin at a location approximately 80 feet fast of OU3-7GW and OU3-MW03 and follow the grid proposed in the sampling and analysis plan in Appendix B.

5.4 WELL INSTALLATION AND SOIL BORINGS FOR SAMPLING

5.4.1 Well Installation

Upon completion of site preparation activities, a subcontractor will mobilize to the site to install the AS wells. An OHM/IT hydrogeologist will be on-site during well installation to provide oversight. OHM/IT personnel and drilling crews will be OSHA Health and Safety trained in accordance with 29 CFR 1910.120. A dedicated OHM/IT health and safety officer will be present during drilling to monitor conditions. A total up to 31 AS wells will be installed at the Hot Spot area as shown in Figure 3 based on the results of the baseline field sampling. Each will be advanced to a total depth of 15 feet below land surface (BLS). The wells will be installed using direct push type methods to minimize the production of drill cuttings. No soil samples will be collected. Each well will be headspace tested in the field using a photoionization detector (PID). The hydrogeologist will record all data in his logbook. Field activities are expected to be performed in modified Level D personnel

protective equipment, including hard hats, Tyvek suits, safety glasses, work gloves, and steel toed boots.

All AS wells will be constructed as shown in Figure 5. Specifications include:

1) The well screen will consist of a 3-foot length of 0.010 slot, one-inch inside diameter (ID) schedule 40 PVC and will be installed from 12 to 15 feet BLS.

2) The riser will be constructed of one-inch ID Schedule 80 PVC, and will extend from the top of the screen to the surface.

3) It is likely that the riser pipe will fit very snugly against the lithology. However, if an annular space is created clean quartz sand filter pack will be installed from the bottom of the boring to 10 feet BLS. A two-foot thick layer of 3/8-inch diameter bentonite pellets will be placed above the filter pack. The bentonite will be hydrated and allowed to set for at least 8 hours to form a seal. Once the bentonite has set, a cement grout will be placed from the top of the bentonite seal to the surface.

4) A concrete seal to the surface may be the only surface structure pad will be install if necessary.

5.4.2 System Performance Sampling

5.4.2.1 Groundwater Confirmational Sampling

Groundwater sampling will be performed to confirm remedial progress. The first sampling event will occur just prior to startup to establish a baseline. Then, sampling events will be performed approximately three months after system startup. Sampling will be performed only for the contaminants of concerning benzene and 2-methylnapthalene. The schedule of wells to be samples is noted in the Sampling and Analysis Plan provided in Appendix B.

5.4.2.2 Soil Confirmational Sampling

Verification sampling for soils will consist of two sampling events. The first will be conducted after three months of operation. The second will be conducted when it is believed that sufficient remedial progress has been achieved to meet clean up objectives for the COCs. It is estimated this will be after approximately 15 months of operation. The timeframe will be determined by the results of the three-month soil sampling and progress measured by quarterly groundwater sampling, and system periodic field monitoring.

Four samples will be collected from various places within the Hot Spot area. The exact locations will be based upon analytical results from previous sampling at the site (including the sampling to be conducted during CH2M HILL's monitoring well installation), and on system performance. Direct push sampling equipment will be used to minimize the production of drill cuttings.

At all sampling locations, direct push soil samplers will be advanced to four feet BLS. Soil will be recovered from the entire interval. The hydrogeologist will examine the lithology of each boring and record a description in the field logbook. Samples will be collected for testing from the intervals 2-3 feet and 3-4 feet BLS in each boring. These samples will be headspace tested in the field using a PID. The sample with the highest PID reading from each sample location will be appropriately packaged and shipped with a Chain-of-Custody to a fixed base laboratory for analysis.

5.5 DISTRIBUTION PIPING AND WELL HEAD PIPING

OU 3, Site 07 is currently a restricted area that has been fenced. This area will remain restricted during the life of this project.

AS distribution piping will be installed above ground as indicated in Figure 4. Under no circumstances will trenching occur.

Because this system is considered to be operational for a limited time, each AS well and flow meter panel will be above-grade without any housing as shown in Figure 5 and Figure 7. All piping, valves, and instrumentation will be prefabricated to the greatest extent possible. AS well heads will utilize primarily metal construction. Piping at the well heads will be supported, as necessary, to reduce pipe stress.

5.6 EQUIPMENT COMPOUND INSTALLATION

5.6.1 Electrical Line Construction

To minimize costs associated with operating diesel powered generators; an electrical power drop will be installed. An electrical subcontractor will install new electrical distribution poles and bring in primary power to the compound through the construction of a 12.47 kv aerial power line. Three pole-mounted transformers will deliver 480V, 3-phase, 100-amp service to the system distribution/control panel via an overhead service feeder. Figure 8 presents the main electrical site plan for the utility poles and Figure 9 shows the electrical power distribution details.

5.6.2 Gravel Pad and Access Road Construction

A gravel driveway and gravel equipment pad shall be constructed. The gravel driveway and equipment pad will be sloped to match existing conditions. Flooding protection for the AS equipment will not be provided.

5.6.3 AS System Installation

Complete piping runs will be field installed in accordance with Figure 4. Construction of equipment skids will be performed such that they are level and all operations and maintenance panels are easily accessible.

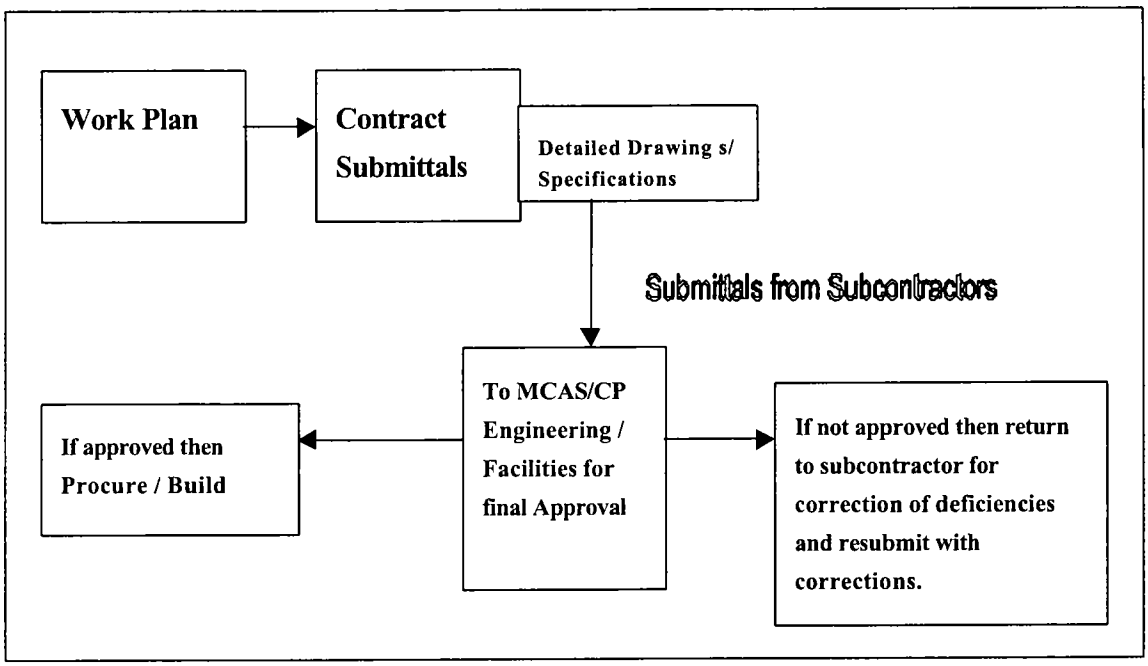
5.6.4 Air Abatement

Air abatement is not scheduled for this project, since there will be no point source discharge. Ground level ambient air quality will be monitored to assure no threat to human health or the environment is occurring.

5.6.5 Controls Installation and Electrical Distribution

The control panel of the Brown and Root pilot SVE Unit is NEMA 4 and is mounted on the SVE skid. Prior to start-up, all electrical systems and equipment will be tested to ensure proper operation.

The electrical subcontractor will install new electrical distribution poles and bring in power to the compound through the construction of a 12.47 kv aerial power lines. Three 15 kva, 480 volt pole-mount transformers will be provided. The NEMA 4 electrical master distribution panel with breakers and the watt-hour meter will be pole mounted as shown in Figure 9. The distribution panel will be approximately twenty-five feet from the equipment compound.



In order to expedite construction and facilitate coordinated efforts on the electrical portion of the system to be installed the above figure depicts the review/approval process. Submittals provided from the selected electrical contractor will be reviewed and approved by MCAS Cherry Point Engineering and Facilities prior to initiating procurement and building activities associated with the electrical portion of the work. The electrical work is subject to approval before the system installation and construction of the associated electrical components can be accomplished. If not approved the electrical subcontractor shall correct the deficiencies in the submittals and resubmit for approval.

5.6.6 Sign Installation and Restoration

Upon completion of all equipment, piping, and electrical installation, signs shall be placed stating "No Unauthorized Entry " into the Hot Spot Area. In areas where grass/vegetation has died or is stressed, replanting or reseeding may be necessary for site restoration.

5.7 SYSTEM START-UP

Site restoration and system start-up and operational activities will begin upon final completion of the equipment, piping, well head and electrical installation. The AS system start-up and optimization will require approximately 5 days. This will include testing, calibration, adjustment, and initial

maintenance of the AS blower. During this time, the system will be placed in full-scale operation. System start-up and optimization activities include:

- Develop, balance, and quantify air injection rates for each of the AS wells
- Test and calibrate equipment
- Ground level VOC emissions will be quantified as per the Sampling and Analysis Plan for air quality and soil gas monitoring
- Perform monitoring well sampling and analysis in accordance with the Sampling and Analysis Plan
- Optimize well flow rates and pressures

5.8 OPERATION AND MAINTENANCE

The sampling and analysis program, which has been developed to monitor the system, will be implemented to document the system performance. This program will include collection and analysis of first quarter soil samples.

Operation and maintenance of the system will be conducted. Personnel will visit the site routinely to monitor system performance and maintain the systems. During each visit, equipment operating parameters and well flow rates and pressures will be logged. Real time monitoring will be correlated to lab data. The system will be optimized for contaminant removal based on real time monitoring. When the system is operating quarterly groundwater sampling will be performed. Please refer to the Sampling and Analysis Plan (*Appendix B*) for a schedule of the analytical parameters to be recorded.

Since the system is a sparge only system, remedial progress monitoring will be performed by indirect means. Monitoring of the soil gas 'relative' concentrations will be conducted, soil gas monitoring samples will be collected from constructed passive gas collection devices. The following table depicts the soil gases to be filed monitored.

Monitor for	Field Method	Frequency
Benzene	Drager Tube	Weekly
2-Methylnapthalene	(TBD) (Drager- or indirect by other means)	TBD
Total VOC's	PID/FID	Weekly
CO_2	CO_2 Meter	Weekly
O_2	O_2 Meter	Weekly

The monitoring for total VOC's, benzene and 2-methylnapthalene will provide for data specific to contaminates and their relative changes in soil gas concentrations. This monitoring of carbon dioxide (CO_2) and oxygen (O_2) will provide for data specific to those compounds that are directly correlative to biologic respiration activity and direct sparging (i.e., addition of oxygen).

6.0 REPORTING

Various reporting requirements are described in the project specifications. The following paragraphs discuss the reports OHM/IT plans to prepare during the course of this project. Any other reports not mentioned in this section have not been deemed applicable to this project.

Electrical System Installation Approval

Prior to construction, electrical construction/installation drawings will be provided for Navy Base and Construction approval.

Environmental Conditions Report

Prior to starting any field activities at the project site, a ROICC, EAD, and OHM/IT representative will tour the site, take photographs and note any existing environmental conditions on or adjacent to the site. This report will be submitted on a contractor's production report form (Appendix D) with attachments as may be necessary.

Daily Reporting

During construction activities, OHM/IT will prepare and submit daily Contractor's Production Reports and a Contractor's Quality Control Report each day that field activities are conducted or material is delivered for this project. It is anticipated that the site supervisor will perform the role of site QC manager during all periods when the designated site QC manager is not present at the job site.

As-Built Drawings

The two sets of contract drawings will be maintained at OHM/IT's field offices at Cherry Point. These drawings will be updated as required for any deviation that has occurred. Upon completion of field activities, all changes will be incorporated into the record drawings for the project. Record drawings will accompany the submission of the Remedial Action Report. CADD drawings of electrical installation/system drawings will be placed on Cherry Point web page.

Monthly Status Reports

Monthly status reports in the form and content previously approved by LANTDIV will be submitted by the Program Office. Sections regarding progress, forecast, costs incurred, committed, delivery order modifications, waste tracking, government materials tracking will be included. Schedules will be updated and variances explained.

Operation and Maintenance Manual

An operation and maintenance manual will be prepared for the integrated remedial system. It will include sections detailing operating instructions for the various equipment components and preventative maintenance requirements for the system. Another section will deal with corrective maintenance and relevant portions of the site safety plan that will reference safety precautions to be employed while performing system maintenance.

Remedial Action Report

After start-up, OHM/IT will supply a Remedial Action Report (RAR), which will fully document the construction of the remedial system. Schedule for submission will follow contract requirements and MCAS partnering team schedule. This report will contain sections discussing a summary of the action with subsections dealing with submittals, sampling, well construction details and a summary of the field daily reports. Subsequent sections will include a final health and safety report, a summary of record documents, a discussion of field changes and contract modifications and a quality control summary. Appendices to the report will contain as-built drawings, photographic documentation and equipment warranties or guarantees, a copy of the testing log, field test reports, the rework items list and the daily QC reports will also be appended to the RAR.

7.0 REFERENCES

LANTDIV. *Scope of Work: Contract N62470-97-D-5000, Task Order 010, RAC Action for OU-3, Site 07, SVE System for Soil Hot Spot Treatment, MCAS Cherry Point, North Carolina,* April 23, 1998.

OHM Remedial Services Corp., *Proposal: Contract N62470-97-D-5000, Delivery Order 010, Modification #1, OU-3, Site 07, SVE Soil Hot Spot Treatment, MCAS Cherry Point, North Carolina*, September 17, 1998.

Brown & Root Environmental, *Remedial Investigation, Operable Unit 3 for Marine Corps Air Station, Cherry Point, North Carolina*, December 1996a.

Brown & Root Environmental, *Feasibility Study Report for Operable Unit 3, Marine Corps Air Station, Cherry Point, North Carolina,* December 1996b.

Brown & Root Environmental, *Proposed Remedial Action Plan for Operable Unit 3, Marine Corps Air Station, Cherry Point, North Carolina,* June 1996.

Brown & Root Environmental, *Interim Measure Record of Decision for Report for Operable Unit 3, Marine Corps Air Station, Cherry Point, North Carolina,* December 1996.

Brown & Root Environmental, April 1998a. *Master Quality Assurance Plan for Marine Corps Air Station Cherry Point, North Carolina.*

Brown & Root Environmental, *Master Field Sampling Plan for Marine Corps Air Station Cherry Point, North Carolina*, April 1998b.

CH2MHILL, *Draft Remedial Design Work Plan Baseline Round of Long-Term Monitoring Operable Unit 3 for Marine Corps Air Station Cherry Point, North Carolina*, November 1998.

Halliburton NUS Corporation, *Final RCRA Facilities Investigation - 21 Units, Marine Corps Air Station, Cherry Point, North Carolina,* June 1993.

Halliburton NUS Corporation, *Technical Direction Memorandum - 10 Units Marine Corps Air Station Cherry Point, North Carolina,* August 1993.

Naval Facilities Engineering Service Center, *Intrinsic Bioremediation of Petroleum Hydrocarbons, Technical Report TM-2185-ENV, Batelle,* June 1996.

NUS Corporation, *Remedial Investigation Interim Report,* October 1988.

U.S. Environmental Protection Agency, *Draft EPA Region 4 Suggested Practices for Evaluation of a Site For Natural Attenuation (Biological Degradation) of Chlorinated Solvents, Version 3.0*, November 1997.

U.S. Environmental Protection Agency, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*, Office of Solid Waste and Emergency Response, Directive 9200.4-17, November 1997

Appendix A

Health and Safety Plan

SITE SPECIFIC HEALTH AND SAFETY PLAN FOR CONSTRUCTION AND OPERATION OF THE AIR SPARGE/ REMEDIATION SYSTEM AT OPERABLE UNIT 03, SITE 7 MCAS CHERRY POINT, NORTH CAROLINA

Submitted to:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000
Delivery Order 0100

Submitted by:

OHM Remediation Services Corp.
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January 1999, REV 6/99
OHM Project #920694

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1.0 SITE HISTORY/SCOPE OF WORK

This Site Specific Health and Safety Plan (SSHASP) establishes the policies and procedures that protect workers and the public from potential hazards posed by work at this site. The health and safety procedures referenced in this SSHASP are a part of OHM's Corporate Health and Safety Procedures Manual for the Navy Atlantic Division (LANTDIV). The US Army Corps of Engineers (USACE) Safety and Health Requirements Manual (EM 385-1-1, September 1996) also applies to project activities. This SSHASP and the corporate H&S Procedures Manual comply with the Accident Prevention Guidelines in EM 385-1-1. Should a conflict between these requirements arise, the most stringent requirement will be followed. A copy of OHM's Corporate Health and Safety Manual for LANTDIV and the USACE Safety and Health Requirements Manual will be at the project site.

This SSHASP has been developed for United States Navy, LANTDIV, Delivery Order entitled, Construction and Operation of the Air Sparge Remediation System, Contract N62470-97-D-5000. OHM will install thirty-one vertical air sparge wells to recover volatile hydrocarbons.

1.1 SITE HISTORY

Site 7 was an incinerator and open burning ground that encompassed approximately 5 acres. Site 7 is bounded by the MCAS Cherry Point Sewage Treatment Plant to the south, Luke Rowe's Gut to the north, and Slocum Creek to the west. The former incinerator was located adjacent to the Luke Rowe's Gut in the eastern portion of the site. The open burning area lies on the southern bank of the confluence of Luke Rowe's Gut and Slocum Creek. From 1949 until 1955, waste petroleum, oil and lubricants (POL), Naval Aviation Depot (NADEP) wastes, and other wastes such as municipal refuse were burned either in the incinerator or on the ground adjacent to the incinerator. No records were kept as to the types or quantities of wastes disposed of at this unit. Fly ash was also disposed of as this site but is mixed with other waste/fill material. The fly ash is believed to have originated from the incinerator. The site is currently vegetated with grass, brush, and trees, with the heaviest vegetation along the stream banks.

1.2 SCOPE OF WORK

The principal tasks to be conducted are listed below:

- Clear surface vegetation for drill rig access
- Well installation via pneumatic punch
- Installation of aboveground header system and piping for AS system
- AS system Operation
- Collect vapor and liquid sampling
- Equipment decontamination

These activities have been analyzed for potential hazards for which control measures are provided in Section 3.4 Job Safety Analysis.

FIGURE 1.1
SITE MAP

2.0 KEY PERSONNEL AND MANAGEMENT

The Project Manager (PM), Site Supervisor (SS), Health and Safety Manager (HSM), project Certified Industrial Hygienist (CIH) and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and for implementing this HASP. The supervisor's and employee safety responsibilities are detailed in SOP's 1-6 and 1-7. The following summarizes the health and safety responsibilities of the site management.

2.1 PROJECT SAFETY RESPONSIBILITIES

The PM has the overall responsibility for the project and to assure that the requirements of the contract are attained in a manner consistent with the HASP requirements. The PM will coordinate with the SS and the SSO to assure that the work is completed in a manner consistent with the HASP. The SS is responsible for field implementation of the HASP. The SS will be the main contact in any on-site emergency situation and will insure off-site emergency agencies have been contacted prior to the start of work. The SS will act as the SSO when the assigned SSO is not on the project site. The SSO is authorized to administer this HASP. The SSO is authorized to stop work when an imminent health or safety risk exists. The HSM and CIH are responsible for reviewing the HASP and ensuring that the HASP is complete and accurate. The HSM and CIH also provide technical and administrative support for the LANTDIV Health and Safety Program and will be available for consultation when required. Each employee is responsible for personal safety as well as the safety of others in the work area.

2.2 EMPLOYEE SAFETY RESPONSILIBITY

Each employee is responsible for personal safety as well as the safety of others in the work area and is expected to participate fully in the ***Safety Improvement Process***, particularly the Safety Observation Program. The employee will use all equipment provided in a safe and responsible manner as directed by the SS. All OHM personnel will follow the policies set forth in the OHM Health and Safety Procedures Manual with particular emphasis on the OHM "Cardinal Safety Rules". Site personnel concerned with any aspect of health and safety shall bring it to the attention of the SS/SSO. If not satisfied, they should contact the Program CIH. All project personnel have the authority to stop work if, in their judgement, serious injury could result from continued activity. The SS and the SSO shall be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions.

2.3 KEY SAFETY PERSONNEL

The following individuals share responsibility for health and safety at the site:

Project Manager	Taylor Sword 757 363-7190 (office)
ROICC/NTR	Karen Boyd 252 466-4731 (office)
RPM	Lance Laughmiller 757 322-4811 (office)

Site Supervisor	Tom Cherrix 252 444-8200 (site phone)
Site Safety Officer	Alison Harwood 252 444-8200 (site phone)
Deputy Program Manager for LANTDIV	David Leadenham 609-588-6370 (office)
Program Manager for LANTDIV	John P. Franz, P.E. 609-588-6477 (office)
Health and Safety Manager	Robert Brooks, CSP 609-588-6423 (office)
Project CIH	Paul Lawless, CIH 609-588-6391 (office)
Vice President, Health & Safety	Warren Houseman, CIH 412-858-3741 (office)

3.0 JOB SAFETY ANALYSIS

This section outlines the potential chemical and physical hazards which workers may be to during work on this project. The assessment of chemical and physical hazards in this section is based on the information provided in D.O. 0010. Table 3.1 lists significant contaminants identified at the site. A list of chemicals which may be brought to the site for which an MSDS is necessary is included in Appendix A.

3.1 CHEMICAL HAZARDS

Work at this site may result in exposure to Benzene, Di-n-butylpthalate, Dioxins, Ethyl benzene, Methyl chloride, 1-Methyl naphthalene, Naphthalene, Phenanthrene, Xylenes, Lead, and Zinc. Workers will undergo personal monitoring if particulate action levels are exceeded to determine actual exposure levels, confirm PPE levels and requirements for biological monitoring. The list below is a partial listing of the contaminants at the Operable Unit 03, Site 7 site. These substances pose the most potential for chemical exposure to site workers

CHEMICAL	EXPOSURE ROUTES	PEL/TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
Benzene	Skin, eye, inhalation, ingestion	0.5ppm SKIN STEL 2.5ppm	• Prolonged skin contact with Benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. A human carcinogen. • Extremely flammable, keep sources of ignition away. Incompatible with fluorides, chlorides, oxygen, permanganates, acids and peroxides.
Dioxins	Skin, Inhalation	0.2ng/m3	• Shortness of breath, headaches, fatigue, severe muscle pain,; eye irritation, chemical burns; possible human carcinogen; effects liver, nervous and endocrine systems. • Relatively sable toward heat, acids and alkalis. It is changed chemically when exposed in isooctane or n-octanol to UV light.
Di-n-butylpthalate	Skin, eye, inhalation, ingestion	5mg/m3 TWA	• It is a low acute oral toxic. Its low vapor pressure makes it a low inhalation hazard unless heated. Liquid contact with eyes can be irritating and painful. Target organs include the respiratory tract and GI tract. • This material is combustible and can react vigorously with oxidizing agents. When heated with chloride, for example, it can explode. Strongly acidic or alkaline materials can hydrolyze the ester to butyl alcohol andphthalic acid
Ethyl benzene	Skin, eye, inhalation, ingestion	100ppm STEL 125ppm	• An irritant to the eyes and upper respiratory tract; headache, nausea, vomiting, dizziness, intoxication; a CNS depressant. • Reacts with strong with oxidizers, flammable liquids, releases toxic gases during combustion.
Methyl chloride	Skin, eye, inhalation, ingestion	100ppm TWA	• Causes dizziness; nausea; vomiting; vis disturbance, stagger; slurred speech; convulsions; coma; liver, kidney damage; liquid: frostbite; reproductive teratogenic effects; potential occupational carcinogen. • Ethylene, chemically active metals such as sodium, potassium, powdered aluminum, zinc, and magnesium alloys can explode on contact with interhalogens such as bromine trifluoride or bromine pentafluoride; and hydrolyzes with water to form hydrochloric acid and methanol.

CHEMICAL	EXPOSURE ROUTES	PEL/TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
2-Methyl naphthalene	Skin, eye, inhalation, ingestion	N/E	• A skin irritant • Reacts with acids and oxidizers; emits acrid somke and irritating fumes.
Naphthalene	Skin,eye, inhalation, ingestion	10ppm PEL STEL 15ppm	• Over exposure may cause headache, nausea, diaphoresis, hematuria, fever, anemia, liver damage, vomiting, convulsions, and coma. • Flammable when exposed to heat or flame, reacts with oxidizing materials. Reacts violently with CrO3; aluminum chloride = benzoyl chloride.
Phenanthrene	Skin,eye, inhalation, ingestion	0.2mg/m3	• A human photosensitizer; a skin and eye irritant; a possible carcinogen. • A combustible substance; reacts vigorously with oxidizers; releases acrid smoke, toxic gas during combustion.
Xylene	Skin,eye, inhalation, ingestion	100 ppm	• Dizziness, excitement, drowsiness, incoherent, staggering walk; eye, nose, throat irritation; nausea, vomiting, dermatitis. • Flammable; reacts with strong oxidizers.
Lead	Inhalation, ingestion	0.05mg/m3	• Weakness, insomnia; loss of appetite, loss of weight, abdominal pain; anemia; tremors; weakness of wrists/ankles; kidney damage; low blood pressure. • Incompatible with strong oxidizers, hydrogen peroxide and acids.
Zinc	Inhalation, ingestion	10.0mg/m3	• A skin, eye, and respiratory irritant; a nuisance dust; health effects primarily from fume inhalation, metal fume fever; chromate's of zinc are human carcinogens

The following general symptoms may indicate exposure to a hazardous chemical. Personnel will be removed from the work site and provided immediate medical attention if the following symptoms occur:

- Dizziness or stupor
- Nausea, headaches, or cramps
- Irritation of the eyes, nose, or throat
- Euphoria
- Chest pains and coughing
- Rashes or burns

3.2 HAZARD COMMUNICATION

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are transmitted (communicated) according to 29 CFR 1926.59 to all OHM personnel and OHM subcontractors. Hazard communication will include the following:

3.2.1 CONTAINER LABELING

OHM personnel will ensure that all drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.

3.2.2 MATERIAL SAFETY DATA SHEETS (MSDSs)

There will be an MSDS located on site for each hazardous chemical known to be used on site. All

MSDSs will be located in Appendix A of the SHSP. The site safety plan can be found in the project office trailer.

3.2.3 EMPLOYEE INFORMATION AND TRAINING

Training employees on chemical hazards is accomplished through on ongoing corporate training program. Additionally, chemical hazards are communicated to employees through daily safety meetings held at OHM field projects and by an initial site orientation program.

At a minimum, OHM and related subcontractor employees will be instructed on the following:

- Chemicals and their hazards in the work area
- How to prevent exposure to these hazardous chemicals
- What the company has done to prevent workers' exposure to these chemicals
- Procedures to follow if they are exposed to these chemicals.
- How to read and interpret labels and MSDSs for hazardous substances found on OHM sites
- Emergency spill procedures
- Proper storage and labeling

Before any new hazardous chemical is introduced on site, each OHM and related subcontractor employee will be given information in the same manner as during the safety class. The site supervisor will be responsible for seeing that the MSDS on the new chemical is available for review by on site personnel. The information pertinent to the chemical hazards will be communicated to project personnel.

Morning safety meetings will be held and the hazardous materials used on site will be discussed. Attendance is mandatory for all on site employees.

Refer to Appendix A of the site safety plan to find a list of hazardous chemicals anticipated to be brought to the site and the corresponding MSDSs for these chemicals.

3.3 PHYSICAL HAZARDS

To minimize physical hazards, OHM has developed standard safety protocols which will be followed at all times. Failure to follow safety protocols will result in removal of an employee from the site and appropriate disciplinary actions.

The SS and SSO will observe the general work practices of each crew member and equipment operator, and enforce safe procedures. Work areas will be inspected by the crew leaders, SS and SSO. All hazards will be corrected in a timely manner. A variety of physical hazards may be encountered during work activities at this site. Job Safety Analyses will be developed for each principal activity and will identify all major hazards to which employees may be exposed. Hard hats, safety glasses, and steel-toe safety boots are required in all areas of the site. Site-specific hazards and all necessary precautions will be discussed at the daily safety meetings. **The Health and Safety Procedures Manual for LANTDIV will be maintained at the project site as a reference document.**

Physical hazards include safety and environmental hazards. The following physical hazards may be present during project activities:

- Heat stress
- Cold stress
- Biological hazards (Poison Ivy ,Ticks, Lyme's Disease)
- Manual lifting/back strain
- Noise
- Fire, Explosion
- Vehicle Traffic

Heat stress prevention procedures will be implemented according to SOP 3-4. Cold stress prevention procedures will be implemented according to SOP 3-5. Personal noise exposures will be controlled by instituting the Hearing Conservation Program, according to SOP 3-3.

3.4 TASK-SPECIFIC JOB SAFETY ANALYSES

This section of the Site-Specific HASP provides a breakdown of the hazards and control measures for each principal task. These Job Safety Analyses are general in nature and must be made project specific by the Site Supervisor prior to each task. The Job Safety Analyses will be field checked by the supervisor on an ongoing basis and revised as necessary. All revisions will be communicated to the work crew.

JOB SAFETY ANALYSIS FOR CLEARING OF SURFACE VEGITATION FOR DRILL RIG ACCESS				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Clearing	Struck By/ Against Heavy Equipment	• Wear reflective warning vests worn when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals	Warning vests, Hard hat, safety glasses, Steel toe work boots	
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris • Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Eye Injuries	• Wear face shield, goggles when operating powered clearing / grubbing equipment	Face shield, goggles	
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use • Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation	Leather gloves	
	Insect/ Snake Bites	• Review injury potential and types of snakes with workers • Avoid insect nests areas, likely habitats of snakes outside work areas • Emphasize The Buddy System where such injury potential exists	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	

JOB SAFETY ANALYSIS FOR CLEARING OF SURFACE VEGITATION FOR DRILL RIG ACCESS

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Clearing (cont.)		• Use insect repellant, wear PPE to protect against sting/bite injuries		
	Contact Dermatitis	• Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants • Identify and review poisonous plants with workers	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers (See Section 5.0 HASP)	
	Operations of power clearing tools (brush saws, weed wackers...)	• Wear eye, face, hand & hearing protection when operating power clearing equipment • Shut-off / idle power tools walking between work areas • Store flammable liquids in well ventilated areas, away from work areas • Shut off equipment during re-fueling • Prohibit smoking while operating clearing equipment • Provide ABC (or equivalent) fire extinguishers for all work	Face shield, goggles, cloth gloves, ear plugs, Steel toe work boots	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5 • Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

JOB SAFETY ANALYSIS FOR CLEARING OF SURFACE VEGITATION FOR DRILL RIG ACCESS				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Clearing (cont.)	Fires	• Eliminate sources of ignition from the work area • Prohibit Smoking • Provide ABC (or equivalent) fire extinguishers for all flammable storage areas, powered cutting equipment re-fueling areas, fuel powered generators and compressors • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers • Enforce use of approved flammable liquid safety cans • Post "NO SMOKING" signs • Store combustible materials away from flammables • Allow chainsaw to cool off before re-fueling • Prohibit chainsaw startup in re-fueling areas	Portable fire extinguishers	

JOB SAFETY ANALYSIS FOR WELL INSTALLATION VIA PNEUMATIC PUNCH

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Well Installation	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the drilling area • Restrict entry to the work area to authorized personnel during drilling activities • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, Goggles, Face shield, steel toe work boots	
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	Underground/ Overhead Utilities	• Identify all utilities around the site before work commences • Cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance		
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)	Ear plugs	Sound Level Meter

JOB SAFETY ANALYSIS FOR WELL INSTALLATION VIA PNEUMATIC PUNCH

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Well Installation (cont)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Caught In/ Between Moving Parts	• Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar injuries • Assure guards are in place to protect from these parts of equipment during operation • Provide and wear proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service		
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, drilling overburden, debris and other materials • Mark, identify, or barricade other obstructions		
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin	Tyvek coveralls, nitrile gloves, latex or neoprene boots (see Section 5.0 HASP)	PID, Mini-RAM (total dust)

JOB SAFETY ANALYSIS FOR WELL INSTALLATION VIA PNEUMATIC PUNCH

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Well Installation (cont)	Fire/ Explosion	• Test well-head atmosphere with combustible gas meter • Eliminate sources of ignition from the work area • Prohibit smoking • Provide ABC (or equivalent) fire extinguishers in all work areas, flammable storage areas, generator and compressor locations • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers • Post "NO SMOKING" signs • Store combustible materials away from flammables • Store all compressed gas cylinders upright, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet minimum	Portable fire extinguishers	LEL/O_2
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures #3-4, 3-5 • Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

JOB SAFETY ANALYSIS FOR INSTALLATION OF ABOVE GROUNG HEADER SYSTEM AND PIPING FOR AS SYSTEM

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Header Assembly and Pipe Installation	Struck by/ Against Heavy Equipment	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the work area • Restrict entry to the work area to authorized personnel • Wear hard hats, safety glasses with side shields, and steel-toe safety boots • Understand and review hand signals	Warning vests, Hard hat, Safety glasses, steel toe work boots	
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5 • Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

JOB SAFETY ANALYSIS FOR INSTALLATION OF ABOVE GROUNG HEADER SYSTEM AND PIPING FOR AS SYSTEM

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Header Assembly and Pipe Installation (cont)	Inhalation and Contact with PVC Primers and Glues	• Provide workers proper skin, and eye protection based on the exposure hazards present Use only in a well ventilated area. • Review hazardous properties of site contaminants with workers before operations begin	Nitrile gloves, goggles	
	Fire/ Explosion	• Test well-head atmosphere with combustible gas meter • Eliminate sources of ignition from the work area • Prohibit smoking • Provide ABC (or equivalent) fire extinguishers in all work areas, flammable storage areas, generator and compressor locations • Store flammable liquids in well ventilated areas • Prohibit storage, transfer of flammable liquids in plastic containers • Post "NO SMOKING" signs • Store combustible materials away from flammables • Store all compressed gas cylinders upright, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet minimum	Insulated Clothing (subject to ambient temperature)	LEL/O2

JOB SAFETY ANALYSIS FOR AS OPERATATION

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
AS System Operation	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, debris and construction materials • Mark, identify, or barricade other obstructions		
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter
	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the drilling area • Restrict entry to the work area to authorized personnel during drilling activities • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times • Understand and review hand signals	Warning vests, hard hat, safety glasses, goggles and face shield, steel toe work boots	
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin • Monitor breathing zone air to determine levels of contaminants	Polyethylene-coated Tyvek coveralls, PVC gloves, neoprene or latex boots (See Section 5.0 HASP)	LEL/O_2, PID

JOB SAFETY ANALYSIS FOR AS OPERATATION

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
AS System Operation (cont)	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5 • Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	

JOB SAFETY ANALYSIS FOR VAPOR AND LIQUID SAMPLING

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Vapor and Liquid Sampling	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris • Mark, identify, or barricade other obstructions		
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin • Monitor breathing zone air to determine levels of contaminants	Poly-coated Tyvek coveralls, latex or neoprene boots, nitrile gloves, goggles and splash shield (see Section 5.0 HASP)	LEL/O_2, PID
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5 • Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

JOB SAFETY ANALYSIS FOR EQUIPMENT DECONTAMINATION

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Equipment Decontamination	Slips, Trips, Falls	• Clear walkways, work areas of equipment, vegetation, tools and debris • Mark, identify, or barricade other obstructions		
	Struck by/Against Heavy Equipment, Protruding Objects	• Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals	Warning vests hard hat safety glasses, goggles and face shield, steel toe work boots	
	Inhalation and Contact with Hazardous Substances, & Splashes	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin • Wear hard hats, safety glasses with side shields, or goggles with splash shields and steel-toe safety boots	PVC rain suit or Tyvek coveralls, nitrile or latex gloves, neoprene or latex boots (See Section 5.0 HASP)	
	Burns	• Wear proper gloves, face shield/safety goggles, shin and toe guards, and splash suits to protect workers from skin burns and injury when operating laser (high pressure washers)	Goggles and face shield, shin and toe guards	
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		

JOB SAFETY ANALYSIS FOR EQUIPMENT DECONTAMINATION

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Equipment Decontamination (cont)	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use	Leather gloves	
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5 • Provide fluids to prevent worker dehydration	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

4.0 WORK AND SUPPORT AREAS

To prevent migration of contamination from personnel and equipment, work areas will be clearly specified as designated below prior to beginning operations. Each work area will be classified in accordance with NIOSH/OSHA/USCG/EPA'S document *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*. Each work area will be clearly identified using signs or physical barriers. The following work zones will be established according to SOP 5-3 and will be delineated on the site map:

- Exclusion Zone
- Contamination Reduction Zone
- Support Zone

A log of all personnel visiting, entering or working on the site shall be maintained in the main office trailer location. No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120(e), (f). Visitors will attend a site orientation given by the SSO and sign the HASP.

The following are standard safe work practices that apply to all site personnel and will be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, smoking is prohibited in the EZ/CRZs.
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco and smoking.
- A buddy system will be used. Hand signals will be established to maintain communication.
- During site operations, each worker will consider himself as a safety backup to his partner. Off-site personnel provide emergency assistance.
- Visual contact will be maintained between buddies on site when performing hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and medical surveillance certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SSO or the SS, will be immediately dismissed from the site.
- Proper decontamination procedures must be followed before leaving the site.
- All employees and visitors must sign in and out of the site.

5.0 PROTECTIVE EQUIPMENT

This section specifies the levels of personal protective equipment (PPE) which are or may be required for each principal activity performed at this site. All site personnel must be trained in the use of all PPE utilized. The PPE program contained in SOP 4-1 will be applied to project activities. The use and maintenance of respiratory protection is specified in SOP 4-2.

5.1 ANTICIPATED PROTECTION LEVELS

The following protection levels have been established for the site work activities based on the information provided in Delivery Order 0010, concerning the levels of site contaminants and the scope of work. Results of site air monitoring and visual inspection of the work activities may indicate the need for changes in PPE level(s).

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Mobilization/ Site Setup	Level D	---	No special requirements	None	Hard-hat, Steel-toe work boots, safety eyewear (safety glasses with side shields or goggles and face shield). Work gloves hearing protection >85 dBA
Clear surface vegetation for drill rig access	Level D+	___	Tyvek coveralls	None	Hard-hat, Steel-toe work boots, eyewear (safety glasses with side shields or goggles and face shield). Work gloves hearing protection >85 dBA
Well installation via pneumatic punch	Level D+	Level C	Tyvek covralls, inner sample gloves, nitrile gloves, latex booties	Initial: None Upgrade:Full-face air purifying respirator	Hard-hat, Steel-toe work boots latex gloves, latex boots and hearing protection >85 dBA
AS system operation	Level D	---	No special requirements	None	Hard-hat, Steel-toe work boots, safety eyewear (safety glasses with side shields or goggles and face shield). Work gloves hearing protection >85 dBA

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Collect vapor samples	Level D+	Level C	Tyvek covralls, inner sample gloves, nitrile gloves, latex booties	Initial: None Upgrade:Full-face air purifying respirator	Hard-hat, Steel-toe work boots, eyewear (safety glasses with side shields or goggles and face shield). Work gloves hearing protection >85 dBA
Equipment contamination	Level D+	---	PVC rain suit or Tyvek coveralls	None	Hard-hat, Steel-toe work boots, goggles/face shield, latex gloves, latex boots and hearing protection >85 dBA
General SZ Activities	Level D	---	None	None	Hard-hat, Steel-toe work boots, Safety glasses

5.2 PROTECTION LEVEL DESCRIPTIONS

This section lists the minimum requirements for each protection level. Modification to these requirements may have been noted above.

5.2.1 LEVEL D

Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots
- Work clothing as prescribed by weather

5.2.2 MODIFIED LEVEL D

Modified Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots
- Nitrile, neoprene, latex or PVC overboots
- Outer nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)
- Tyvek coverall [Polyethylene-coated Tyveks required when workers have a potential to be exposed to contaminated liquids or sludges.]

5.2.3 LEVEL C

Level C consists of the following:

- Full-face, air-purifying respirator with appropriate cartridges
- Hooded Tyvek Coveralls [Polyethylene-coated Tyveks required when workers have a potential to be exposed to contaminated liquids or sludges].
- Hard hat
- Steel-toed work boots
- Nitrile, neoprene, latex or PVC overboots
- Nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)

5.3 AIR-PURIFYING RESPIRATORS

A NIOSH approved full face respirator with appropriate air purifying cartridges will be used for level C work. The crew members working in Level C will wear respirators equipped with air-purifying cartridges approved for: organic vapors <1,000 ppm; chlorine gas 10 ppm; hydrogen chloride <50 ppm; sulfur dioxide <50 ppm; dusts, fumes and mists with a TWA <0.05 mg/m^3; asbestos-containing dusts and mists and radionuclides.

6.0 DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

6.1 PERSONNEL DECONTAMINATION

Decontamination procedures will ensure that material which workers may have contacted in the EZ does not result in personal exposure and is not spread to clean areas of the site. This sequence describes the general decontamination procedure for Level Modified (D+) or Level C. The specific stages will vary depending on the site, the task, the protection level, etc.

6.1.1 LEVEL D DECONTAMINATION

1. Go to end of EZ
2. Remove and discard latex booties
3. Remove outer gloves and discard
4. Cross into CRZ (dirty side of respirator wash area)
5. Remove protective suit (polycoated/regular tyvek)
6. Remove inner sample gloves and discard
7. Wash face and hands

6.1.2 LEVEL C DECONTAMINATION

1. Go to end of EZ
2. Wash outer boots (Tingley or Robars) and stage to let dry; or
b. Remove and discard latex booties
3. Remove outer gloves and discard
4. Remove outer suit (Saranex/polycoated/regular Tyvek)
5. Remove outer sample gloves and discard
6. Cross into CRZ (dirty side of respirator wash area)
7. Remove inner suit and discard, (if applicable)
8. Remove and wash respirator (4 stages)
   a. Soap and water solution
   b. First rinse
   c. Disinfect respirator (1 cap full of bleach to 1 gallon of water)
   d. Final rinse
   e. Hang respirator to dry
   f. Remove inner sample gloves and discard
   g. Wash face and hands

6.1.3 SUSPECTED CONTAMINATION

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination facility. Here the worker will remove clothing, shower, don clean clothing, and immediately be taken to the first-aid station. Medical attention will be provided at determined by the degree of injury.

6.1.4 PERSONAL HYGIENE

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face.

6.2 EQUIPMENT DECONTAMINATION

All contaminated equipment will be decontaminated before leaving the site. Decontamination procedures will vary depending upon the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steaming the exterior of the equipment. Personnel performing this task will wear the proper PPE as prescribed by the SSO.

6.3 DISPOSAL

All decontamination liquids and disposable clothing will be treated as contaminated waste unless determined otherwise by accepted testing methods. Wastes will be disposed of according to state and federal regulations.

7.0 AIR MONITORING

Air monitoring will be conducted in order to characterize personnel exposures and fugitive emissions from site contaminants. Principal contaminants of concern are listed in Section 3.0 of this HASP. The target compounds selected for air monitoring purposes for this site include Benzene, Naphthalene and Lead. Results of air monitoring will be used to ensure the proper selection of protective clothing and equipment, including respiratory protection, to protect on-site personnel and off-site receptors from exposure to unacceptable levels of site contaminants. Descriptions of air monitoring strategies, procedures and equipment are provided below. Modification of this plan, including additional monitoring, may be considered as judged necessary by the Program CIH, in conjunction with the HSM and SSO.

7.1 WORK AREA AIR MONITORING

Work area air monitoring at the Operable Unit 03, Site 7 will include direct reading methods as well as integrated sampling strategies. Air monitoring will be conducted during soil excavation, transportation and staging activities.

7.1.1 DIRECT READING AIR MONITORING

If any soil excavation, transportation and staging activities are required, direct reading air monitoring will be performed in the EZ to determine exposure to workers. A PID meter will be used to monitor for toxic vapors. A mini-RAM will be used to monitor for air borne particulates. A summary of air monitoring information is provided in the table below.

Monitoring Device	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	Action
PID	EZ Excavation/ staging area Equipment Operator (EO), Recovery Technician (RT)	Periodic during excavation, transportation and staging activities	< 1 ppm*	Level D+
			>1 ppm Benzene present	Test for Benzene Level C
			0-5ppm with no Benzene present	Level D+
			>5 ppm* With no Benzene present	Level C
			5-500 ppm*	Level B
			>500 ppm*	Level A
Mini-Ram (total dust)	EZ Excavation/ staging area EO, RT	4 times per day for 5 minutes during excavation and staging activities	< 5.0 mg/m^3 (TWA)	Level D
			5.0 mg/m^3 - 10.0 mg/m^3 (TWA)	Level C
			> 10.0 mg/m^3 (TWA)	Level B

*Sustained levels above background for 5 minutes

7.2 INSTRUMENTATION

The following is a description of the air monitoring equipment to be used at this site.

7.2.1 PHOTOIONIZATION DETECTOR (PID)

7.2.1.1 Type And Operational Aspects

PID Model PI 101 or equivalent

- Principle of Operation

  Ionization potential (IP) - The energy required to remove the outermost electron from a molecule; measured in electron volts (eV); characteristic property of a specific chemical.

  Photoionization - Using ultraviolet (UV) light to remove the outermost electron from a molecule.

  Energy of UV light (10.2, 9.5, 11.7 eV) must be equal to or greater than the IP to photoionize the molecule.

  Fan or pump is used to draw air into the detector where the contaminants are exposed to a UV light source (lamp).

  Ions are collected on a charged plate and produce a current directly proportional to the number of ionized molecules; current is amplified and displayed on the meter.

7.2.1.2 Calibration Method/Frequencies

The PID Model PI 101 is designed for trace gas analysis in ambient air and is calibrated at HNU with certified standards of benzene, vinyl chloride, and isobutylene. Other optional calibrations are available (e.g., ammonia, ethylene oxide, H_2S, etc.).

OHM will use a PID with a 10.2 eV lamp. This lamp has been determined to be most responsive to the contaminants on site. Optional probes containing lamps of 9.5 and 11.7 eV are interchangeable in use within individual read-out assemblies for different applications.

The approximate span settings for the probe that would give different readings of the amounts of trace gas of a particular species in a sample are based upon the relative photoionization sensitivities of various gases twice daily (beginning and end of shift).

It is recommended that calibration be checked twice each day (beginning and end of shift). The SSO will record and log such calibration information into an air monitoring notebook.

7.2.1.3 Preventative Maintenance

Maintenance of the PID Model PI 101 consists of cleaning the lamp and ion chamber, and replacement of the lamp or other component parts or sub-assemblies.

7.2.2 PORTABLE TOTAL DUST MONITOR

7.2.2.1 Type And Operational Aspects

Real-Time Aerosol Monitor (Mini-RAM Model PDM-3 and Model Pr100 Data Ram)

- Principle of Operation

  Detection of light in the near infrared region back-scattered to a sensor (photovoltaic detector) by airborne particulate in a sensing volume

  The higher the dust concentration the more back-scattering of light to the sensor, resulting in increased readings

  Device calibrated at the factory against an air sampling filter/gravimetric analysis reference method

7.2.2.2 Calibration Methods/Frequencies

There is no calibration method or procedure for calibrating the Mini-RAM monitor. However, it is recommended that the Mini-RAM monitor be re-zeroed once a week. During a zero check, the sampled air passes through the purge air filter and dryer to effect a self-cleaning of the optical chamber.

7.2.2.3 Preventative Maintenance

Maintenance of the Mini-RAM consists of replacement of filters and desiccant; battery replacement; and cleaning of the optical detection assembly.

7.3 AIR MONITORING LOG

The SSO will ensure that all air-monitoring data is logged into a monitoring notebook. Data will include instrument used, wind direction, work process, etc. The OHM Project CIH and/or HSM may periodically review this data.

7.4 CALIBRATION REQUIREMENTS

The PID will be calibrated daily before and after use. A log will be kept detailing date, time, span gas, or other standard, and name of person performing the calibration.

7.5 AIR MONITORING RESULTS

Air monitoring results will be posted for personnel inspection, and will be discussed during morning safety meetings.

8.0 EMERGENCY RESPONSE

8.1 PRE-EMERGENCY PLANNING

Prior to engaging in construction/remediation activities at the site, OHM will plan for possible emergency situations and have available adequate supplies and manpower to respond. In addition site personnel will receive training during the site orientation concerning proper emergency response procedures.

The following situations would warrant implementation of the Emergency Response and Contingency Plan (ERCP):

Fire/Explosion	• The potential for human injury exists. • Toxic fumes or vapors are released. • The fire could spread on site or off site and possibly ignite other flammable materials or cause heat-induced explosions. • The use of water and/or chemical fire suppressants could result in contaminated run-off. • An imminent danger of explosion exists.
Spill or Release of Hazardous Materials	• The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard. • The spill could cause the release of toxic liquids or fumes in sufficient quantities or in a manner that is hazardous to or could endanger human health.
Spill or Release of High Temperature Liquid or Vapor	• The spill can be contained on site, but the potential exists for groundwater contamination. • The spill cannot be contained on site, resulting in off-site soil contamination and/or ground-water or surface water pollution. • The spill quantity is greater than the reportable quantity limit for the material.
Natural Disaster	• A rain storm exceeds the flash flood level. • The facility is in a projected tornado path or a tornado has damaged facility property. • Severe wind gusts are forecasted or have occurred and have caused damage to the facility.
Medical Emergency	• Overexposure to hazardous materials. • Trauma injuries (broken bones, severe lacerations/bleeding, burns). • Eye/skin contact with hazardous materials. • Loss of consciousness. • Heat stress (Heat stroke). • Cold stress (Hypothermia). • Heart attack. • Respiratory failure. • Allergic reaction.

The following measures will be taken to assure the availability of adequate equipment and manpower resources:

- Sufficient equipment and materials will be kept on site and dedicated for emergencies only. The inventory will be replenished after each use.
- On-site emergency responders will be current in regards to training and medical surveillance programs. Copies of all applicable certificates will be kept on file for on-site personnel required to respond.
- It will be the responsibility of the emergency coordinator to brief the on-site response team on anticipated hazards at the site. The emergency coordinator shall also be responsible for anticipating and requesting equipment that will be needed for response activities.
- Emergency response activities will be coordinated with the Local Emergency Management Agency (EMA) in compliance with SARA Title III requirements.

Communications will be established prior to commencement of any activities at the remediation site. Communication will be established so that all responders on site have availability to all pertinent information to allow them to conduct their activities in a safe and healthful manner. The primary communication device will be two-way radios. Air horns may be used to alert personnel of emergency conditions. A telephone will be located at the command post to summon assistance in an emergency.

Primary communication with local responders in the event of an emergency will be accomplished using commercial telephone lines.

8.2 EMERGENCY RECOGNITION AND PREVENTION

Because unrecognized hazards may result in emergency incidents, it will be the responsibility of the Site Supervisor and Site Safety Officer (SSO), through daily site inspections and employee feedback (Safety Observation Program, daily safety meetings, and job safety analyses) to recognize and identify all hazards that are found at the site. These may include:

Chemical Hazards	• Materials at the site • Materials brought to the site
Physical Hazards	• Fire/explosion • Slip/trip/fall • Electrocution • Confined space • IDLH atmospheres • Excessive noise
Mechanical Hazards	• Heavy equipment • Stored energy system • Pinch points • Electrical equipment • Vehicle traffic
Environmental Hazards	• Electrical Storms • High winds • Heavy Rain/Snow • Temperature Extremes (Heat/Cold Stress) • Poisonous Plants/Animals

Once a hazard has been recognized, the Site Supervisor and/or the SSO will take immediate action to prevent the hazard from becoming an emergency. This may be accomplished by the following:

- Daily safety meeting
- Task-specific training prior to commencement of activity
- Lock-out/tag-out
- Personal Protective Equipment (PPE) selection/use
- Written and approved permits for hot work, confined space
- Trenching/shoring procedure
- Air monitoring
- Following all OHM standard operating procedures
- Practice drills for fire, medical emergency, and hazardous substances spills

TABLE 8.1
EMERGENCY TELEPHONE NUMBERS

Local Agencies All services	
City of Havelock	911
Police Dept.	911
Sheriff	911
Fire Dept.	911
Ambulance	911
Hospital	(252) 247-1616
Carteret General Hospital	
3500 Arendell Street	
Moorehead City	
Directions: Through the main gate to 70E. (2nd Light, turn left) Stay on 70E for Approximately 15 miles. Come into the city of Morehead. Hospital on the left Across from the community college	
On-Base Facilities	(252) 466-0148 (acute care)
Health Clinic	9-911
Emergency Medical	9-911
Emergency Fire	
NADEP Fire Chief	(252) 466-2241
NOSC/NORSCDR	(904) 772-5216
Station Safety and Industrial Hygienist	(252) 466-2730
Regional Poison Control Center	800-441-6127
State Agencies	
State Highway Patrol	800-441-6127

Federal Agencies	
EPA Region Branch Response Center	(404) 347-3931
Nation Response Center	800-424-8802
Agency for Toxic Substance and Disease Registry	(404) 639-0615 (24 HR)
LANTDIV	
ROICC – Karen Boyd	(252) 466-4731
RPM – Lance Laughmiller	(757) 322-4811
OHM Personnel	
Project Manager – Taylor Sword.	(757) 363-7190
Health & Safety Manager - Bob Brooks	(609) 588-6423
OHM Corporation (24 hour)	800-537-9540
Additional Phone #'s in Section 2 this HASP	

8.3 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS

This section of the ERCP describes the various roles, responsibilities, and communication procedures that will be followed by personnel involved in emergency responses.

The primary emergency coordinator for this site is the Site Supervisor. In the event an emergency occurs and the emergency coordinator is not on site, the Site Safety Officer or the highest ranking employee on site will serve as the emergency coordinator until he arrives. The emergency coordinator will determine the nature of the emergency and take appropriate action as defined by this ERCP.

The emergency coordinator will implement the ERCP immediately as required. The decision to implement the plan will depend upon whether the actual incident threatens human health or the environment. Immediately after being notified of an emergency incident, the emergency coordinator or his designee will evaluate the situation to determine the appropriate action.

8.3.1 RESPONSIBILITIES AND DUTIES

This section describes the responsibilities and duties assigned to the emergency coordinator.

It is recognized that the structure of the "Incident Command System" will change as additional response organizations are added. OHM will follow procedures as directed by the fire department, LEPC, State and Federal Agencies as required. OHM will defer to the local Fire Department chief to assume the role of Incident Commander upon arriving on site. Additional on-site personnel may be added to the Site Emergency Response Team as required to respond effectively.

8.3.2 ON-SITE EMERGENCY COORDINATOR DUTIES

The on-site emergency coordinator is responsible for implementing and directing the emergency procedures. All emergency personnel and their communications will be coordinated through the emergency coordinator. Specific duties are as follows:

- Identify the source and character of the incident, type and quantity of any release. Assess possible hazards to human health or the environment that may result directly from the problem or its control.

- Discontinue operations in the vicinity of the incident if necessary to ensure that fires, explosions, or spills do not recur or spread to other parts of the site. While operations are dormant, monitor for leaks, pressure build-up, gas generation, or ruptures in valves, pipes, or other equipment, where appropriate.

- Notify local Emergency Response Teams if their help is necessary to control the incident. Table 8.1 provides telephone numbers for emergency assistance.

- Direct on-site personnel to control the incident until, if necessary, outside help arrives.

- Ensure that the building or area where the incident occurred and the surrounding area are evacuated and shut off possible ignition sources, if appropriate. The Emergency Response Team is responsible for directing site personnel such that they avoid the area of the incident and leave emergency control procedures unobstructed.

- If fire or explosion is involved, notify facility Fire Department.

- Notify NAVY ROICC

- Notify OHM Project Manager

- Have protected personnel, in appropriate PPE, on standby for rescue.

If the incident may threaten human health or the environment outside of the site, the emergency coordinator should immediately determine whether evacuation of area outside of the site may be necessary and, if so, notify the Police Department and the Office of Emergency Management.

When required, notify the National Response Center. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of facility
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside of the facility.

The emergency telephone number for the National Response Center is 800-424-8802.

If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained.

- Containers of waste are removed or isolated from the immediate site of the emergency.

- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.

- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.

- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

- Notify the USEPA Regional Administrator that cleanup procedures have been completed and that all emergency equipment is fit for its intended use before resuming operations in the affected area of the facility. The USEPA Regional Administrator's telephone number is included in the Emergency Contacts.

- Record time, date, and details of the incident, and submit a written report to the USEPA Regional Administrator. Report is due to USEPA within 15 days of the incident.

8.4 SAFE DISTANCES AND PLACES OF REFUGE

The emergency coordinator for all activities will be the SS. No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies which could occur. Safe distances can only be determined at the time of an emergency based on a combination of site and incident-specific criteria. However, the following measures are established to serve as general guidelines.

In the event of minor hazardous materials releases (small spills of low toxicity), workers in the affected area will report initially to the contamination reduction zone. Small spills or leaks (generally less than 55 gallons) will require initial evacuation of at least 50 feet in all directions to allow for cleanup and to prevent exposure. After initial assessment of the extent of the release and potential hazards, the emergency coordinator or his designee will determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to secure the boundaries.

In the event of a major hazardous material release (large spills of high toxicity/greater than 55 gallons), workers will be evacuated from the building/site. Workers will assemble at the entrance to the site for a head count by their foremen and to await further instruction.

If an incident may threaten the health or safety of the surrounding community, the public will be informed and, if necessary, evacuated from the area. The emergency coordinator, or his designee, will inform the proper agencies in the event that this is necessary. Telephone numbers are listed in Table 8.1.

Places of refuge will be established prior to the commencement of activities. These areas must be identified for the following incidents:

- Chemical release
- Fire/explosion
- Power loss
- Medical emergency
- Hazardous weather

In general, evacuation will be made to the crew trailers, unless the emergency coordinator determines otherwise. It is the responsibility of the emergency coordinator to determine when it is necessary to evacuate personnel to off-site locations.

In the event of an emergency evacuation, all the employees will gather at the entrance to the site until a head count establishes that all are present and accounted for. No one is to leave the site without notifying the emergency coordinator.

8.5 EVACUATION ROUTES AND PROCEDURES

All emergencies require prompt and deliberate action. In the event of an emergency, it will be necessary to follow an established set of procedures. Such established procedures will be followed as closely as possible. However, in specific emergency situations, the emergency coordinator may deviate from the procedures to provide a more effective plan for bringing the situation under control. The emergency coordinator is responsible for determining which situations require site evacuation.

8.5.1 EVACUATION SIGNALS AND ROUTES

Two-way radio communication and an air horn will be used to notify employees of the necessity to evacuate an area or building involved in a release/spill of a hazardous material. Each crew supervisor will have a two way radio. A base station has been installed in the OHM office trailer to monitor for emergencies. Total site evacuation will be initiated only by the emergency coordinator, however, in his absence, decision to preserve the health and safety of employees will take precedence. Evacuation routes will be posted in each outside work area. Signs inside buildings will be posted on walls or other structural element of a building. Periodic drills will be conducted to familiarize each employee with the proper routes and procedures.

8.5.2 EVACUATION PROCEDURES

In the event evacuation is necessary, the following actions will be taken:

- The emergency signal will be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site will cease in order to allow safe exit of personnel and movement of emergency equipment.
- Shut off all machinery if safe to do so.
- ALL on-site personnel, visitors, and contractors in the support zone will assemble at the entrance to the site for a head count and await further instruction from the emergency coordinator.
- ALL persons in the exclusion zone and contamination reduction zone will be accounted for by their immediate crew leaders (e.g., foreman). Leaders will determine the safest exits for employees and will also choose an alternate exit if the first choice is inaccessible.
- During exit, the crew leader should try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the emergency coordinator.
- Contract personnel and visitors will also be accounted for.
- The names of emergency response team members involved will be reported to the emergency spill control coordinator.

- A final tally of persons will be made by the emergency coordinator or designee. No attempt to find persons not accounted for will involve endangering lives of OHM or other employees by re-entry into emergency areas.

In all questions of accountability, immediate crew leaders will be held responsible for those persons reporting to them. Visitors will be the responsibility of those employees they are seeing. Contractors and truck drivers are the responsibility of the Site Supervisor. The security guard will aid in accounting for visitors, contractors, and truckers by reference to sign-in sheets available from the guard shack.

- Personnel will be assigned by the emergency coordinator to be available at the main gate to direct and brief emergency responders.

- Re-entry into the site will be made only after clearance is given by the emergency coordinator. At his direction, a signal or other notification will be given for re-entry into the facility.

- Drills will be held periodically to practice all of these procedures and will be treated with the same seriousness as an actual emergency.

8.6 EMERGENCY SPILL RESPONSE PROCEDURES AND EQUIPMENT

In the event of an emergency involving a hazardous material spill or release, the following general procedures will be used for rapid and safe response and control of the situation. Emergency contacts found in Table 8.1 provide a quick reference guide to follow in the event of a major spill.

8.6.1 NOTIFICATION PROCEDURES

If an employee discovers a chemical spill or process upset resulting in a vapor or material release, he or she will immediately notify the on-site emergency coordinator.

On-site Emergency Coordinator will obtain information pertaining to the following:

- The material spilled or released.
- Location of the release or spillage of hazardous material.
- An estimate of quantity released and the rate at which it is being released.
- The direction in which the spill, vapor or smoke release is heading.
- Any injuries involved.
- Fire and/or explosion or possibility of these events.
- The area and materials involved and the intensity of the fire or explosion.

This information will help the on-site emergency coordinator to assess the magnitude and potential seriousness of the spill or release.

8.6.2 PROCEDURE FOR CONTAINING/COLLECTING SPILLS

The initial response to any spill or discharge will be to protect human health and safety, and then the environment. Identification, containment, treatment, and disposal assessment will be the secondary response.

If for some reason a chemical spill is not contained within a dike or sump area, an area of isolation will be established around the spill. The size of the area will generally depend on the size of the spill and the materials involved. If the spill is large (greater than 55 gallons) and involves a tank or a pipeline rupture,

an initial isolation of at least 100 ft. in all directions will be used. Small spills (less than or equal to 55 gallons) or leaks from a tank or pipe will require evacuation of at least 50 ft. in all directions to allow cleanup and repair and to prevent exposure. When any spill occurs, only those persons involved in overseeing or performing emergency operations will be allowed within the designated hazard area. If possible the area will be roped or otherwise blocked off.

If the spill results in the formation of a toxic vapor cloud (by reaction with surrounding materials or by outbreak of fire) and its release (due to high vapor pressures under ambient conditions), further evacuation will be enforced. In general an area at least 500 feet wide and 1,000 feet long will be evacuated downwind if volatile materials are spilled. (Consult the DOT Emergency Response Guide for isolation distances for listed hazardous materials.)

If an incident may threaten the health or safety of the surrounding community, the public will be informed and possibly evacuated from the area. The on-site emergency coordinator will inform the proper agencies in the event this is necessary. (Refer to Table 8.1)

As called for in regulations developed under the Comprehensive Environmental Response Compensation Liability Act of 1980 (Superfund), OHM's practice is to report a spill of a pound or more of any hazardous material for which a reportable quantity has not been established and which is listed under the Solid Waste Disposal Act, Clean Air Act, Clean Water Act, or TSCA. OHM also follows the same practice for any substances not listed in the Acts noted above but which can be classified as a hazardous waste under RCRA.

Clean up personnel will take the following measures:

- Make sure all unnecessary persons are removed from the hazard area.
- Put on protective clothing and equipment.
- If a flammable material is involved, remove all ignition sources, and use spark and explosion proof equipment for recovery of material.
- Remove all surrounding materials that could be especially reactive with materials in the waste. Determine the major components in the waste at the time of the spill.
- If wastes reach a storm sewer, try to dam the outfall by using sand, earth, sandbags, etc. If this is done, pump this material out into a temporary holding tank or drums as soon as possible.
- Place all small quantities of recovered liquid wastes (55 gallons or less) and contaminated soil into drums for incineration or removal to an approved disposal site.
- Spray the spill area with foam, if available, if volatile emissions may occur.
- Apply appropriate spill control media (e.g. clay, sand, lime, etc.) to absorb discharged liquids.
- For large spills, establish diking around leading edge of spill using booms, sand, clay or other appropriate material. If possible, use diaphragm pump to transfer discharged liquid to drums or holding tank.

8.6.3 EMERGENCY RESPONSE EQUIPMENT

The following equipment will be staged in the support zone and throughout the site, as needed, to provide for safety and first aid during emergency responses. (Emergency eyewash equipment meets ANSI Standard;

- ABC-type fire extinguisher
- First-aid kit, industrial size
- Eyewash/safety shower
- Emergency signal horn

In addition to the equipment listed above, OHM maintains direct reading instrumentation that may be used in emergency situations to assess the degree of environmental hazard. This equipment will only be used by the Site Safety Officer or other specially trained personnel. This equipment will be stored, charged and ready for immediate use in evaluating hazardous chemical concentrations. The equipment will be located at the OHM office trailer.

EQUIPMENT NAME	APPLICATION
Portable H-NU Photoionization Meter	Measures selected inorganic and organic chemical concentrations
Mini-RAM	Measures total particulates in air

8.6.4 EMERGENCY SPILL RESPONSE CLEAN-UP MATERIALS AND EQUIPMENT

A sufficient supply of appropriate emergency response clean-up and personal protective equipment will be inventoried and inspected, visually, on a weekly basis.

The materials listed below may be kept on site for spill control, depending on the types of hazardous materials present on site. The majority of this material will be located in the support zone, in a supply trailer or storage area. Small amounts will be placed on pallets and located in the active work areas.

- Sand or clay to solidify/absorb liquid spills.

- Appropriate solvents, e.g., CITRIKLEEN, for decontamination of structures or equipment.

The following equipment will be kept on site and dedicated for spill cleanup:

- Plastic shovels for recovering corrosive and flammable materials.
- Sausage-shaped absorbent booms for diking liquid spills, drains, or sewers.
- Sorbent sheets (diapers) for absorbing liquid spills.
- Overpack drums for containerizing leaking drums.
- 55-gallon open-top drums for containerization of waste materials.

*NOTE: All contaminated soils, absorbent materials, solvents and other materials resulting from the clean-up of spilled or discharged substances shall be properly stored, labeled, and disposed of off-site.

8.7 EMERGENCY CONTINGENCY PLAN

This section of the ERCP details the contingency measures OHM will take to prepare for and respond to fires, explosions, spills and releases of hazardous materials, hazardous weather, and medical emergencies.

8.8 MEDICAL EMERGENCY CONTINGENCY MEASURES

The procedures listed below will be used to respond to medical emergencies. The SSO will contact the local hospital and inform them of the site hazards and potential emergency situations. A minimum of two First-Aid/CPR trained personnel will be maintained on site.

8.8.1 RESPONSE

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew supervisor will be summoned.

The work crew supervisor will immediately make radio contact with the on-site emergency coordinator to alert him of a medical emergency situation. The supervisor will advise the following information:

- Location of the victim at the work site
- Nature of the emergency
- Whether the victim is conscious
- Specific conditions contributing to the emergency, if known

The Emergency Coordinator will notify the Site Safety Officer. The following actions will then be taken depending on the severity of the incident:

Life-Threatening Incident
If an apparent life-threatening condition exists, the crew supervisor will inform the emergency coordinator by radio, and the local Emergency Response Services (EMS) will be immediately called. An on-site person will be appointed who will meet the EMS and have him/her quickly taken to the victim. Any injury within the EZ will be evacuated by OHM personnel to a clean area for treatment by (EMS) personnel. No one will be able to enter the EZ without showing proof of training, medical surveillance and site orientation.

Non Life-Threatening Incident
If it is determined that no threat to life is present, the Site Safety Officer will direct the injured person through decontamination procedures (see below) appropriate to the nature of the illness or accident. Appropriate first aid or medical attention will then be administered.

*NOTE: The area surrounding an accident site must not be disturbed until the scene has been cleared by the Site Safety Officer.

Any personnel requiring emergency medical attention will be evacuated from exclusion and contamination reduction zones if doing so would not endanger the life of the injured person or otherwise aggravate the injury. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life-saving first aid. For others, decontamination may aggravate the injury or delay life-saving first aid. Decontamination will be performed if it does not interfere with essential treatment.

If decontamination can be performed, observe the following procedures:

- Wash external clothing and cut it away.
- If decontamination cannot be performed, observe the following procedures:
- Wrap the victim in blankets or plastic to reduce contamination of other personnel.
- Alert emergency and off-site medical personnel to potential contamination, instruct them about specific decontamination procedures.
- Send site personnel familiar with the incident and chemical safety information, e.g. MSDS, with the affected person.

All injuries, no matter how small, will be reported to the SSO or the Site Supervisor. An accident/injury/illness report will be completely and properly filled out and submitted to the Health and Safety Director/Project CIH, in accordance with OHM's reporting procedures.

A list of emergency telephone numbers is given in Table 8.1.

8.8.2 NOTIFICATION

The following personnel/agencies will be notified in the event of a medical emergency:

- Local Fire Department or EMS
- On-site Emergency Coordinator
- Workers in the affected areas
- Client Representative

8.9 FIRE CONTINGENCY MEASURES

OHM personnel and subcontractors are not trained professional firefighters. Therefore, if there is any doubt that a fire can be quickly contained and extinguished, personnel will notify the emergency coordinator by radio and vacate the structure or area. The emergency coordinator will immediately notify the local Fire Department.
The following procedures will be used to prevent the possibility of fires and resulting injuries:

- Sources of ignition will be kept away from where flammable materials are handled or stored.
- The air will be monitored for explosivity before and during hot work and periodically where flammable materials are present. Hot work permits will be required for all such work.
- "No smoking" signs will be conspicuously posted in areas where flammable materials are present.
- Fire extinguishers will be placed in all areas where a fire hazard may exist.
- Before workers begin operations in an area the foreman will give instruction on egress procedures and assembly points. Egress routes will be posted in work areas and exit points clearly marked.

8.9.1 RESPONSE

The following procedures will be used in the event of a fire:

- Anyone who sees a fire will notify their supervisor who will then contact the Emergency Coordinator by radio. The emergency coordinator will activate the emergency air horns and contact the local Fire Department.

- When the emergency siren sounds, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest fire exit.

- Work crews will be comprised of pairs of workers (buddy system) who join each other immediately after hearing the fire alarm and remain together throughout the emergency. Workers will assemble at a predetermined rally point for a head count.

- When a small fire has been extinguished by a worker, the emergency coordinator will be notified.

8.10 HAZARDOUS WEATHER CONTINGENCY MEASURES

Operations will not be started or continued when the following hazardous weather conditions are present:

- Lightning
- Heavy Rains/Snow
- High Winds

8.10.1 RESPONSE

- Excavation/soil stock piles will be covered with plastic liner.

- All equipment will be shut down and secured to prevent damage.

- Personnel will be moved to safe refuge, initially crew trailers. The emergency coordinator will determine when it is necessary to evacuate personnel to off-site locations and will coordinate efforts with fire, police and other agencies.

8.10.2 NOTIFICATION

The emergency coordinator will be responsible for assessing hazardous weather conditions and notifying personnel of specific contingency measures. Notifications will include:

- OHM employees and subcontractors
- Client Representative
- Local Emergency Management Agency

8.11 SPILL/RELEASE CONTINGENCY MEASURES

In the event of release or spill of a hazardous material the following measures will be taken:

8.11.1 RESPONSE

Any person observing a spill or release will act to remove and/or protect injured/contaminated persons from any life-threatening situation. First aid and/or decontamination procedures will be implemented as appropriate.

First aid will be administered to injured/contaminated personnel. Unsuspecting persons/vehicles will be warned of the hazard. All personnel will act to prevent any unsuspecting persons from coming in contact

with spilled materials by alerting other nearby persons. Attempt to stop the spill at the source, if possible. Without taking unnecessary risks, personnel will attempt to stop the spill at the source. This may involve activities such as uprighting a drum, closing a valve or temporarily sealing a hole with a plug.

Utilizing radio communications, the emergency coordinator will be notified of the spill/release, including information on material spilled, quantity, personnel injuries and immediate life threatening hazards. Air monitoring will be implemented by the emergency coordinator and SSO to determine the potential impact on the surrounding community. Notification procedures will be followed to inform on-site personnel and off-site agencies. The emergency coordinator will make a rapid assessment of the spill/release and direct confinement, containment and control measures. Depending upon the nature of the spill, measures may include:

- Construction of a temporary containment berm utilizing on-site clay absorbent earth
- Digging a sump, installing a polyethylene liner and
- Diverting the spill material into the sump placing drums under the leak to collect the spilling material before it flows over the ground
- Transferring the material from its original container to another container

The emergency coordinator will notify the NAVY ROICC of the spill and steps taken to institute clean-up. Emergency response personnel will clean-up all spills following the spill clean-up plan developed by the emergency coordinator. Supplies necessary to clean up a spill will be immediately available on-site. Such items may include, but are not limited to:

- Shovel, rake
- Clay absorbent
- Polyethylene liner
- Personal safety equipment
- Steel drums
- Pumps and miscellaneous hand tools

The major supply of material and equipment will be located in the Support Zone. Smaller supplies will kept at active work locations. The emergency coordinator will inspect the spill site to determine that the spill has been cleaned up to the satisfaction of the ROICC. If necessary, soil, water or air samples may be taken and analyzed to demonstrate the effectiveness of the spill clean-up effort. The emergency coordinator will determine the cause of the spill and determine remedial steps to ensure that recurrence is prevented. The emergency coordinator will review the cause with the ROICC and obtain his concurrence with the remedial action plan.

9.0 TRAINING REQUIREMENTS

As a requirement for work at this site, in any hazardous waste work area, all field personnel will be required to take a 40-hour training class. This training must cover the requirements in 29 CFR 1910.120: personal protective equipment, toxicological effects of various chemicals, hazard communication, blood borne pathogens, handling of unknown tanks and drums, confined-space entry procedures, electrical safety, etc. In addition, all personnel must receive annual 8-hour refresher training and three day on-site training under a trained, experienced supervisor. Supervisory personnel shall have received an additional 8-hour training in handling hazardous waste operations.

All personnel entering the exclusion zone will be trained in the provisions of this site safety plan and be required to sign the Site Safety Plan Acknowledgment in Appendix C.

Site-specific training for OU3 Site 7 will include potential site contaminants, Hazard Communication as per 29 CFR 1910.1200, site physical and environmental hazards, emergency response and evacuation procedures, and emergency telephone numbers will be held at the site location by the SS and SSO before any site work activities begin.

Outlines of the orientation for OHM / OHM sub-contract personnel and visitors are presented below:

OHM/SUBCONTRACTORS	VISITOR ORIENTATION
• HASP sign off • Sign in/out procedures • Site background • Chain of command • Rules and regulations • Hours of work • Absences • Equipment • Emergency Information • Emergency signal • Gathering point • Responsibilities/roles • Emergency phone numbers • Work Zones • Contaminants and Material Safety Data Sheets (MSDS) [Hazard Communication Program] • JSAs (Phase Safety Plans) • Forms, site-specific • Incident Reporting	• Sign in/out procedures • Review of Site map • Work Zones in progress • Hazard Communication • Emergency plan/signals • Training/medical requirements • Zones/areas open to visitors

10.0 MEDICAL SURVEILLANCE PROGRAM

All OHM personnel participate in a medical and health monitoring program. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. A listing of OHM's worker medical profile is shown below. This program was developed in conjunction with a consultant toxicologist and OHM's occupational health physician. Other medical consultants are retained when additional expertise is required.

The medical surveillance program meets the requirements of the OSHA Standard 29 CFR 1910.120/1926.65(f).

No special tests are required for this project.

The following information is provided in the event that medical attention is necessary.

The IT/OHM Medical Director is:

Dr. Elayne Theriault
Continuum Health Care
800-229-3674 (office)

Doctor's Urgent Care Center
4815 Cleander Dr
Wilmington, NC 28403
Contact: Ms. Beth Cahill
910-452-1111

The IT/OHM Medical Director and the Program CIH will be immediately notified of any suspected exposures to hazardous materials/wastes.

APPENDIX A
MATERIAL SAFETY DATA SHEETS

APPENDIX B
SPECIFIC HEALTH AND SAFETY PROCEDURES

SOP No. 2-1	Vehicle Safety
SOP No. 2-3	Personal Lifting Safety
SOP No. 2-4	Slip, Trip, Fall Prevention
SOP No. 2-5	Electrical Safety
SOP No. 2-7	Equipment Inspection
SOP No. 3-3	Hearing Conservation Program
SOP No. 3-4	Heat Stress Prevention
SOP No. 4-2	Respiratory Protection
SOP No. 5-4	Decontamination
SOP No. 6-4	Lockout/Tagout/Try
SOP No. 6-5	Excavation
SOP No. 7-1	High Pressure Washers
SOP No. 7-6	Ladders
SOP No. 7-7	Equipment and Hand Tools
SOP No. 7-9	Solvents and Flammable Liquids
SOP No. 7-11	Buried Utility Location and Associated Subsurface Field Activities
SOP No. 7-14	Equipment Operator Qualification

APPENDIX C
SAFETY PLAN ACKNOWLEDGEMENT

WORKER ACKNOWLEDGEMENT TO HEALTH-AND-SAFETY PLAN

I HAVE READ THE SITE-SAFETY PLAN FOR THIS SITE AND FULLY UNDERSTAND ITS CONTENTS.

Name	Date

APPENDIX D
HEALTH AND SAFETY FORMS

CASE Track Forms
Supervisor's Employee Injury Report
Accident/Injury Investigation
Accident Review Board
Vehicle Accident Report
General Liability, Property Damage & Loss Report
First Aid Log
OHM Safety Rules
Daily Safety Meeting Log
Instrument Calibration Logs (LEL/PID)
Air Monitoring Instrument (Direct Reading) Logs
Heavy Equipment Inspection Forms
Fire Extinguisher Checklist/Inventory Form
SCBA/SAR Inspection Forms
Project Site Safety Inspection Checklist (weekly)
SSO Daily Report
Air Sampling & Analysis Log
Air Sampling Data Sheet
Chain-of-Custody Record

APPENDIX E
ACCIDENT PREVENTION PLAN

APPENDIX E

ACCIDENT PREVENTION PLAN

1.0 SIGNATURE SHEET

Plan Preparer: Health and Safety Coordinator	Alison Harwood 252 444-8200 (on-site)
	_____
Approved by: Health and Safety Manager	Robert Brooks, CSP 609 588-6423
	_____
Approved by: Sr. Project Manager	Roland Moreau, P.E. 757 363-7190 (office)
	_____
Approved by: Program Manager for LANTDIV	John P. Franz, P.E. 609-588-6477 (office)
	_____

2.0 BACKGROUND INFORMATION

2.1 OHM REMEDIATION SERVICES CORPORATION (OHM)

Contract No. N62470-"97-D-5000", Delivery Order 0010

The principal scope of work for this project is the installation of an Air Sparge (AS) system at the Operable Unit 03, Site 7 at MCAS Cherry Point. The major work activities will include:

- Clear surface vegetation for drill rig access.
- Well installation via pneumatic punch.
- Installation of aboveground header system and piping for AS system
- AS system operation
- Vapor and liquid sample collection
- Equipment decontaminate

The site location map is provided in Section 1.0 of the Site Specific Health and Safety Plan (SSHASP).

2.2 OHM ACCIDENT EXPERIENCE

YEAR	EMR	OSHA Recordable Incident Rate*	LANTDIV Program OSHA Recordable Incident Rate
1997	0.11	2.7	1.4
1996	0.14	2.8	1.7
1995	0.13	3.0	2.2

*(Corporate Wide)

2.3 HAZARDOUS ACTIVITIES REQUIRING ACTIVITY HAZARD ANALYSIS*

- Clear surface vegetation for drill rig access.
- Well installation via hydraulic push.
- Installation of aboveground header system and piping for AS system
- AS system operation
- Vapor and liquid sample collection
- Equipment decontaminate

*OHM's Activity Hazard Analyses are referred to as Job Safety Analyses (JSAs) in the Site Specific Health and Safety Plan.

3.0 STATEMENT OF SAFETY AN HEALTH POLICY

3.1 CORPORATE POLICY STATEMENT (ATTACHED)

4.0 RESPONSIBILITIES AND LINES OF AUTHORITIES

Safety responsibilities, accountability and lines of authority are discussed in Section 2.0 of the SSHASP. The Project Manager (PM), Site Supervisor (SS), Program Certified Industrial Hygienist (CIH), Health and Safety Manager (HSM) and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the Site Specific Health and Safety Plan (SSHASP).

5.0 SUBCONTRACTORS AND SUPPLIERS

5.1 TBD

5.2 Subcontractor/Supplier Coordination and Control

OHM subcontractors will be screened for safety performance and compliance with Federal Alcohol and Drug testing requirements prior to being issued any contract for site work. OHM subcontractors will comply with the requirements for site safety as outlined in OHM Health and Safety Procedure 49 (see OHM Corporate Health and safety Procedures Manual for LANTDIV). OHM Site Superintendent/Supervisor will be responsible for the conduct and control of OHM subcontractors.

5.3 Subcontractor/Supplier Safety Responsibilities

All subcontractor employees are subject to the same training and medical surveillance requirements as OHM personnel depending on job activity. All activities involving the potential for exposure to hazardous waste materials will require medical and training certification as mandated by 29 CFR 1910.120. All subcontractor personnel will be required to sign in daily and be required to attend a daily meeting discussing operations and safety issues. All subcontractors involved in construction/remedial activities will be required to submit a Subcontractor Prequalification Questionnaire prior to the award of a contract and will complete a Subcontractor Pre-Job Safety Checklist prior to the start of work at the site. Subcontractors will submit Job Safety Analyses for their work activities to the OHM SS. The subcontractor reports directly to the OHM Project Manager. All incidents involving subcontractor employees shall be reported to the OHM Site Supervisor and a copy of the subcontractor's injury/illness report shall be submitted to the OHM SS within 24 hours.

OHM subcontractors are required to sign off and comply with all requirements of the OHM Site-Specific Health and Safety Plan and Accident Prevention Plan. Contractors not in compliance will be immediately dismissed from the site.

Suppliers delivering various materials to the project site or providing equipment/ equipment maintenance will comply with all Naval Facility rules and regulations. Supplier personnel will not be permitted into contaminated areas unless training and medical surveillance is in accordance with 29 CFR 1910.120. Contractors will not ride on tractors, forklifts or similar vehicles unless specific seats are provided. They will follow Facility hot work rules if hot work is required for vehicle or equipment maintenance. Trucks will be loaded and unloaded in a safe and effective manner and materials will be stored safely in designated locations only. Associated packaging will be properly disposed of and litter will not permitted to be scattered or blown from truck beds. Operators of mobile equipment on site must observe all traffic rules such as speed limits and right-of-ways of pedestrians.

6.0TRAINING

6.1 SAFETY INDOCTRINATION SUBJECTS:

Outlines of the site safety orientation for Ohm / sub-contract personnel and visitors are provided in Section 9.0 of the SSHASP.

6.2 Mandatory Training AND Certifications

Mandatory training and certifications are discussed in Section 9.0 of the SSHASP. All personnel entering the exclusion zone will be trained in the provisions of this Accident Prevention Plan, as described in 6.a, and be required to sign the Accident Prevention Plan.

Site-specific training for the PCB Soil Removal Actions at Sites 17, 25, & 26 and associated tasks, including review of potential site contaminants, Hazard Communication as per 29 CFR 1910.1200, site physical and environmental hazards, emergency response and evacuation procedures, and emergency telephone numbers will be held at the site location by the SS and SSO before any site work activities begin. Although all OHM workers receive confined space training during initial 40 hour health and safety training, site specific training, including rescue procedures, will be conducted before any confined space entry is performed.

6.3 Emergency Response Training

All OHM personnel who have completed 40 hour HAZWOPER Training are qualified as emergency responders per 29 CFR 1910.120(e)(3)(iv). Site Specific Emergency Response Procedures will be reviewed with all site personnel as a part of site indoctrination.

6.4 Supervisory and Employee Safety Meetings

The OHM SS and SSO will conduct daily safety meetings at the start of each work shift for on-site personnel and will require subcontractors to follow similar meeting procedures or participate in the OHM daily safety meetings. Daily safety meetings will comply with SOP 1-3 (see OHM Health and Safety Procedures Manual for LANTDIV).

7.0SAFETY AND HEALTH INSPECTIONS

7.1 Safety Inspections

The OHM Project Manager is required to perform initial (within thirty days of mobilization) and periodic (quarterly) site safety reviews using the Management Safety Improvement Report. Site Supervisors/ Superintendents are required to conduct weekly inspections of their sites using the Site Safety Inspection Checklist according to SOP 2-6 (see OHM Health and Safety Procedures Manual for LANTDIV). SSOs are responsible for conducting and preparing reports of daily safety inspections of work processes, site conditions, equipment conditions and submitting them to SS. The SSO will discuss any necessary corrective actions with the SS and review new procedures. Copies of these reports are maintained on file at the project locations.

The OHM Health and Safety Manager (HSM) will periodically conduct site visits and perform Site Safety Assessments using the attached format. These reports are kept on file at the Northern Region Office and are tracked in a database for each OHM Project Manager and Supervisor/ Superintendent, including the number of action items noted during the visit and written confirmation of the corrective actions for each item. These responses are compiled and provided to program management for review.

7.2 External Inspections/Certifications

OHM does not anticipate, but may consider the use of outside sources, to provide safety inspections on an as necessary basis.

As required, OHM safety equipment will comply with appropriate OSHA (Occupational Safety and Health Administration), NIOSH (National Institute for Occupational Safety and Health), ANSI (American National Standards Institute), ASTM (American Society for Testing and Materials), and US Coast Guard or other recognized certification organizations.

8.0 SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS, AND COMPLIANCE

8.1 Company Safety Program Goals

OHM considers safety the highest priority during work at a site containing potentially hazardous materials and has established a goal of **zero incidents** for all projects. All projects will be conducted in a manner which minimizes the probability of near misses, equipment/property damage or injury. OHM will establish programs to recognize people and projects that demonstrate excellence in safety performance. OHM will use safety observation programs to identify and correct unsafe acts and conditions. Safety awareness programs will be used to provide continuous training and development of good safety practices. OHM site supervision will investigate all incidents to determine root causes and institute corrective actions to prevent recurrence. OHM will provide and enforce safety rules to protect employees, subcontractors, clients and the public.

8.2 OHM Safety Incentive Programs:

A copy of the OHM Safety Awareness and Recognition Program (SHARP) is provided at the project. The OHM Project Manager will develop a site-specific SHARP for approval by the HSM and Program Manager within 10 days of project mobilization.

8.3 OHM Employee Safety Responsibility Requirements

Each employee is responsible for personal safety as well as the safety of others in the area and is expected to participate fully in the ***Safety Improvement Process***, particularly the Safety Observation Program. The employee will use all equipment provided in a safe and responsible manner as directed by the SS. All OHM personnel will follow the policies set forth in the OHM Health and Safety Procedures Manual, with particular emphasis on the OHM "Cardinal Safety Rules." Site personnel concerned with any aspect of health and safety shall bring it to the attention of the SS/SSO. If not satisfied, they should contact the Regional Health and Safety Director. All project personnel have the authority to stop work if in their judgement serious injury could result from continued activity. The SS and the SSO shall be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions up to and including termination. OHM Employee Safety Responsibility is fully detailed in SOP 1-72 (see OHM Health and Safety Procedures Manual for LANTDIV).

8.4 Managers and Supervisors Safety Accountability

It is the duty of the first line supervisor to motivate employees to adhere to OHM's safety policy in each work situation. A first line supervisor for these purposes is defined as that person designated to give immediate on-site supervision to personnel involved in a task.

All supervisors shall have complete knowledge of the safe procedure for all jobs and tasks under their supervision or when in doubt, shall seek assistance prior to initiating a task. This is the only acceptable manner in which to perform the task. If the task cannot be accomplished safely, it will not be attempted.

Supervisors will:

- Explain the safety procedure involved with a task to each employee and check frequently to see that the employee understands and works as instructed.
- Allocate sufficient time for the training and coaching of all employees to insure that everyone knows the correct procedure for safely accomplishing required tasks.
- Prevent new employees from performing any tasks until required training is completed.
- Immediately correct unsafe conditions, which involved OHM employees or contractors.
- Ensure that the employees are outfitted with and wear personal protective equipment as specified by this APP, site-specific health and safety plan, other OHM procedures or as directed by the Program CIH o site safety officer (SS)).
- Set a good safety example.
- Obtain the cooperation of employees and contractors.
- Provide a safe work environment for employees and contractors.
- Confirm contractor safety performance records have been verified prior to contract award and monitor contractor performance during operations.
- Report all accidents, near misses and property damage in accordance with the Incident Management and Reporting Procedure.
- Establish a safety culture, using the elements of the OHM Safety Improvement process, which promotes awareness, encourages participation and recognizes excellence.

9.0 ACCIDENT REPORTING

9.1 Exposure Data (man-hours worked)

The Regional Industrial Hygienist tracks and maintains incident records as to Federal reporting requirements (OSHA 200 Log). Incident rates are reported monthly to the Program CIH, and the LANTDIV Program Manager. Incident Rates and Workers Compensation losses are tracked for each Project, Project Manager and Site Supervisor.

9.2 Accident Investigations, Reports and Logs

The site supervisor conducts Accident/incident investigations. A report is completed by the site supervisor and is required to be reviewed and signed by the site safety officer and the Project Manager. The report must be submitted to the Program Manager within 24 hours. All incident reporting forms are provided in Appendix D of the SSHASP.

9.3 Immediate Notification of Major Incidents

OHM will immediately notify the Navy of any major incident, including injury, fire, equipment/ property damage and environmental incident. A full report will be provided within 48 hours. The following procedure will be followed in response to any major personal injury.

9.3.1 RESPONSE

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew supervisor will be summoned.

The work crew supervisor will immediately make radio contact with the site supervisor to alert him of a medical emergency situation. The work crew supervisor will advise the following information:

- Location of the victim at the work site
- Nature of the emergency
- Whether the victim is conscious
- Specific conditions contributing to the injury, if known

The following actions will then be taken depending on the severity of the incident:

- **Life-Threatening Incident** — If an apparent life-threatening condition exists, the crew supervisor will inform the emergency coordinator by radio, and the local Emergency Response Services (EMS) will be immediately called. An on-site person will be appointed who will meet the EMS and have him/her quickly taken to the victim. OHM personnel will evacuate any injury within the EZ to a clean area for treatment by (EMS) personnel. No one will be able to enter the EZ without showing proof of training, medical surveillance and site orientation.

- **Non Life-Threatening Incident** — If it is determined that no threat to life is present, the Site Safety Officer will direct the injured person through decontamination procedures (see below) appropriate to the nature of the illness or accident. Appropriate first aid or medical attention will then be administered.

  *NOTE: The area surrounding an accident site must not be disturbed until the Site Safety Officer has cleared the scene.

Any personnel requiring emergency medical attention will be evacuated from exclusion and contamination reduction zones if doing so would not endanger the life of the injured person or otherwise aggravates the injury. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life-saving first aid. For others, decontamination may aggravate the injury or delay life-saving first aid. Decontamination will be performed if it does not interfere with essential treatment.

If decontamination can be performed, observe the following procedures:

- Wash external clothing and cut it away.

If decontamination cannot be performed, observe the following procedures:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.

- Alert emergency and off-site medical personnel to potential contamination; instruct them about specific decontamination procedures.

- Send site personnel familiar with the incident and chemical safety information, e.g. MSDS, with the affected person.

10.0 MEDICAL SUPPORT

On-site Medical Support/Off-site Medical Arrangements are provided in Section 8.0 of the SSHASP.

11.0 PERSONAL PROTECTIVE EQUIPMENT

11.1 Hazard Assessment Procedures/Written Certifications for Personal Protective Equipment

Protection levels provided in the SSHASP have been established for the site work activities based on the information provided in Delivery Order 0012 concerning the levels of site contaminants and the scope of work. Once on-site, results of air monitoring and visual inspection of the work activities may indicate the need for changes in these PPE level(s). Any significant change in the PPE level will be approved by the SSO in consultation with the Program CIH. Personal Protective Equipment (PPE) selection criteria are outlined in SOP's 4-1 and 4-2 (see OHM Health and Safety Procedures Manual for LANTDIV).

.

All personnel using respiratory protection will be cleared by a physician for use of a respirator and will be fit-tested to assure they can achieve an acceptable fit. Physician clearance and results of fit testing will be documented as required by SOP 4-2.

12.0 PLANS REQUIRED BY THE SAFETY MANUAL

12.1 Hazard Communication Program

The Site-Specific Hazard Communication Program is included Section 3.2 of the SSHASP. OHM Hazard Communication Program complies with 29 CFR 1926.59/1910.1200 and is outlined in SOP 1-10 (see OHM Health and Safety Procedures Manual for LANTDIV).

12.2 Emergency Response Plans

The Site-Specific Emergency Response and Contingency Plan is included in Section 8.0 of the SSHASP.

12.3 Layout Plans

Site Layout Plans (indicating work zones) are attached. Work zones are defined in Section 4.0 of the SSHASP.

12.4 Respiratory Protection Plan

The primary objective of respiratory protection is to prevent employee exposure to atmospheric contamination. When engineering measures to control contamination are not feasible, or while they are being implemented, personal respiratory protective devices will be used.

The criteria for determining respirator need have been evaluated based on the site contaminants; expected levels of protection are outlined in Section 5.1. Air monitoring will be conducted to confirm that respiratory protection levels are adequate (see Section 7.0 SSHASP). All respirator users will be OSHA trained in proper respirator use and maintenance. The SS and SSO will observe workers during respirator use for signs of stress. The SS, HSM, and SSO will also evaluate the implementation of the SSHASP, periodically, to determine its continued effectiveness with regard to respiratory protection. All persons assigned to use respirators will have medical clearance to do so.

12.4 Lead Abatement Plan

Not Applicable

12.5 Asbestos Abatement Plan

Not Applicable

12.6 Abrasive Blasting

Not Applicable

12.7 Confined Space

Confined Space Entry Procedures are outlined in OHM Procedure 24 (see OHM Health and Safety Procedures Manual for LANTDIV).

12.8 Hazardous Energy Control Plan

Lockout/Tagout Procedures are outlined in SOP 6-4. (See OHM Health and Safety Procedures Manual for LANTDIV).

12.9 Critical Lift Procedures

Not Applicable

12.10 Contingency Plan for Severe Weather

Contingency plans for severe weather are included in Section 8.0 of SSHASP.

12.11 Access and Haul Road Plan

Not Applicable

12.13 Demolition Plan

Not Applicable

12.14 Emergency Rescue (tunneling)

Not Applicable

12.15 Underground Construction Fire Prevention and Protection Plan

Not Applicable

12.16 Compressed Air Plan

Not Applicable

12.17 Form work and Shoring Erection and Removal Plans

Not Applicable

12.18 Lift Slab Plans

Not Applicable

12.19 SSHP

The OHM Site Specific Health and Safety Plan is included with this submission.

12.20 Blasting Plan

Not Applicable

12.21 Diving Plan

Not Applicable

12.22 Alcohol and Drug Abuse Prevention Plan

OHM substance abuse Procedures are outlined in SOP 3-2 (see OHM Health and Safety Procedures Manual for LANTDIV).

13.0 CONTRACTOR INFORMATION TO MEET THE REQUIREMENTS OF THE MAJOR SECTIONS OF EM 385-1-1

In addition to this Accident Prevention Plan, this Site-Specific Health and Safety Plan meets the major requirements of USACE Manual 385-1-1. Additional procedures for major requirements are provided in the OHM Corporate Health and Safety Procedures Manual for LANTDIV previously submitted.

APPENDIX F
HURRICANE PREPAREDNESS PLAN

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

HURRICANE PREPAREDNESS PLAN FOR CHERRY POINT PROJECT SITES CHERRY POINT, NORTH CAROLINA

Submitted to:

DEPARTMENT OF THE NAVY
Naval Facilities Engineering Command
6500 Hampton Boulevard
Building A (South East Wing) 3rd floor
Norfolk, VA 23508
Contract No. N62470-93-D-3032

Submitted by:

OHM Remediation Services Corp.
Program Management Office
5700 Thurston Avenue, Suite 116
Virginia Beach, VA 234555-3302

5/19/99
OHM Project 920578

HURRICANE PREPAREDNESS PLAN

APPROVALS

Taylor Sword – Project Manager — Date: 5/24/99

Bob Brooks – Health and Safety Manager — Date: 5/24/99

Tom Cherrix, Site Supervisor — Date: 5/24/99

Allson Harwood, Site H & S — Date: 5/19/99

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1.0 INTRODUCTION

PURPOSE

This procedure outlines the general responsibilities and actions to be taken in preparation for and response to a hurricane or hurricane warnings in the MCAS Cherry Point area. All personnel should understand that predicting the occurrence and path of a hurricane is difficult, however the risk can be minimized and controlled by following the procedures in this plan.

SCOPE

This procedure is applicable to all contractor personnel, including OHM's subcontractors, temporary construction facilities, and remediation equipment present at the Cherry Point project sites

DISCUSSION

This procedure provides information on how to protect personnel and property in the event of a hurricane. In the MCAS Cherry Point area, attention must be paid to all hurricanes, since there is no way to determine with 100 percent accuracy whether a hurricane will actually hit the area until a few hours before landfall.

The following table demonstrates accuracy of forecasting a hurricane landfall. Probability of a landfall occurrence is low more than 24 hours in advance of a storm.

Hours Before Landfall	Maximum Probability Values
72 Hours	10 Percent
48 Hours	13-18 Percent
36 Hours	20-25 Percent
24 Hours	35-45 Percent
12 Hours	60-70 Percent

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2.0 DEFINITIONS

The following definitions apply to various terms used in this document.

Conditions of Readiness (CORS):

Condition V - Destructive winds are possible at MCAS Cherry Point within 96 hours. Normal daily jobsite cleanup and good housekeeping practices.

Condition IV - Destructive winds are possible at MCAS Cherry Point within 72 hours. Normal daily jobsite cleanup and good housekeeping practices. Collect and store in piles or containers, scrap lumber, waste material, and rubbish for removal and disposal at the end of each work day. Maintain the construction site, including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 4 feet high. Remove all trash debris and other objects which could become missile hazards. Contact ROICC for Condition requirements, updates, and completion of required actions.

Condition III - Destructive winds are possible at MCAS Cherry Point within 48 hours. Maintain Condition IV requirements. Begin securing the jobsite for and taking those actions necessary for Condition I, which cannot be completed within 18 hours. Cease all routine activities which might interfere with securing operations. Begin collecting and stowing all gear and portable equipment. Make preparations for securing buildings. Review requirements pertaining to Condition II and continue action as necessary to attain Condition III readiness. Contact the weather station on base for weather and COR updates and completion of required actions.

Condition II - Destructive winds are possible at MCAS Cherry Point within 24 hours. Curtail or cease routine activities until securing operations are complete. Reinforce or remove form work and scaffolding. Secure machinery, tools, equipment and materials, or remove from job site. Expend every effort to clear all missile hazards and loose equipment from the jobsite. Contact ROICC for weather and COR updates and completion of required actions.

Condition I - Destructive winds are possible at MCAS Cherry Point within 12 hours. Perform and complete all remaining actions required for lower conditions of readiness. Secure the jobsite and leave the government premises.

Destructive Winds - Generally winds reaching or exceeding the force of a tropical storm ($\geq$ 39 mph or 34 knots). Winds from any storm system (tropical or otherwise) that are determined to have the potential to cause property damage or personal injury which would warrant MCAS Cherry Point to initiate a Condition IV alert.

Hurricane Watch - An announcement for specific areas where a hurricane or an incipient hurricane poses a possible threat to a coastal area, generally within 36 hours.

Hurricane Warning - A warning that sustained winds of 74 MPH (64 knots) or higher, associated with a hurricane are expected in a specified coastal area in 24 hours or less.

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Hurricane - A tropical cyclone in which the maximum sustained surface wind is 64 knots (74 MPH) or greater.

Missile Hazard - Any object that may become airborne during high winds.

Severe Weather - Any storm of tropical or non-tropical origin that has the capacity to produce destructive winds

Storm Surge - An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the storm.

Storm Tide - The actual sea level resulting from the astronomical tide combined with the storm surge. This term is used interchangeably with "Hurricane Tide."

Tropical Depression - A tropical low pressure system in which the maximum sustained surface wind is 33 knots (38 MPH) or less.

Tropical Storm - A tropical low pressure system in which the maximum surface wind ranges from 34 to 63 knots (39 to 73 MPH) inclusive. This is the strength at which the National Hurricane Center applies a name to the storm.

Tropical Storm Watch - Tropical storm conditions pose a threat to a coastal area generally within 36 hours.

Tropical Storm Warning - A warning for tropical storm conditions with sustained winds within the range of 39 to 73 MPH which are expected in a specified coastal area within 24 hours or less.

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3.0 RESPONSIBILITIES

Project Manager – Taylor Sword

The Project Manager (PM) is responsible for ensuring that all adequate measures have been taken to prepare for hurricanes and to protect OHM site personnel and property in the event of a hurricane. The PM will ensure that ample resources are available to implement this plan and that all personnel are aware of this plan and their responsibilities.

Site Supervisor – Tom Cherrix

The Site Supervisor (SS) will communicate all hurricane information to site personnel, and keep the site personnel continually informed of the measures to be taken. The SS is responsible for the coordination and direction of site equipment shut-down and will oversee the preparation of site facilities for any imminent storm. The SS will oversee the coordination of both pre- and post-storm operations and will ensure that the proper material, equipment, and supplies are utilized to implement this procedure.

Site Safety Officer – Alison Harwood

The Site Safety Officer (SSO) will monitor weather information, including the National Weather Service probability values for landfall. The SSO will maintain the necessary emergency supplies, and will periodically tour the site to ensure that proper steps are being taken to protect site personnel and property. The SSO will develop the emergency contact list and post the list in a prominent area in the office trailer.

Project Accountant – Felicia Crawford

The Project Accountant is responsible for the back-up of critical computer files at the site and will oversee the securing of the site computers and project files prior to any storm.

Note: When personnel identified in Section 3.0 leave the site, they are responsible for notifying the Project Manager of a designated back-up person. The back-up person will be instructed in their responsibilities in the event of a hurricane.

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4.0 NORMAL OPERATING PROCEDURES

The site will continuously conduct major housekeeping efforts to minimize the potential for loose material, equipment, etc., being stored at the site. At least one tailgate safety meeting will be held each month (June through November) to discuss:

Hurricane safety
Safety of employees and their families
Site evacuation
Review of this procedure

The SSO will monitor the weather systems as they develop. If a hurricane is in the area, a daily report from the National Weather Service will be posted in the office trailer. The SSO will inform the PM and SS of all storms reaching the level of a tropical storm (see definition), as defined by the National Weather Service.

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5.0 EMERGENCY OPERATING PROCEDURES

Condition V - ***Early Preparedness***

The SSO will notify the PM and SS when a tropical storm has been named and/or any severe weather has the potential to produce destructive winds at Cherry Point within 96 hours. This will initiate Condition of Readiness (COR) Condition V. This phase will continue until:

The storm or condition is downgraded
The storm track poses no threat to the site
Condition IV begins

During Condition V, the progress of the storm will be monitored and tracked. The ROICC will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition V.

See Appendix A for the Hurricane Preparedness Responsibility Punch List - Condition V.

Condition IV - ***(Destructive winds are possible within 72 Hours)***

This COR starts when OHM is notified by the ROICC that severe weather is within 72 hours of posing a threat to the project location. The SSO will ensure that the following steps are taken:

Monitor the storm and inform the PM and SS of its progress
Check PPE supplies and equipment to determine if any shipments are required or if pending shipments should be advanced or postponed

During Condition IV, the progress of the storm will be continuously monitored and tracked. The SS will instruct site personnel to begin general cleanup of all loose materials which may pose a hazard during high winds or rain. This will include removal of all debris, trash, and other debris that may become missle hazards. All form lumber will be stacked in neat piles less than 4 feet high. The ROICC will be contacted at least twice daily for Condition Requirements updates and to inform him of completion of required actions for Condition IV.

The SS will keep all site personnel advised of the status of the storm and site preparation activities. Due to the urgency and amount of work involved in preparing for a threatening storm, all construction operations which might interfere with securing operations will cease.

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The SS will ensure that the following steps are taken:

Fill fuel tanks in all equipment on-site
Secure stockpiled material on-site.
Make sure all portable generators and light plants are operational and make arrangements to secure additional ones if needed.
Review requirements for Condition II with all crew members.
Maintain condition IV requirements.

See Appendix A for the Hurricane Preparedness Responsibility Checklist - Condition IV.

*Condition III - **Tropical Storm Warning (Destructive winds are possible Within 48 Hours)***

This COR starts when severe weather places the project site under a tropical storm warning. Condition III activities will also start if a threatening tropical storm is upgraded to a hurricane, or a severe storm approaching Cherry Point has generated destructive winds in other locations. The PM, SS, and SSO will determine when to cease all operations based upon current weather conditions and/or as directed by the ROICC. If the storm or Condition is downgraded, the PM, SS, and SSO will meet with the ROICC to decide if a downgrade of the COR is appropriate. Actions for Condition III will be maintained and the following shall also be completed:

Machinery, tools, equipment, and materials will be secured or removed form the site.
Take actions to secure jobsite necessary for Condition I that cannot be completed within 18 hours.

See Appendix A for the Hurricane Preparedness Responsibility Checklist - Condition III.

*Condition II - **Destructive Winds are anticipated <u>within 24 hours</u>.***

Condition II begins when destructive winds are anticipated within 24 hours and/or as directed by the ROICC. The PM, SS, and SSO will determine when to demobilize from the site based upon weather conditions. During this phase:

The SS will:

Form work and scaffolding will be reinforced or removed.
Secure machinery, tools, equipment and materials or remove them fron the jobsite.
Conduct a roll call of personnel on-site and inform the SSO
Notify personnel, on leave, of schedule changes
Personnel needing to leave the project to attend to personal matters will notify their SS immediately.
Valuable records, files, and equipment will be boxed in preparation for movement to a safe location. (optional)

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The SSO will ensure that the following step is taken:

All visitors from the site are evacuated
Make a final site walk-through to determine that the site is secure and clear all missile hazards from the jobsite
Inform the Project Manager that all personnel are being released from the site

The Project Accountant shall ensure that the following steps are taken:

Valuable records, files, and small office equipment are moved to a safe location (optional)
Move large office equipment away from doors and windows
Tape or board the windows in the office and decontamination trailers

Project Foreman will ensure that the following steps are taken:

Heavy equipment will be secured according to the manufacturer's recommendations
All small field equipment will be moved t the Conex box.

If the storm or Condition is downgraded, the PM, SS, and SSO will meet to decide if a downgrade of the phase is necessary.

See Appendix A for the Hurricane Preparedness Responsibility Checklist - Condition II.

Condition I - ***Destructive winds are anticipated*** ***within 12 hours.***

Complete all remaining actions required for lower conditions of readiness.
Secure jobsite access and evacuate to safe refuge.

See Appendix A for the Hurricane Preparedness Responsibility Checklist - Condition I.

Resume Site Operations

The PM will contact the ROICC to determine when site operations will resume. Although the hurricane/severe weather has passed, hazards may still exist because of water damage, other hazardous conditions, dangers from electric shock, poisonous snakes, etc.

The SSO will conduct a damage survey with the PM and SS. Photographs of the storm damage at the site will be taken by the SS. They will develop a prioritized recovery plan from the survey findings. Subsequently, all site personnel will be notified when it is safe to return to work. Required personnel and subcontractor expertise will be mobilized to the site to repair any damaged equipment.

See Appendix A for the Hurricane Preparedness Responsibility Checklist - Resume Site Operations.

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6.0 DEBRIEFING

Following the return to work of site personnel, the Site Supervisor will conduct a debriefing with site personnel. The debriefing will accomplish the following objectives:

Finalize a recovery plan
Review the Hurricane Plan for effectiveness
Suggest and agree on improvements to the plan
Incorporate plan changes

When completed, the PM and SS will meet with site personnel to discuss any corrective actions or changes in this plan.

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7.0 REFERENCES

The following references and sources of information may be consulted for additional guidance on hurricane preparedness and response.

Disaster Planning Guide for Business and Industry, Federal Emergency Management Administration (FEMA).

Metro-Dade Aviation Department Hurricane Procedures (1993).

U.S. Department of Commerce; National Oceanic and Atmospheric Administration (NOAA)

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ATTACHMENT A
HURRICANE PREPAREDNESS RESPONSIBILITY CHECKLISTS

HURRICANE PREPAREDNESS CHECKLIST

Condition V

Date/Time Entered Condition V:_____

Severe Weather/Tropical Storm: _____

Action Items

- ☐ Project Manager Notified
- ☐ Track of Storm Poses No Threat
- ☐ Storm or Condition is Downgraded
- ☐ Upgrade to Condition IV

Storm Location

Date/Time:_____ Date/Time:_____

Location/Coordinates:_____ Location/Coordinates:_____

Date/Time:_____ Date/Time:_____

Location/Coordinates:_____ Location/Coordinates:_____

Condition V Action Items Complete:_____

Date:_____

HURRICANE PREPAREDNESS CHECKLIST

Condition IV (Landfall within 72 hours)

Date/Time Entered Condition IV:_____

Action Items:

- ☐ Notify Project Manager
- ☐ Notify Project Superintendent
- ☐ Notify Site Personnel
- ☐ Assemble Shift personnel to begin preparation
- ☐ Track storm on hurricane tracking map (Attachment C) (if applicable)

The Project Foremen will ensure the following steps are taken:

- ☐ Secure all heavy equipment located at the site in accordance with manufacturer's specifications. All equipment will be moved to the either the Sea Trailer or the Water Treatment Building area.
- ☐ All excavated soils will be secured.
- ☐ All equipment fuel tanks will be filled.
- ☐ All subcontractors with equipment or supplies on-site will be notified to begin removal procedures
- ☐ Ensure all generators and lights are operational and make arrangements to secure additional ones if needed.

Condition IV Action Items Complete:_____
Date:_____

HURRICANE PREPAREDNESS CHECKLIST

Condition III (Landfall within 48 hours)

Date/Time Entered Condition III:_____

Action Items:

- ☐ Provide the status of the storm to site personnel on an hourly basis
- ☐ Remove all valuable records, files, and small equipment from the trailers and move to Water Treatment Building
- ☐ Take actions to secure jobsite necessary for Condition I that cannot be accomplished in 12 hours
- ☐ Recheck all items on checklist IV to ensure they are complete (ie.: gas tanks are still filled)
- ☐ Shut down SVE and Air Sparge Systems. Lockkout/Tagout where appropriate.

See itemized equipment checklist (itemized list of equipment to be secured/removed and COR for action)

Condition III Action Items Complete:_____
Date:_____

HURRICANE PREPAREDNESS CHECKLIST
Itemized Equipment Checklist, Condition III.

Equipment	Secure in Place	Remove from Project Site

HURRICANE PREPAREDNESS CHECKLIST

Condition II

Date/Time Entered Condition II:_____

Action Items:

- ☐ Evacuate all visitors from the site
- ☐ Conduct a role call of site personnel and inform the SSO
- ☐ Move large office equipment away from doors and windows
- ☐ Check the status all incoming shipments of supplies and equipment
- ☐ Remove all unnecessary vehicles from the site
- ☐ Secure heavy equipment in accordance with manufacturer's specification
- ☐ Tape or board trailer windows
- ☐ Secure all valuable records and equipment (optional)
- ☐ Release personnel from the site
- ☐ Recheck all items on checklist IV and III to ensure they are complete (ie.: gas tanks are still filled)

Condition II Action Items Complete:_____
Date:_____

HURRICANE PREPAREDNESS CHECKLIST

Condition I

Date/Time Entered Condition I:_____

Action Items:

- ☐ Complete all action items for lower conditions of readiness
- ☐ Secure jobsite access and evacuate to safe refuge
- ☐ Lockout/Tagout energy to Site trailers

Condition I Action Items Complete:_____
Date:_____

HURRICANE PREPAREDNESS CHECKLIST

Resume Site Operations

Date/Time Resume Site Operations:_____

Action Items:

- ☐ Conduct a damage survey
- ☐ Notify all site personnel when to return to work
- ☐ Develop a prioritized recovery plan
- ☐ Inspect electrical equipment before re-energizing to detect and repair damage
- ☐ Inspect trailers for structural damage. Repair as needed.
- ☐ Inspect site systems and prepare site assessment report(s).
- ☐ Provide bottled water for drinking until normal drinking water is deemed safe to drink
- ☐ Remove storm debris from site
- ☐ Notify ROICC of the extent of damages, discuss the priority of repairs and resume site activities.

Resume Site Operations Action Items Complete:_____
Date:_____

ATTACHMENT B
EMERGENCY PHONE NUMBERS

EMERGENCY TELEPHONE NUMBERS

The following are the business and home telephone numbers where personnel can be reached. In addition, the emergency telephone numbers of other vital agencies are listed:

OHM PROJECT PERSONNEL

		Phone	Pager
Project Manager – Taylor Sword	WK	757 363-7190	888-914-8731
	HM	757-482-8236	
Project Supervisor – Tom Cherrix	WK	252 444-8200	800 999-6710
	HM	252 637-6230	PIN# 994-2649
	CELL	252 514-8657	
Project Foreman – Steve Cadle	WK	252 444-8200	800 999-6710
	HOTEL	252 223-6020 Rm#221	PIN# 990-8212
	HM	304 458-19~~75~~ 57	
Project Accountant – Felicia Crawford	WK	252 444-8200	
	HM	252 223-0417	
Health and Safety – Alison Harwood	WK	252 444 8200	800 283-1212
	HM	252 726-7576	PIN # 888-1233

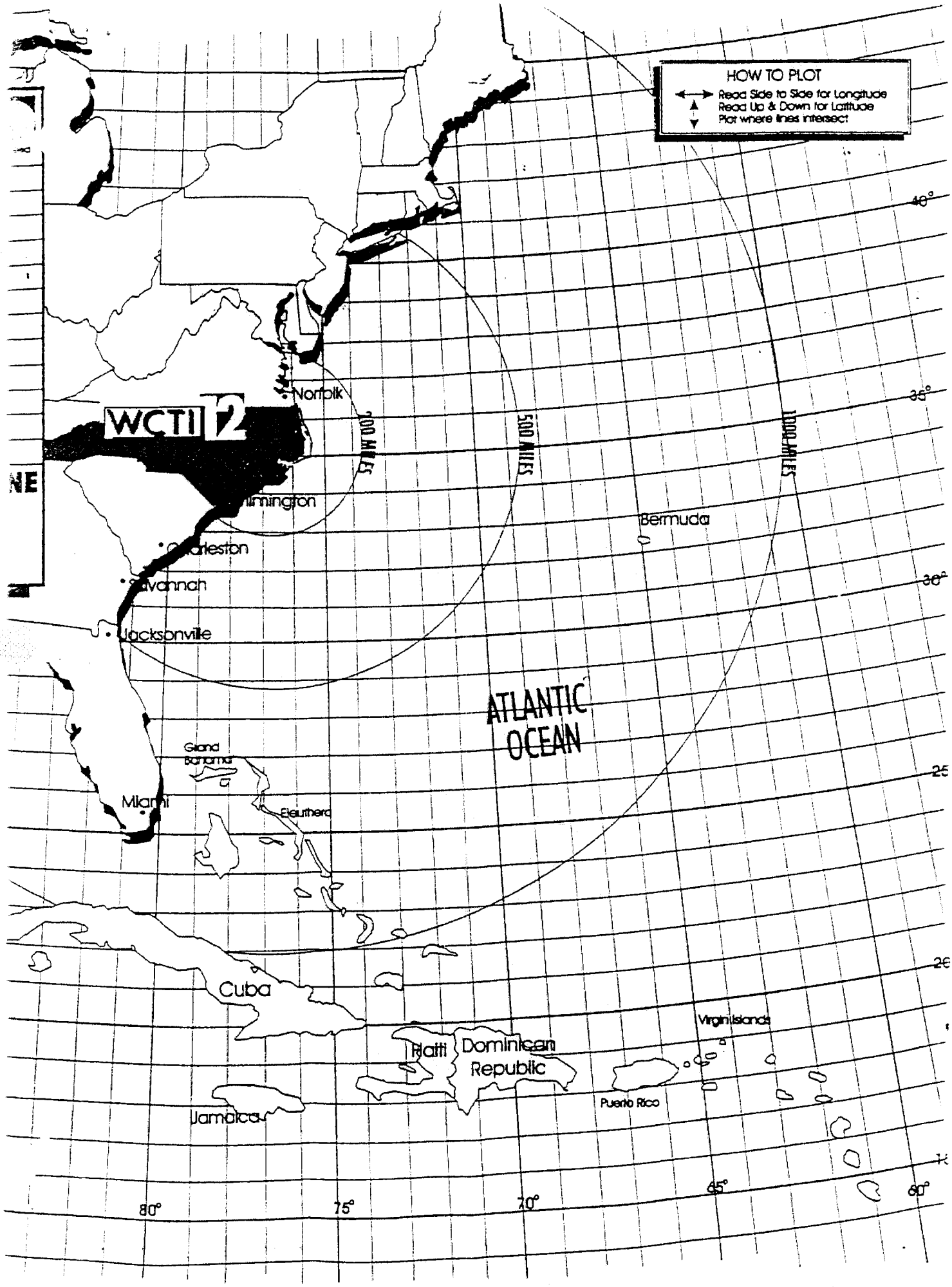
MCAS, CHERRY POINT

Program Manager for LANTDIV-	
John Franz, P.E.	609 588-6477
Fire Department	252 466-2211
Police	911
Base Utilities	252 466-2718
Carteret General Hospital	252 247-1616

HURRICANE INFORMATION SOURCES

Base Weather	252 466-2533	
National Weather Service	252 223-5327	Main Number
	252 223-5737	Recording

ATTACHMENT C
HURRICANE TRACKING MAP


HOW TO PLOT
Read Side to Side for Longitude
Read Up & Down for Latitude
Plot where lines intersect
WCTI 2
Norfolk
Wilmington
Charleston
Savannah
Jacksonville
Miami
Grand Bahama
Eleuthera
Bermuda
ATLANTIC OCEAN
Cuba
Haiti
Dominican Republic
Jamaica
Puerto Rico
Virgin Islands
100 MILES
500 MILES
1000 MILES
40°
35°
30°
25°
20°
80°
75°
70°
65°
60°

Appendix B

Sampling and Analysis Plan

Sampling and Analysis Plan for Construction and Operation of the Air Sparge Remediation System at Operable Unit 3, Site 07, Soils MCAS Cherry Point, North Carolina

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000

Atlantic Division
Naval Facilities Engineering Command
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Program Manager

January 1999, Rev 6/99, Rev 12/99
Delivery Order 0010
OHM Project No. 920694

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List of Acronyms

Acronym	Title
1,2-DCB	Orthodichlorobenzene
1,4-DCB	Paradichlorobenzene
CAR	Corrective Action Report
COC	Chain-of-Custody
DBP	di-n-butyl phthalate
DEHP	di (2-ethylphthalalte)
DEP	Diethylphthalate
EAD	Environmental Affairs Department
EDB	Ethylene dibromide
FB	Field Bank
FID	Flame Ionization Detector
FSP	Field Sampling Plan
GIS	Geographic Information System
HNO3	Nitric Acid
IPE	Isopropyl ether
LANTDIV	Navy Atlantic Division
LQMPs	Laboratory Quality Management Plans
MDLs	Method detection limits
mg/kg	milligrams per kilogram
MTBE	Methy tertiary butyl ether
NCAC	North Carolina Administrative Code
NFESC	Naval Facilities Engineering Service Center
NTR	Navy's Technical Representative
O & G	Oil and Grease
OHM	OHM Remediation Service Corp.
OU	Operable Unit
PCE	Tetrachloroethylene
PE	Performance Evaluation
PPE	Personal Protective Equipment
PQL	Practical quantitation limits
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QARs	Quality Assurance Reports
QC	Project Quality Control
RB	Equipment Rinsate Bank
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedures
SS	Stainless Steel
TAT	Turn around time
TCE	Trichloroethylene
ug/kg	micrograms per kilogram
USACE-MRD	US Army Corps of Engineers-Missouri River Division
UST	Underground Storage Tank
WP	Work Plan

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) presents, in specific terms, the policies, organization, functions, and Quality Assurance/Quality Control (QA/QC) requirements designed to achieve the data quality goals for the soil remediation by the air sparging at OU 3, Site 07 Soils. This work will be performed under Delivery Order 0010 of Contract Number N62470-97-D-5000 for the Navy Atlantic Division (LANTDIV) at the MCAS, Cherry Point, North Carolina.

This SAP integrates the required components of a generic quality assurance project plan (QAPP) and a field sampling plan (FSP). The Project Manager, Project QC Manager, Project Chemist, Field Chemist/Scientist, and Sample Technicians shall implement this document. Any field changes shall be approved by the Navy's Technical Representative (NTR), OHM Remediation Services Corp. (OHM) Project Manager, and OHM Project Chemist. These changes shall be documented by the Field Chemist/Scientist and distributed to the appropriate persons as amendments to the SAP.

The SAP outlines the following:

- project objectives
- data quality objectives
- sample handling
- decontamination steps
- quality control requirements
- data deliverables
- corrective procedures
- management
- sampling methods and procedures
- sample packaging
- data acquisition
- instrument testing, inspection and maintenance
- data storage
- remedial strategy
- sample identification system
- field QC procedures
- analytical method requirements
- laboratory data reduction, validation
- audit procedures

2.0 PROJECT MANAGEMENT

2.1 PROJECT OBJECTIVE AND SCOPE OF WORK

The scope of work for Delivery Order No. 0010 for OU 3, Site 07, Soils MCAS Cherry Point encompasses:

- Provide a complete RD/RA Workplan that outlines construction and initial sampling, operations and maintenance while incorporating and presenting the RD/RA Work Plan in alignment with all applicable plan and execution documentation to date related to the RA for OU3 Site 7 soils.
- Reduce soil contamination concentration in the capillary zone using air sparging with secondary beneficial effects of reduction of contamination in the groundwater directly beneath the soils, by enhanced bioremediation due to the increase in oxygen from the sparged air.
- Initiate a soil and groundwater monitoring program to evaluate progress of the remedial activities.
- Initiate the operations and maintenance of the system and sampling activities for performance monitoring.
- During initial operations establish and proceed with procedures and protocol for maintaining and monitoring the system performance.
- Collect baseline and performance data applicable for comparison against performance standards established for the soils at OU3 Site 7.

2.2 DESCRIPTION OF CONTAMINANTS PRESENT

2.2.1 Site Rehabilitation Goals

Based on the Federal and State regulations, the recommendations of the Remedial Investigation and Feasibility Studies conducted by Brown & Root Environmental Inc., the site rehabilitation goals for soils (i.e. the soil-to-groundwater target concentrations) were established for benzene (5.6 ug/kg) and 2-methyl naphthalene (4,900 ug/kg).

2.3 PROJECT TASK DESCRIPTIONS

The following tasks will be performed in support of the remedial actions at OU 3, Site 07, MCAS Cherry Point, North Carolina:

- Sample and analyze capillary fringe soil
- Sample and analyze groundwater
- Perform surveillance and technical audits of site sampling activities
- Validate the acquired data

2.3.1 Description of the Remediation Strategy

Soil vapor extraction (SVE) was selected by Brown and Root Engineering as the best available technology to remediate petroleum-based hydrocarbons from the soil at this site.

Because the water table is so close to the surface, OHM proposes to install air sparge wells only. As described in the work plan OHM will install up to thirty-one vertical air sparge wells to recover volatile hydrocarbons. The wells will be installed with a pneumatic punch to minimize the quantity of soil required for disposal.

These 31 wells will be separated into six header systems. Each header can be operated simultaneously or independently. This remediation project will be served by a single AS blower that will provide pressure for the wells.

In order to obtain analytical data from the soils being treated by the system outlined in this work plan, sampling and analysis is to be conducted on a periodic basis.

The soil samples collected periodically will provide analytical data that will be compared to the performance standards of benzene and 2-methylnapthalene, 5.6 μg/kg and 4,900 μg/kg respectively.

Appendix A, Tables provide detail pertaining to necessary sampling for construction and initial start up activities. Appendix A Table A-1 provides a summary matrix for monitoring sampling of the soils being treated by this system once installed. The monitoring soil sample schedule depicted provides for two, post-system construction sample events: one after 3 months of operation and a second event after 15 months of operation.

Soil sampling for performance monitoring beyond 15 months of operation is to be described in the Long Term Remedial Action Plan (LTRA). Within the LTRA multiple sampling event results will be described, and the use of the data from multiple events will be used in comparison with the standard to show that the system has or has not achieved the remedial goals. In essence the exit strategy to be defined in the LTRA will summarily show that after multiple soil sampling events depict analytical result concentrations for benzene and 2-methylnapthalene below the performance standards, then the remedial objective has been achieved. At that time in the future,

steps of additional sampling for confirmation and QA/QC will be conducted concurrent with programmatic steps to document achievement of standards. Subsequently leading to the approval for, and completion of decommissioning of the remedial system.

2.4 PROJECT ORGANIZATION

The project manager is the primary focal point for control of the project activities. The project manager will be supported by the QA management team, which will provide reviews, guidance, and technical advice on project execution issues. Members of this staff will be on an "as-needed" basis to assist in smooth project execution. The project team consisting of supervisory, health and safety, and technical will support the Project Manager and QA/QC staff to ensure that the project is safely executed in compliance with applicable laws, regulations, statutes, and industry codes. Individuals of the project team are responsible for fulfilling appropriate portions of the project QA program, in accordance with assignments made by the project manager. The project manager is responsible for satisfactory completion of the project QA program. The project manager may assign specific responsibilities to the deputy project manager and other members of the project staff. An organizational chart of the project team is presented in the Quality Control Plan.

The responsibilities of the key members in the project organization are:

Project Manager – Taylor Sword

The project manager is responsible for the overall direction of this project executed under his supervision. He provides the managerial administrative skills to ensure that resource allocations, planning, execution, and reporting meets contract requirements. He is ultimately accountable for all work activities undertaken on this project. The global quality-related responsibilities of the project manager can include, but are not limited to, the following:

- Organization of the project staff and assignment of responsibilities.
- Understanding of contract and scope of work for a specific project.
- Communication to the project staff regarding client requirements and QA practices.
- Identification, documentation, and notification to the client and project staff and QA personnel of changes in the scope of work, project documentation and activities.
- Supervision of preparation and approval of project-specific procedures, work plans, and QA project plans.
- Approval of project design bases, design parameters, drawings, and reports.
- Approval of project remedial action/construction methodologies.

- Dissemination of project-related information from the client such as design bases, input parameters, and drawings.
- Liaison for communications with the client and subcontractors.
- Liaison between the project staff and other internal groups.
- Decision of whether or not drawings require independent review.
- Investigation of nonconformances, notification of QA personnel, and implementation of corrective actions.
- Determination of the effect of nonconformances on the project and the appropriateness for reporting such items to the client, and providing appropriate documentation for reporting.
- Determination that changes, revisions, and rework are subject to the same QC requirements as the original work.
- Serve as final reviewer prior to release of project information.
- Approve and sign outgoing correspondence.
- Custodian of all project related documents.

Some of these responsibilities may be assigned by the project manager to the Site Supervisor, who will remain on site throughout the project field activities.

Site Supervisor – Tom Cherrix

The site supervisor is responsible for the day-to-day management of this specific delivery order. He will ensure sufficient resource allocations to maintain project schedule and budget. He will provide daily feedback to the project manager on project progress, issues requiring resolution, etc. The quality-related responsibilities of the site supervisor include, but are not limited to, the following:

- Notification to the project manager if the project cannot be completed with regard to quality, schedule, or cost.
- Oversight and control of subcontractor services.
- Liaison for communications with OHM project staff and other internal groups as well as with the NTR and on-site inspector.
- Supervision of day-to-day site activities in accordance with project and program requirements.
- Preparing the Contractor Production Report.
- Preparing the Quality Control Reports.
- Initiating corrective actions for non-conformance identified on-site.

Program Chemist – Dorothy S. Small

The program chemist is responsible for implementing the project chemical QA program. She is responsible for informing the project manager of any site-specific QA issues. Her responsibilities include, but are not limited to, the following listing. The program chemist is also responsible for procuring a certified laboratory based on the requirements needed for the project.

- Reviewing subcontractor's QA Manuals and/or Laboratory Quality Management Plans (LQMPs) and if possible, performing audits on the labs.
- Certifying the level of QA that has been achieved during the generation of analytical data.
- Initiating and overseeing all audit functions.
- Stopping work if quality objectives are not being met.
- Initiating investigations for nonconformances, identifying appropriate corrective actions, and performing follow-up audits to ensure that the corrective actions were successful.
- Selection of qualified laboratories and control of laboratory services requests.
- Assist coordination of laboratory with field sample shipments.
- Management of laboratory data in conjunction with the project and field chemist.
- Liaison between the field and the laboratories when changes are required in the SAP and Purchase Orders.

Project Field Chemist – to be determined

The project chemist is responsible for implementing the project plans and ensuring that the quality assurance and data quality objectives are being met for the project. He is also responsible for informing the chemical QA officer of any site-specific problems and for coordinating QA efforts with the contracted laboratory. His specific responsibilities include, but are not limited to, the following:

- Determining if the project and data quality objectives are being met.
- Evaluating chemical data for technical validity and ensuring adherence to published guidelines.
- Analyzing and interpreting all subcontracted technical and laboratory results.
- Implementing QA/QC procedures.
- Assuring the continuity of chain-of-custody evidence.
- Working with the QC engineer to compile and submit required QA Reports (QARs).
- Compiling, revising, updating, and submitting SAPs.
- Implementing corrective actions as required by the QC engineer or chemical QC officer.

- Ongoing QA/QC training of new and current personnel.
- Reviewing laboratory invoices for completeness and accuracy.

Field Chemist – Mark Martin

The field chemist will:

- Implement the SAP and designated QA/QC procedures.
- Oversee all field-sampling activities.
- Report all QC data to the project chemist for review.
- Implement corrective actions as required by the project chemist.
- Perform on-site screening and analyses of samples, if needed.
- Fill out sample tracking forms and related analytical and QC forms and logbooks.
- Ensure that the samples are handled, packaged, and shipped according to the SAP.
- Ensure that the laboratory supplies the sample containers, shipping supplies, chain-of-custody records, and the required QC samples (i.e., trip blanks).

Sample Technician - TBD

The sample technician will be responsible for:

- Carrying out all sampling in accordance with approved procedures and methodologies as defined in the SAP.
- Generating field blanks, equipment rinsate blanks, and acquiring field duplicate samples as required by the SAP.
- Completing sampling logbooks, sampling forms, labels, custody seals, and chain-of-custody forms and other paperwork as required by the SAP.
- Packaging and shipping of samples to appropriate laboratories.

2.5 DATA QUALITY OBJECTIVES FOR MEASUREMENT DATA

Data generated from the tasks described in Section 2.2 will be used to assess the effectiveness of the treatment system, and to identify and assess the need for continued treatment or select other alternatives. Project specific quality objectives are listed in Appendix A, Table A-2. These include the quantitation, project action, accuracy, precision, and completeness limits by which the data will be evaluated.

A Naval Facilities Engineering Service Center (NFESC) certified or US Army Corps of Engineers-Missouri River Division (USACE-MRD) approved laboratory will be used for all sample analyses. The laboratory will also be North Carolina approved. A copy of the

laboratory's QA Manual, statement of qualifications, and appropriate certificates of approval are kept on file, at OHM's Virginia Beach office, and are available upon request from the NTR, LANTDIV, or other regulatory agencies. A copy of the approved Sampling and Analysis Plan will be forwarded to the laboratory selected to perform chemical analysis of the samples.

All off-site samples will meet OHM's standard requirement for the QA/QC as specified in OHM QP-650. A copy of QP-650 is included in Appendix C. If disposal analysis is required no duplicates or rinsate blanks will be collected. All sampling and analytical activities will be in accordance with federal, state, and local regulations. A summary of the field QC sampling requirements is shown in Table A-1in Appendix A.

Data evaluation will be performed by the project chemist on all data before it is used. Third party data validation will not be performed on the final data. Data evaluation results will be provided in the project closeout report.

3.0 SAMPLING

3.1 SAMPLING METHODS AND PROCEDURES

The following sections describe sampling locations, frequencies, sample matrices, and measurements of parameters of interest. Table A-1, "Sampling Summary", in Appendix A presents a summary of these items.

3.1.1 On-Site Soil Screening

To verify the contaminated area perimeters, an on-site GC will be used to screen soils collected for Benzene and 2-Methylnaphthalene. Samples will be collected on 40-ft centers (see figure 3.1) until contamination is not detected. Samples will be collected at one foot and transported to the on-site laboratory. The sampling grid can be expanded depending on the field result. Four (4) ounce jar will be used to collect the samples from the bucket auger. Figure 3.1 shows the proposed sampling locations.

3.1.2 Gauging for Free Product

There is no confirmed free product at OU 3, Site 7, therefore free product gauging will not be performed. Monitoring wells in the immediate vicinity of the work area will be gauged for depth to groundwater.

3.1.3 Groundwater Sampling and Analysis

Prior to system start-up, one round of groundwater sampling will be conducted for baseline. CH2M Hill performed baseline sampling of groundwater in September 1999.

Once the system is in the operation, the following four wells will be sampled quarterly after the operation to assess the effectiveness of the remediation process and monitor the performance. Additionally, some of the sparge wells may also be selected for monitoring within the impacted zone. At a minimum, the following wells will be sampled:

OU 3-MW 11
OU 3- MW12
OU 3-7GW01
OU 3-7GW04

All wells will be purged with a minimum of three well volumes or until the pH, temperature and conductivity measurements are stabilized. Stabilization is defined as temperature +/- 1°C, pH +/- 0.1 pH units and conductance +/- 5 percent. Purged water will be stored for disposal. Samples will be collected with disposable Teflon bailers. The volatile sample will be collected first, followed by the semivolatile sample, then the remaining parameters. Standard Operating Procedure (SOP) QP-618 attached in Appendix C provides general information and procedures for collecting sample with a bailer. Groundwater samples will be analyzed for the parameters listed in Table A-1 in Appendix A.

Sampling equipment will be thoroughly decontaminated between samples using the procedures described in Section 3.5 or disposable sampling equipment will be used. Field sampling personnel will wear disposable sampling gloves during sampling and will change gloves between sample locations to minimize the potential for cross-contamination. Other personal protective equipment (PPE) may be required for sampling per the Site Specific Health and Safety Plan (SSHASP). Contact with sample(s) will be avoided to minimize the potential for cross-contamination.

3.1.3.1 Water Level Measurement

The water levels of the monitoring wells will be measured prior to collection of the groundwater samples and at a frequency as directed by the Technical Lead for the project. The procedure described in Section 3.1.2 will be used to perform the measurement. Baseline depth to water measurements will be made and recorded with the air sparge off as well as on. This is so that if groundwater mounding occurs it is measured and recorded.

3.1.4 Soil Samples

Subsequent to system start-up two soil sampling events will take place to document system performance. The first will occur three months after system start-up. A total of four direct push samples will be advanced and samples collected within the vicinity of the air sparge. There will be a total of eight samples taken, four during one event (at three months) and four more during a second event (at fifteen months). The exact locations will be based upon the results of the sampling during CH2M Hill's monitoring well installation and baseline sampling.

All direct push sample collectors will be advanced to 4 feet below land surface (BLS). In each direct push soil collector, the sample from 0-2 feet will be for lithology only. The 2-3 and 3-4

feet samples will also be examined for lithology. A sample will be collected at depths of 2-3 feet and 3-4 feet BLS. Each sample will be headspace screened after it is collected using the photoionization detector (PID). The sample from each boring with the highest PID reading will be selected for analysis by an off-site laboratory.

The second sampling event will occur when there is reason to believe (based on effluent concentrations of volatile organic compounds) that soil action level may have been achieved or at 15 months. A total of four direct push samples will be advanced in the vicinity of the air sparge system from soils that are being treated by the system. The exact locations will be based upon the results of the previous sampling and analysis performed and available date from system performance. All direct push sample collectors will be advanced to 4 feet BLS. In each direct push collector, samples will be collected at depths of 2-3 feet and 3-4 feet BLS. Each sample will be headspace screened after it is collected using the photoionization detector (PID). The sample with the highest PID reading will be selected for analysis by an off-site laboratory.

At each depth interval, one grab sample will be collected for volatile analysis and one composite sample will be collected for remainder of the analyses. Sampling will be performed according to the procedures described below:

Procedure for collecting grab samples using EnCore soil sampler:

1. Open the EnCore reusable package and remove the core device and cap
2. Place into the T-handle with the plunger pulled back
3. Push into the soil to be sampled, packing the soil into the sampler
4. Remove from the soil, brush of the sides, and put the cap seal onto the sampler
5. Label and reseal in the original package
6. Place into the cooler for shipment
7. Repeat for a total of two small and one large EnCore sample

Additional soil samples for performance monitoring will likely be collected after the second sampling event if necessary. The frequency and procedures for these long term sampling events, or for closure sampling will be outlined and described in detail in the LTRA. The LTRA will be prepared after construction and initial operations of the system. Differences for sampling that are required as a result of the construction (due to unforeseen changes) or operational parameters to be defined (due to unforeseen circumstances) will also be described in detail in the LTRA so

to provide a long term operational and closure strategy for the Remedial Action being applied to the soils at OU3 Site 7.

3.2 SAMPLE IDENTIFICATION SYSTEM

Sample identification names, or sample IDs, are assigned based on the following combination of sample identifiers, The '&' indicates that the two indicators joined are concatenated to create the sample identification name. The 'or' indicates that only one of the two indicators are used depending on the type of sample. See examples on the following page.

(Site Type) & (Site #)-(Type of Sample) & (Location #) & (Depth) or (Sample Round #).

Definition of identifiers:

Site Type:

UST	=	Underground storage tank associated site
AST	=	Aboveground storage tank associated site
IR	=	Location associated with an IR site
PSW	=	Potable supply well
SWMU	=	Solid Waste Management Unit

Site Number: The site number is the number, (i.e. building or tank system) of the associated UST or AST (if applicable).

Type of Sample:

BG	=	Sample collected from a background sample location for any media
SB	=	Soil sample collected from any depth of a soil boring that was not converted into a well
GW	=	Groundwater sample collected from a monitoring well

Location #: Sequential numbering starting at 001. If there are existing locations, a new location will be given the next available number for that location type on the site.

Sample Round #: The sample round number will be used for groundwater samples. A combination of the last 2 digits of the year in which the sample was collected and a letter corresponding to the quarter of the year during which the sample was collected will be used as the sample round #.

For example:

99A = 1999, first quarter (January through March)

In the event that multiple samples are collected from the same water during a quarter, single-digits 1-9 may follow the quarter identifier:

99A2 = 1999, first quarter (January through March), second sample from the same monitoring well

Groundwater samples collected during the first and second round of sampling in 1999 for this project will be identified as follows:

Well Number	Sample Number	Sampling Round
OU 3-MW11	OU 3-GW001-001	(First round of sampling in 2000)
OU 3-MW11	OU 3-GW001-002	(Second round of sampling in 2000)
OU 3-MW12	OU 3-GW002-001	(First round of sampling in 2000)
OU 3-MW12	OU 3-GW002-002	(Second round of sampling in 2000)
OU 3-7GW01	OU3-GW003-001	(First round of sampling in 2000)
OU 3-7GW01	OU3-GW003-002	(Second round of sampling in 2000)
OU 3-7GW04	OU3-GW004-001	(First round of sampling in 2000)
OU 3-7GW04	OU3-GW004-002	(Second round of sampling in 2000)

Soil samples collected during first and second round of sampling in 2000 for this project will be identified as follows:

Soil Sampling Location	Sample Number	Sampling Round
Boring Area 1	OU3-SB001-001	(First round of sampling in 2000)
	OU3-SB005-002	(Second round of sampling in 2000)
Boring Area 2	OU3-SB002-001	(First round of sampling in 2000)
	OU3-SB006-002	(Second round of sampling in 2000)
Boring Area 3	OU3-SB003-001	(First round of sampling in 2000)
	OU3-SB007-002	(Second round of sampling in 2000)
Boring Area 4	OU3-SB004-001	(First round of sampling in 2000)
	OU3-SB008-002	(Second round of sampling in 2000)

Air samples collected each month for this project and will be identified as follows:

Sample Number

OU3-AS-001 through OU3-AS-017

(This includes two duplicates)

Other representative designations may be used as needed based on field conditions.

If the sample is a field QC sample, the following designations will be added as a suffix:

FB - Field Blank (numbered sequentially such as FB01, FB02 etc)

RB- Equipment Rinsate Blank (numbered sequentially such as RB01, RB02 etc.)

(Duplicates will not be identified to the laboratory)

Sample location information will be included in the sample description area of the Chain-of-Custody (COC). Sample sequential numbers are not to be duplicated. Duplicate samples will be sent to the off-site laboratory blind. The latest OHM COC has been designed so that the cross-

reference of the duplicate to the original sample can be included on the last page of the COC that does not go to the laboratory.

3.3 SAMPLE PRESERVATION AND HOLDING TIMES

Samples collected for off-site analyses will be sent to the laboratory within 24 hours after collection to ensure that the most reliable and accurate answers will be obtained as a result of the analysis. The holding time begins from the date and time of collection in the field.

All environmental and treatment system samples, except for aqueous samples for metals, will be preserved to a temperature of 4°C prior to shipment to the analytical laboratory, using ice or refrigeration. This temperature should be maintained during shipment by placing ice in leak-proof containers, and placing it above and below the sample containers. Other sample preservation requirements and holding times applicable to the sample matrix and analyses are listed in Appendix A, Table A-1.

3.4 FIELD QC SAMPLES

The appropriate number of field QC samples, as specified in the NFESC 1996 document, will be collected during this project. These samples will include field blanks, equipment rinsate blanks, and field duplicate samples. These samples will be collected at the following frequencies and analyzed for the parameters listed in Appendix A, Table A-1:

Field Blanks (Ambient Blanks)

Field blanks, sometimes referred to as ambient blanks, are samples of contaminant-free media (reagent grade water) which are prepared at the site and handled in the field in the same manner as all other field samples. Field blanks are collected during the course of field sampling and, to the extent possible, in the actual sampling locations. Field blanks are collected by placing contaminant-free medium (reagent grade water) in the same type of container as field sample. Field blanks are preserved and stored in the same manner as field samples. At a minimum, one field blank per contiguous site from each sampling event is collected and is analyzed for those interfering contaminants that could potentially be present in ambient air at the sampling site. Approximate number of field blank samples planned to be collected is presented in Appendix A, Table A-1.

Equipment Rinsate Blank

Equipment rinsate blanks are the final analyte-free water rinse from equipment cleaning collected daily for each matrix sampled. An equipment rinsate blank is collected in the same type of sample containers, and is handled in the same manner as other field samples. The equipment rinsate blank must be collected during the sampling event (after collection of at least one field sample) after the sampling equipment has been decontaminated and prior to collection of the next field sample.

All equipment that comes into contact with field samples must be decontaminated prior to use. The use of disposable equipment is acceptable, but does not obviate the requirement for decontamination prior to use, or the requirement for collection of equipment rinsate blanks. Equipment rinsate blanks for disposable equipment are collected by passing contaminant-free medium through or over the decontaminated equipment. One equipment rinsate blank is collected per day, per sampling event for each matrix sampled that day. Equipment rinsates are analyzed for the same parameters as the sample collected that day. Approximate number of equipment blank samples planned to be collected is presented in Table A-1, Appendix A.

Field Duplicate

Duplicates for soil samples are collected, homogenized, and split. All samples except volatiles are homogenized and split. Volatiles are not mixed, but select segments of soil are taken from the length of the core and placed in 4-oz glass jars. The duplicates for water samples are collected simultaneously. Field duplicates must be collected at a frequency of one sample per day per matrix or 10% of the field samples per matrix. All the duplicates should be sent to the primary laboratory responsible for analysis, along with the samples. Approximate number of field duplicates planned to be collected are presented in Table A-1, Appendix A. Duplicates will be sent to the off-site laboratory blind.

Trip Blank

Trip blanks are defined as samples that originate from analyte-free water taken from the laboratory to the sampling site and returned to the laboratory with the volatile samples. One trip blank should accompany each cooler containing aqueous and non-aqueous volatile samples, should be stored at the laboratory with the samples, and analyzed by the laboratory. Trip blanks are only analyzed for volatile organic compounds and may not be required for this project if disposal samples are not taken. Approximate number of trip blank samples planned to be analyzed is presented in Table A-1, Appendix A.

3.5 DECONTAMINATION

All sampling equipment (hand augers, spoons, stainless steel/glass mixing bowls, etc.) will be decontaminated before sampling commences, between each sample location, and prior to leaving the site. The procedures for decontamination of equipment according to NEESA 20.2-047B are as follows:

1. Remove gross contamination by scraping or brushing.
2. Clean with tap water and phosphate-free laboratory detergent (liquinox), using a stiff brush to remove all surface contaminants.
3. Rinse thoroughly with tap water.
4. Rinse with 1:1 nitric acid (HNO3) metals grade (only if samples are to be analyzed for metals).
5. Rinse thoroughly with tap water.
6. Rinse thoroughly with deionized/distilled water.
7. Rinse twice with reagent grade isopropanol or methanol.
8. Rinse thoroughly with organic-free water and allow to air dry. (Do not rinse with deionized/distilled water. If organic-free water is not available, allow equipment to air dry.)
9. Wrap equipment with aluminum foil prior to storage or transportation to sample locations.

Decontamination fluids will be collected in properly labeled 55-gallon drums, and staged in a secure area until final disposal, unless other arrangements are made.

3.6 CROSS-CONTAMINATION MINIMIZATION

Cross-contamination is the introduction of contaminants into the sample through the sampling and/or sample-handling procedures. It can cause an otherwise representative sample to become non-representative. The most important means of minimizing cross-contamination are as follows:

Sampling expendables, i.e., sample gloves, pipettes, string, dip jars, etc., must not be reused. Used expendables should be labeled so they are not confused with non-contaminated trash

Minimum contact should be made between the sampler and the sample medium. For example, a sampler should not touch the sample during while loading the sample in the container.

Sample collection activities should proceed progressively from the least contaminated area to the most contaminated area.

Sampling equipment should be constructed of Teflon, stainless steel, or glass that has been properly precleaned for collecting samples. Equipment constructed of plastic or PVC should not be used to collect samples for trace organic analyses.

Any tools used in sampling must be carefully decontaminated prior to first use and after each use.

Activities that could contaminate samples are prohibited in the sample handling and preparation area. These activities and the possible contaminants include:

Activity	*Possible Contaminants*
Smoking	Poly Aromatic Hydrocarbons
Spraying for insects	Pesticides, oils, solvents
Spraying for weeds	Herbicides, oils, solvents
Refueling	BTEX, hydrocarbons
Painting and paint stripping	Solvents

3.7 SAMPLE LOG BOOK

It is necessary for the sampling crew to maintain daily field notes. Items that must be included are sampling protocol, any changes to the procedures, meetings, instructions, safety precautions, personnel protection, and activities pertaining to the samples. The person taking notes must be knowledgeable enough about these activities to know which details are important.

Repetition of information recorded in other permanent logs should be avoided, but enough should be recorded to present a clear and accurate picture of technical activities. At a later date, should a question arise concerning a specific event or a procedure used, it will be answered from these notes. The following information should be logged into the logbooks and/or database:

- Date and time of sampling
- Sample number, locations, type, matrices, volumes
- Sample ID and descriptions, type and number of sample containers
- Names and signatures of individuals performing sampling tasks
- Chain-Of-Custody (COC) and air bill numbers, preservatives, and date samples were sent
- Name of laboratories and contacts to which the samples were sent, turn around 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 collecting them
- Levels of protection used (with justification)
- Meetings and telephone conversations held with LANTDIV, NTR, regulatory agencies, project manager, or supervisor
- Details concerning any samples split with another agency
- Details of QC samples collected

These notes must be dated and signed (each page) for validity. All logbooks will be bound and pre-numbered. All log book entries will be made with indelible ink and legibly written. The language will be factual and objective. No erasures will be permitted. If an incorrect entry is made, the error will be crossed out with a single strike mark, initialed, and dated. When audits are performed, the auditor's remarks and decisions must also appear in these notes. These audits should be followed up by written report submitted by the auditor, including opinions and conclusions. A copy of this report should be placed in the project file and one copy kept in the sampling file for easy reference. This information will also be entered in to the database programs that have been prepared for the site. The field chemist or sample technician will enter it daily. This person will be the point of contact for all sampling and analytical information. Report outputs from the database are an acceptable substitute for the sample logbook.

3.8 SAMPLE LABELS

Any samples placed into a sample container will be identified by a sample label. Sample label will identify the following information:

PROJECT NUMBER
DATE- Month, day, year
TIME- Military time
SAMPLE NUMBER- See Section 3.2 for designations
SAMPLE DESCRIPTION
SAMPLER- Sampler's name
PRESERVATIVES
ANALYSIS REQUIRED- See Appendix A, Table A-1

The information described above should be printed neatly using an indelible marker. After the sample is taken and the label is securely attached, the sample is logged into the sample logbook. An example of a sample label is presented in Appendix B.

3.9 CUSTODY SEALS

Custody seals are narrow strips of adhesive tape of glass fiber used to demonstrate that no tampering has occurred. They may be used on sampling equipment, sample transport containers, and individual sample containers. They should be signed and dated by the sampler and placed from one side, across the top, and to the other side of the sample container or across the openings of the sample transport containers. An example custody seal is presented in Appendix B.

3.10 CHAIN-OF-CUSTODY PROCEDURES

In order to generate legally defensible data of the samples collected throughout the project, the possession of samples must be traceable from the time the samples are collected until they are introduced as evidence in legal proceedings. To maintain and document sample possession, chain-of-custody (COC) procedures are followed as described below:

A sample is under your custody if:

- It is in your actual possession
- It is in your view, after being in your physical possession
- It was in your physical possession and then you locked it up to prevent tampering
- It is in a designated secure area

An example of a COC form is presented in Appendix B. The following information is required on the COC:

- Project Name
- Project Location - City and State in which the project site is located
- Project Number
- Project Contact - OHM employee responsible for overseeing the sampling operation. This person should be the individual to whom questions are to be directed or verbal results are given (Project Manager, Site supervisor, or Project Chemist)
- Site Telephone Number - The telephone number of on-site office trailer or number where person responsible for samples can be contacted.
- Sample Date - Month, Day, Year
- Sample Time - Military time

- Sample Identification - Sample number and location
- Sample Type - Designation of sample as grab or composite
- Sample Description - Sample matrix, and a brief description of the sampling location
- Sample Preservation - Preservatives used
- Analytical Parameters Requested - Analytical parameter, method numbers, and specific compounds of interest, if applicable.
- Air bill Number
- Laboratory - Laboratory where samples are to be sent
- Laboratory Phone - Telephone number of laboratory
- Laboratory Contact - Contact person for laboratory
- Relinquished By - Signature of sender (OHM)
- Date Relinquished - Date samples were relinquished
- Accepted By - Signature of acceptor
- Date Received - Date samples were accepted
- Turnaround Time - Turnaround times requested or date the results are required from the lab
- Sampler's Signature - Signature of sampler
- The COC will be sealed in a ziploc bag and taped in place on the underside of the top of the sample transport container (cooler).

3.11 PACKAGING, HANDLING, AND SHIPMENT OF SAMPLES

Samples will be packaged as to minimize shifting of the samples during shipment. An absorbent, such as vermiculite or kitty litter, will be placed at the bottom of the shipment container in order to absorb any liquids in the event of sample breakage. All samples will be individually placed into appropriately sized ziploc bags and sealed.

Samples, which must be kept at 4°C, will be shipped on ice in insulated containers. Ice will be placed in a container such as a ziploc bag and sealed so that water will not fill the shipping container as the ice melts. The ice will be double bagged to insure the ice does not leak. Aqueous samples for metals analysis, except hexavalent chromium, shall not be shipped or stored under refrigeration.

Samples will be shipped via an overnight shipping agency to the appropriate laboratory. IATA regulations will be followed, as they are more applicable to OHM's method of sample shipment. Instructions for filling out shipment documentation are included in Appendix B. These

instructions are for shipping samples with unknown or limited hazards. All information will be entered as directed. No changes or substitutions to these instructions will be made irrespective of their significance. A copy of the OHM sample-shipping label is included in Appendix B.

4.0 DATA ACQUISITION

4.1 ANALYTICAL METHOD REQUIREMENTS

Analytical requirements for this project are listed in Appendix A, Table A-1. All samples will be analyzed according to USEPA SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, whenever possible. Alternative methods of analysis from other sources (ASTM, NIOSH, Standard Methods, etc.) may also be used.

4.2 QUALITY CONTROL REQUIREMENTS

Project Quality Control (QC) requirements for precision, accuracy, completeness, and quantitation limits are listed in Appendix A, Table A-2. QC procedures and acceptance limits must be met as specified in the individual methods. In addition, the laboratory must meet the specification and requirements as described in the NFESC 1996 document.

4.3 INSTRUMENT TESTING, INSPECTION, AND MAINTENANCE

Proper maintenance is critical to the performance of minimization of downtime of all equipment, whether it is for measurement or support. Inspection will be performed, at a minimum, prior to use of the instruments. Preventive maintenance will be performed as recommended by the manufacturer of the respective equipment. All routine maintenance and major repairs performed on field screening or analytical equipment will be recorded in bound maintenance logbooks that have been specifically designated for that instrument. Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent use, or will be tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated or completely replaced.

4.4 INSTRUMENT CALIBRATION

All calibrations on field instruments will be performed, as a minimum, on a daily basis. Every calibration will be recorded in the maintenance logbook for each instrument. Quality control check standards from a separate source will be used to check initial calibration, and acceptance and rejection criteria.

Monitoring instruments, such as the OVA or FID, O2/LEL meter, Monitox, etc. will be calibrated as specified in the SSHASP. Off-site analytical instruments will be calibrated according to the method specifications and the laboratory's QA Manual.

5.0 DATA MANAGEMENT

Data management is the system by which data is reduced, reviewed, validated, reported, distributed, and finally archived. The criteria in this system are designed to meet the project objectives.

5.1 LABORATORY DATA REDUCTION

Data reduction includes the identifications and calculations necessary to convert the raw instrument readings to the final reported compounds and their respective concentrations.

Responsibilities of Analyst

Each analyst is responsible for converting raw data into reportable values. These specific duties include:

- Proper identification of the analyte
- Generation of calculations
- Checking associated calibrations to ensure support of data
- Associated QA/QC checks are supportive of data
- Associated documentation is complete and accurate in respective log books
- Associated chromatograms and strip chart recordings are labeled with data, instrument number, run parameters and analyst

5.2 LABORATORY DATA VALIDATION

All data generated for the project within the laboratory will be extensively checked for accuracy and completeness. The data validation process consists of data generation, reduction, and three levels of review.

The analyst who generates the raw data has the prime responsibility for the correctness and completeness of the data. All data generated and reduced will follow protocols specified in the laboratory SOP. Each analyst reviews the quality of his work based on an established set of guidelines. The guidelines are:

- Sample preparation information is correct and complete
- Analysis information is correct and complete
- The appropriate Standard Operating Procedures have been followed
- Analytical results are correct and complete

- Analysis is performed within prescribed holding times.
- QC sample results are within established control limits
- Blank sample results are within appropriate QC limits
- Special sample preparation and analytical requirements have been met
- Documentation is complete
- The next level of review is performed by the section supervisor or data review specialist. The review is structured to ensure that:
  - Calibration data are scientifically sound, appropriate to method, and completely documented
  - QC results are within established limits
  - Reporting units are consistent with the method and the matrix
  - Quantitative results are correct
  - Data results are consistent with information on the COC
  - Documentation is complete
  - The data is ready for incorporation into a final report
  - The data package is complete and ready for data archive

The second level of review is structured to ensure all calibration data and QC sample results are reviewed and all of the analytical results from 10 percent of the samples are checked back to the bench sheet. If no problems are found with the data package, the review is complete. If problems exist, an additional 10 percent is reviewed, the process continues until no errors are found or the package has been reviewed in its entirety.

The final level of review by the laboratory comes from the program administrator or laboratory QA Officer. They review the report to ensure that the data meets the overall objectives of the project.

Once the data has been validated, it is ready for report production. The report will contain:

- Description of sample types
- Tests performed, problems encountered during testing
- Dates sampled
- Date received
- Date extracted
- Date analyzed
- Analytical results
- Reportable limits

- QC information: percent recovery, relative percent difference, control limits, blanks analyses, matrix spikes, and other additional special QC information
- Qualifiers for data falling outside of QC limits
- Methodology
- Name of the analyst
- Signature of laboratory representative
- Dual column confirmation results
- Calibrations (when requested)
- Instrument performance checks (when requested)
- QC Batch number

The report from the laboratory will be paginated and will also include a copy of the original COC for the samples analyzed.

5.3 PROJECT DATA REVIEW

Program Chemist Data Review Responsibilities

The program chemist is responsible for initial review of the data from the laboratory. This review includes:

- Verifying that all requested data are reported
- Verifying that samples are analyzed according to the contract specified method
- Verifying that all analytes requested are reported
- Verifying that holding times are not exceeded
- Verifying that matrix spike, matrix spike duplicate, and surrogate recoveries fall within the laboratory's acceptance criteria
- Reviewing blank data for contamination
- Reviewing field quality control results for inconsistencies
- Verifying that the data generated meet the project Data Quality Objectives specified in the SAP

The project chemist is responsible for informing the Project Manager and Project Chemical QA/QC Officer of any laboratory and/or sampling deficiencies or issues. These issues and subsequent decisions will be documented on the data evaluation report produced by the project chemist for each data package.

Project QC Engineer Data Review Responsibilities

The Project QC Engineer is responsible for interfacing with the project chemist, project manager, and the laboratory's QA Officer to resolve any QA/QC issues affecting the data. He/she is also responsible for finalizing any QA/QC issues with the laboratory and/or the project chemist. This includes obtaining a corrective action from the parties involved.

5.4 DATA DELIVERABLES

Data deliverables will be in the electronic and hard copy format. The requirements for each deliverable format are discussed below:

5.4.1 Hard Copy Data Deliverable

The preliminary data will be faxed to the program chemist. This data may or may not have undergone the full laboratory review process and may contain errors and discrepancies. Prior to the use of data results for any decisions, the data will be reviewed by the program chemist and assessed against the project goals and data quality objectives. A copy of the preliminary data, including review comments from the project chemist will be submitted to the site and/or the project manager.

The hard copy data will be submitted within prescribed time as defined by the Terms and Conditions of the laboratory contract document. The items that need to be included in the hard copy data package are listed in the Standard Operating Procedure (SOP QP-650) for Data Deliverable Requirements. A copy of the SOP QP-650 is included in Appendix C.

The hard and final copy data will be evaluated by the project chemist and assessed against the preliminary data, project goals and data quality objectives. Any errors, discrepancies, and nonconformances will be brought to the laboratory's and project manager's attention.

When QA issues have been satisfactorily settled and data evaluation has been completed, the project manager may release the data to the client and/or regulating agencies.

5.4.2 Electronic Data Deliverables

All well, sampling and analysis, and geologic and hydrogeologic data will be provided to OHM using the prescribed standards and procedures. All data will be finally submitted to the MCAS Cherry Point Environmental Affairs Department (EAD) in the format that is compatible to

EAD's Environmental Data Management System, a subset of the basewide Geographic Information System (GIS). A copy of the data submittal requirement is provided in Appendix D.

5.5 DATA STORAGE AND ARCHIVE

After OHM has completed its work for the project, all documents generated will be assembled in the project file. The laboratory files will be maintained in the PMO office. These files are maintained in a centralized data management manner to ensure proper maintenance of the data. The Program Chemist is responsible for the maintenance of the data for LANTDIV projects. The project manager/supervisor will also have a second copy. The Project Manager is responsible for ensuring the collection, assembly, and inventory of all documents relative to the project at the time the objectives are met. These files then become accountable. Any records leaving the file must be signed out.

When a contractor has completed the project objectives, all file documents are reviewed and submitted to the central file. The project file contains the following document classes:

- Project logbooks
- Drum logs and other forms
- Sample identification documents
- Chain-of-custody records
- Analytical logbooks, laboratory data, calculations, graphs, etc.
- Correspondence
  - Inter-office
  - Client
  - Regulating agencies
  - Record of confidential material
- Report notes, calculations, drafts
- References, literature
- Sample (on-hand) inventory
- Check-out logs
- Litigation documents
- Miscellaneous – photographs, maps, drawings, etc.

Once deposited in the file, documents must be checked out. The final report is usually generated by use of computer. A back-up copy of the report on diskette is filed along with the project file.

The original report remains in the hard drive of the computer until such a time is required to download it on a diskette. This diskette is also archived. All information under the corresponding project number is maintained in the archive system for five years. All archives are accessed by the archives file master list which is maintained in a separate location from the archives.

6.0 DATA ASSESSMENT PROCEDURES

Reliability in analytical determination is maintained through strict adherence to quality control procedures. Procedures are designed to control both the accuracy and precision of analytical results. For the validation of the data, a known method spike is routinely analyzed to ensure the accuracy of results. The procedure is to run the standard QA/QC and sample analysis with each lot of samples sent to the laboratory. If more than ten individual analyses are made, additional standards will be analyzed at a rate of one standard per ten analyses. Some procedures call for the use of either a surrogate spike or the standard addition of a known quantity of the analyte to a split of the sample being analyzed.

Control charts will be prepared using an estimate of the spike recovery obtained from the literature or determined by repeated analyses run in the laboratory. Each time the analyst runs a method spike, the results is entered on the control table. If a standard addition technique is used, a plot of instrument response versus added analyte concentration is made in order to determine analyte concentration in the original sample. These are further explained in the laboratory's QAM.

Replicate analyses will be performed on at least 10 percent of the samples processed by the laboratory. A record of the precision of most analyses is kept by calculating and plotting the industrial statistic I (which is equivalent to the coefficient of variation). Blanks are also run with each batch of samples or individual sample analyzed regardless of the level of certification of the data.

The purpose of spikes, blanks, and replicates is to provide a sound scientific basis from which the degree of certification of the resultant data can be objectively concluded. These are not management decisions, but follow naturally from the results of the above QC procedures.

6.1 ACCURACY

Data accuracy is a reflection of the efficiency of the analytical procedure. It is determined by use of spiked samples and standard reference materials or laboratory control samples performed at the rate of one set every 20 samples. A control chart is generated using historical laboratory data where warning and control limits are established to assess data accuracy.

The accuracy (check standards) samples will have concentration values of the mid-standard. During analysis, a minimum of 10 percent of samples are accuracy samples. The accuracy samples are staggered through the analysis, not placed one after another. After a minimum of seven accuracy samples are analyzed, the percent recovery is calculated for each sample.

The accuracy criteria is determined by calculating the standard deviation of seven or more percent recovery values and setting the upper and lower control limits using the following equations:

Upper control limit = p + 3 SD

Lower control limit = p - 3 SD

Where:

p = Average percent recovery

SD = Standard deviation

After the standard deviation, for the seven or more samples has been calculated, the accuracy control limits are generated and are then used to determine if the analysis is out of control. This is done by checking the results against the control limits. If any values are above the upper control limit or below the lower control limit, all sample results after the last qualifying accuracy sample must be repeated or discarded. If seven consecutive values fall below the lower control limit, new limits are calculated using the new accuracy check values. If the values fall between the upper and lower limits, then conditions are reported as "within limits".

6.1.1 Recovery Control

Recovery control is necessary to determine if the sample matrix is interfering with the constituent being analyzed. A minimum 5 percent of samples will be recovery check samples (matrix spikes). Samples involving different types of matrices will have at least one recovery check sample for each matrix.

Control limits will be determined for each matrix, determining the deviation for seven or more percent recovery values.

6.2 PRECISION

Duplicate and replicate samples analyzed by the laboratory assess the precision of the sampling effort. Control limits for duplicate/replicate Relative Percent Difference (RPD)s are listed in Appendix A, Table A-2. Once a sufficient amount of replicate data becomes available, field precision control charts are constructed similar to the laboratory precision charts. For any given concentration, the mean and the standard deviation(s) of the replicates are calculated. Data from each sample set are pooled with the previous sample sets to generate control and warning limits for the next set. Control and warning limits for water samples are set at ± 2s and ± 3s, respectively. Control limits for solid samples are more liberally established due to matrix heterogeneity. Data outside any control limit are subject to QA review.

Precision is based upon the results of the RPDs as calculated from the percent recoveries of the matrix spike and duplicate samples. The control limits for precision is based on historical laboratory data.

MS and MSD samples on a per batch or a minimum frequency of 5 percent are analyzed to assess precision. Duplicate results are compared and the RPD is then determined. The RPD will be entered into the laboratory's data system and will be used to define the precision of the analysis. Minimum limits are listed in Appendix A, Table A-2.

6.3 COMPLETENESS

The field supervisor must ensure all sites are sampled for all the specified analyses, that sufficient sample volume has been provided to complete those analyses, and that all of the QA samples have been included with each sample set. The goal for completeness for each sample set shipped to the laboratory is 100 percent. Minimum limits are listed in Appendix A, Table A-2.

Completeness is expressed as the percentage of the amount of valid data obtained to the amount of data expected. For a set of data to be considered complete, it must include all QC data verifying its accuracy and precision.

If samples analyzed do not meet all QC requirements in terms of accuracy and precision for any specific parameter, the sample preparation and analysis will be repeated pending adequate volume.

6.4 CRITERIA FOR REJECTION OF OUTLYING MEASUREMENTS

There are many statistical tests for rejection of outlying data points obtained from a set of measurements from a single population. A test recommended in "Statistical Manual of the Associate of Official Analytical Chemists," 2nd Edition, W. J. Youden and E. H. Steiner, 1975, pg. 86, is the Dixon Test. This test is not dependent on the distribution of the data and can be used for as few as three measurements. A more complete description for this broadly applicable test can be found in the referenced text.

Another reference is the USEPA National Functional Guidelines for Data Validation of Organics and Inorganics. Also, specific programs may have quality objectives with criteria for rejection of outlying measurements.

6.5 METHOD DETECTION LIMITS AND PRACTICAL QUANTITATION LIMITS

Method detection limits (MDLs) must be established by the laboratory. This should, at a minimum, be established on a yearly basis. MDL is the minimum concentration of a substance that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero.

Practical quantitation limit (PQL) is the lowest level that can be reliably determined within specified limits of precision and accuracy during routine laboratory operating conditions. The PQLs are generally 5-10 times the MDL. The PQL is the most applicable limit of reporting for this program.

6.6 LABORATORY AND FIELD CONTAMINATION

It is not unusual to find the following analytes at trace levels in the samples:

Methylene chloride
Acetone
Freon (1,1,2-trichlorotrifluorethane)
Bis(2-ethylhexyl)phthalate
Hexane
Isopropanol
2-Butanone

These are common solvents used in the field and in the laboratory.

In order to fully evaluate data containing trace levels of these contaminants, one must have data from trip blanks, field blanks, equipment blanks, and all applicable laboratory blanks for that batch of samples.

The determination on the use of the data will be made during the Data Validation process.

7.0 PERFORMANCE AND SYSTEM AUDITS

Audit is defined as systematic check to determine the quality of operation of field and laboratory activities. It is comprised of the following:

Performance audit
System audits

These include a detailed review of each operating component of the network. Auditing will ultimately assist in determining if each element within a system is functioning appropriately per the QA program requirements.

7.1 FIELD PERFORMANCE AUDITS

Field performance audits are performed on an ongoing basis during the project as field data is generated, reduced, and analyzed. All numerical analyses, including manual calculations are documented. All records of numerical analysis are legible, of reproduction quality, and supporting to complete permit logical reconstruction by a qualified individual other than the originator.

Other indicators of the level of field performance are the analytical results of the blank, duplicate, and replicate samples. Each blank analysis is an indirect audit of effectiveness of measures taken in the field to ensure sample integrity. The results of the field duplicate and replicate analysis is an indirect audit of the ability of each field team to collect representative sample portions of each matrix type.

7.2 FIELD SYSTEM AUDITS

System audits of site activities are accomplished by an inspection of all field activities by the Project Chemical QC Officer. This audit is composed of comparisons between current field practices and standard procedures. The following is a list of criteria to be used in the evaluation of field activities:

- Overall level of organization and professionalism
- All activities conducted in accordance with work plan
- All procedures and analyses conducted according to procedures outlined in this document
- Sample collection techniques versus the site sampling and analysis plan

- Level of activity and sample documentation
- Working order of instruments and equipment
- Level of QC conducted by each field team
- Contingency plans in case of equipment failure or other event preventing the planned activity from proceeding
- Decontamination procedures
- Level of efficiency which each team conducts planned activities at the site
- Sample packaging and shipment

After the audit, any deficiencies are discussed with the field staff, and corrections are identified. If any of these deficiencies might affect the integrity of the samples being collected, the QA Officer informs the field staff immediately, so corrections can be made. The field performance audit will be conducted at the start of the project, one before the end of the project, and as directed by the project manager. OHM will also submit to all requests by regulatory agencies, or other clients for external field systems audits.

7.3 LABORATORY PERFORMANCE AUDIT

The laboratory performance audit verifies the ability of the laboratory to correctly identify and quantitate compounds in blind check samples submitted by an auditing agency. If the laboratory participates in Performance Evaluation (PE) programs such as USEPA WS/WP studies, AIHA, PAT studies, etc., results from these studies will be generally acceptable by OHM. However, during the course of the project, it may be necessary for the Project QA/QC Officer to send PE samples to the laboratory to evaluate specific parameters.

The contracted laboratories will undergo performance audits throughout the project consisting of field QC samples. Occasionally PE samples will be supplied by the client or external organizations which will be spiked with the same analytical parameters that are being investigated on site. External laboratory performance audits by auditing agencies such as the USEPA, USACE-MRD, DOD, NFESC, etc. are not routinely scheduled. However OHM and its subcontracted laboratories will submit to any external audit upon request by the USEPA or the client.

7.4 LABORATORY SYSTEM AUDITS

The laboratory system audit is a review of analytical laboratory operations to verify that the facility has the necessary equipment, staff, and procedures in place to generate acceptable data.

It is also to determine that each element within an activity is functioning appropriately and within the guidelines of applicable methodology, approved procedures, and the site QAP. An on-site inspection is routinely performed by the laboratory's QA Manager and may also be frequently performed by the OHM Project Chemical QA/QC Officer. If the laboratory participates in certification programs, audits performed by the certifying agencies may satisfy the criteria of systems audits for the project.

If the laboratory is in question, a system audit can be directed by the client and performed by OHM or the client's representative. Any recommendations made will be considered for implementation and any corrective actions will be taken to correct any deficiencies found. Project-specific audit reports will be placed in the project files and laboratory audit reports will be kept by the laboratory for future reference.

8.0 CORRECTIVE ACTION

This Corrective Action may be necessary as a result of the following QA activities:

- Field and laboratory performance audits
- Field and laboratory system audits
- Inter-laboratory comparison studies
- Calibration data fall out of specified limits
- Failure to adhere to the CQMP
- Failure to adhere to the site
- Failure to adhere to standard operating procedures and methods
- Data completeness below required limits
- Control limits are exceeded for QC samples

If, during system and performance audits, deficiencies or problems are discovered, corrective action will be initiated immediately. The appropriate field and laboratory personnel will be notified immediately and an investigative process will be implemented immediately to find solutions to these issues. The investigative process will consist, but is not limited to, the following:

- Determining when the problem occurred
- Determining which systems were affected by the problem
- Determining the cause of the problem
- Determining a corrective action to eliminate the problem
- Assigning the responsibility for implementing the corrective action
- Implementing the corrective action
- Evaluating the effectiveness of the corrective action
- Investigating alternative corrective actions if the original action was not sufficient in eliminating the problem
- Documenting that the corrective action has eliminated the problem

The Project Chemical QC Officer has the authority to require that all site activities threatened by the problem be stopped or limited until the corrective action has been implemented and satisfactorily verified to eliminate the problem.

Corrective actions may include, but is not limited to:

- Modifications to procedures
- Recalibration of instruments
- Replacement of solvents, reagents, and/or standards
- Additional training of personnel
- Reassignment of personnel

8.1 CORRECTIVE ACTION REPORT

A Corrective Action Report (CAR) is necessary documentation of the investigative process. Depending on the issues, the CAR may be generated by the laboratory or the field personnel. Copies of the CAR will be given to the Project QC Officer and Project Manager, who will distribute it to the client. A copy of the CAR will be placed in the project files for future reference.

The CAR should include, but is not limited to:

- A description of the problem, deficiency, or issue
- Proposed resolutions
- Resulting actions
- Effectiveness of the resolutions
- Personnel responsible for implementation of the corrective actions
- Personnel responsible for monitoring the effectiveness of the actions.

8.2 QUALITY ASSURANCE REPORT

The Project Manager, Project QC Officer, and Project Chemist will converse on a regular basis to review possible and potential problem areas and to ensure that all QA/QC procedures are being carried out. It is important that all data abnormalities be investigated to ensure that they are not a result of operator or instrument deviation but are a true reflection of the methodology or task function. The project final report will contain a separate section that covers the data quality and validity. At a minimum, the information on the next page, will be included in the report:

- Assessment of measurement data precision, accuracy, and completeness
- System and performance audit results
- Significant QA problems and corrective actions implemented
- Copies of documentation such as memos, reports, etc.

The Project QC Officer will be responsible for preparing this report weekly or daily, as well as monthly written QA reports to OHM QA management. The Regional QA/QC Director will be responsible for reviewing and approving these monthly reports. Verbal reports will be made on a more frequent basis. All reports will be made available to the project manager, client, and regulating agencies. If no project audits were performed and no significant QA/QC problems occurred, a letter stating these facts will be submitted to the referenced parties in lieu of a QA Report.

APPENDIX A

TABLE A-1 SAMPLING SUMMARY

TABLE A-2 PROJECT QUALITY CONTROL OBJECTIVES

TABLE A-1
SAMPLING SUMMARY

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method	Sampling Equipment	TAT[1]	QC Level	Required Analysis	Analytical Method	Holding Time	Preservatives	Containers
BASELINE SAMPLING													
Baseline Sampling	**To be Determined and Sampled by CH2M Hill**												
MONITORING SAMPLING													
System Monitoring													
Soil Borings	Hot Spot	Soil	Two borings after 3 months and after 15 months of operation	4 samples each for the 2 sampling events (8 total) + 1 duplicate	Grab	EnCore Soil Sampler, SS spoons and bowls	14 Days	OHM Standard Deliverables	Volatiles	5035/ 8260B	14 days	Cool to 4 °C	3ea 5g and 1ea 25g EnCore Soil Sampler 1 ea 4oz jar
									Semi-Volatiles	8270C	7 days ext; 40 days analysis	Cool to 4 °C	1 ea 8 oz glass
Monitoring Wells	Monitoring Wells (see list below) [(2)]	Water	Quarterly	4 Wells X 5 events = 20 samples + 6 duplicates	Grab	Disposable Bailer	14 Days	OHM Standard Deliverables;	Volatiles	5030B/8260B	14 days	Cool to 4 °C; HCl pH <2	2 ea 40 ml Vials
Field QA	Trip Blank	Water	One per shipping container containing volatile samples	2	Prepped by Laboratory	Prepped by Laboratory	14 Days	OHM Standard Deliverables;	Volatiles	8260B	14 days	Cool to 4 °C; HCl pH <2	2 ea 40 ml Vials

TABLE A-1
SAMPLING SUMMARY

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx. Sample No	Sampling Method	Sampling Equipment	TAT[1]	QC Level	Required Analysis	Analytical Method	Holding Time	Preservatives	Containers
Monitoring Wells Continued													
Monitoring Wells	4 Monitoring Wells (see list below) [(2)]	Water	Once after 3 months and after 12 months	4 Wells x 2 events = 8 samples + 2 Duplicates	Grab	Bailer	14 Days	OHM Standard Deliverables	TCL Semi-Volatiles	8270C	7 days ext; 40 days analysis	Cool to 4 °C	1 ea 1 liter amber glass
									TCL Pest / TCL PCBs	8081A/ 8082	7 days ext; 40 days analysis	Cool to 4 °C	2 ea 1 liter amber glass
									TOC	9060	28 days	Cool to 4 °C; HCl pH <2	1 ea 250 ml HDPE
									Methane	RSK-SOP 175 (3)	14 days	Cool to 4 °C; HCl pH <2	2 ea 40 ml Vials
									Nitrate	353.2	28 days	Cool to 4 °C; H_2SO_4 pH <2	1 ea 500 ml HDPE
									Sulfate	375.4	28 days	Cool to 4 °C	1 ea 500 ml HDPE
									Chloride	325.3			
									Alkalinity	310.1	14 days		
									Sulfide	376.1	7 days	Cool to 4 °C, + 4 drops 2N Zinc acetate + NaOH to pH >12	1 ea liter HDPE
									Fe^{+3}	Field Analysis	ASAP	Not Applicable	1 ea 250 ml HDPE

Notes: (1) Calendar Days

(2) Monitoring Wells to be sampled : OU3-MW11, OU3-MW12, OU3-7GW01, OU3-7GW04

(3) Method developed by the USEPA.

TABLE A-2
PROJECT QUALITY CONTROL OBJECTIVES

		Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits LCS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
Method No[1]	Analyte / Component	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]	Water	Soil[2]
8260B	Benzene	**5.6**	NS	1	5	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8270C	2-Methylnaphthalene	**4,900**	NS	10	660	60-140	20-150	<30	<50	41-125	31-135	<50	<75	95	90

Notes: (1) SW-846 method unless otherwise noted
(2) Includes sediment wastes and solids.

TABLE A-2
PROJECT QUALITY CONTROL OBJECTIVES

		Project Action Limits	Minimum PQL	Accuracy Limits Audit Accuracy Recoveries	Precision Limits Field Dup Deviation	Completeness Limits
Method No[1]	Analyte / Component	Air	Air	Air	Air	Air
TCL VOLATILES IN AIR BY GC/MS		ppbv	ppbv	%	%	%
TO-15	Benzene	NS	5	70-130	<30	95
TO-15	2-Methylnapthalene	NS				

APPENDIX B

CUSTODY SEAL

CHAIN-OF CUSTODY RECORD

OHM SHIPPING LABEL

SHIPPING INSTRUCTIONS FOR SENDING SAMPLES TO THE LABORATORY

Client _____

Sample ID _____

Location _____

Analysis _____

Preservative _____

Collection Date/Time _____

Collected By _____

CUSTODY SEAL

Person Collecting Sample _____ Sample No. _____
(signature)

Date Collected _____ Time Collected _____

Custody Seal

Sample Label

OHM Remediation Services Corp.

OHM Remediation Services Corp

Subsidiary of OHM Corporation

CHAIN-OF-CUSTODY RECORD

205391

Item	Sample Identifier	Matrix	Date	Time	Preserved	# of Cont.	QC Level	T A	Analysis							
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

Distribution: White - Laboratory (To be returned with Analytical Report), Goldenrod - Project File, Yellow - Project Data Manager

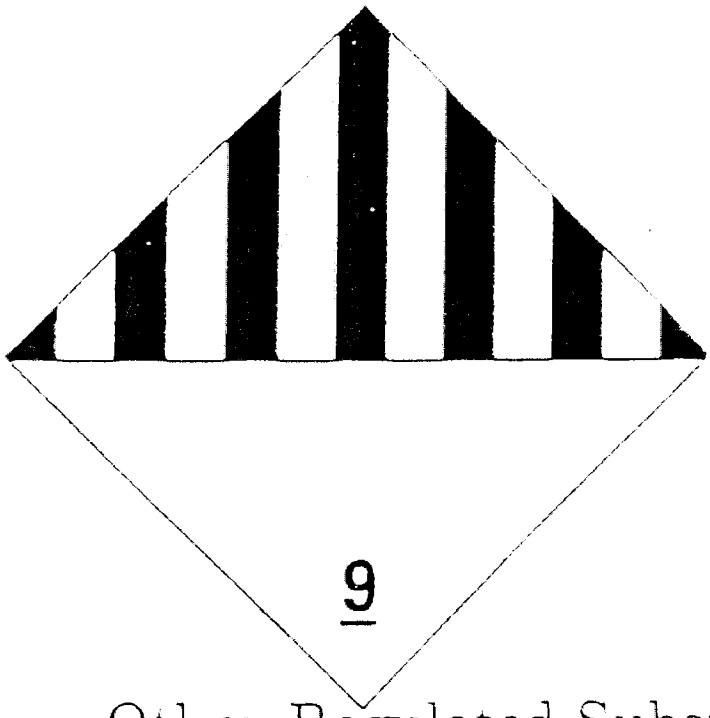
Project Information Section
For Project Personnel Only
Do Not Submit to Laboratory

Sample Point Location	Sample Type G	C	F	QC

Sample Type: G - Grab, C - Composite, F - Field Sample, QC - Quality Control Sample

CHAIN OF CUSTODY RECORD

OHM Corporation



OHM Corporation

From

Phone

To

Phone

Other Regulated Substances, ID# 8027

Class 9 Shipping Label

OHM Remediation Services Corp.

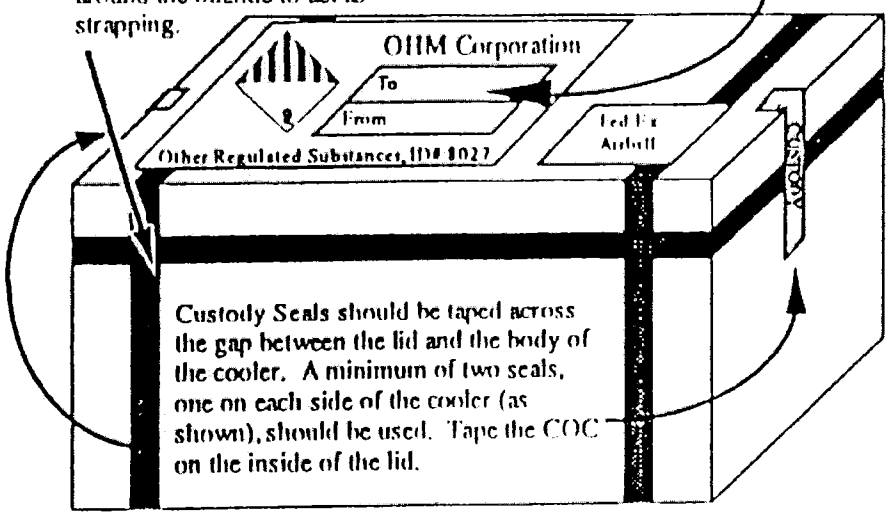
OHM Remediation Services Corp

Shipping Instructions . Sending Samples to the Lab

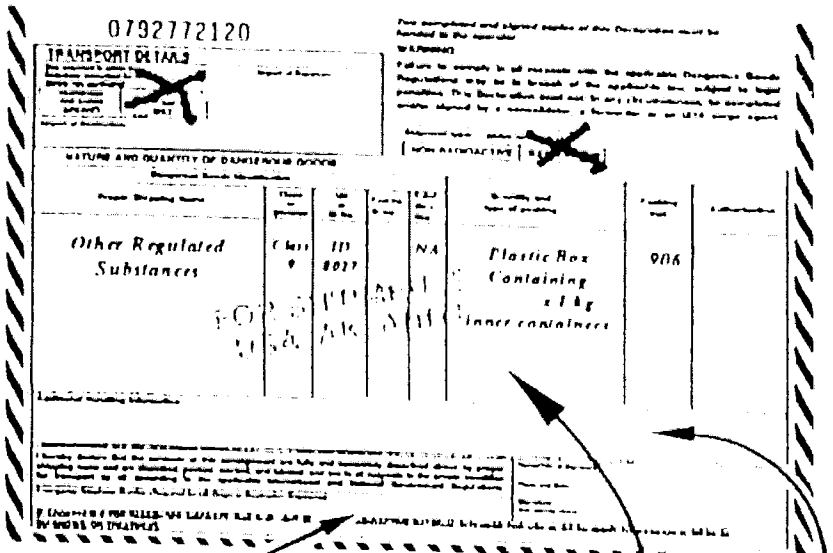
NOTE: These procedures are ONLY for shipping unknown environmental samples such as sludge, soil, or water samples for laboratory analysis and identification. Materials which are known to be explosive, compressed gases, flammable, oxidizers, poisons, radioactive, or corrosive SHOULD be shipped by this method. Call the Regional T&D Coordinator for help in that case. Drum or tank materials must be shipped as per the Regional T&D Coordinator's instructions.

Cooler lid is taped closed and additional tape should be used around the outside to act as strapping.

OHM custom sample shipping label



Lower Portion of Fed Ex DANGEROUS GOODS airbill



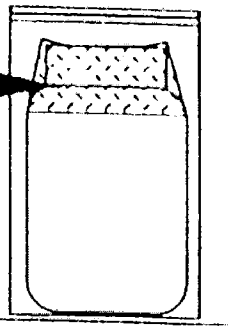
Don't forget to sign and include the 24-hr Emergency Response Phone number. Check with the Regional T&D Coordinator for this number

Fill in the Additional Handling space with:

"Samples from OHM Job # _____ see attached chain of custody. In case of emergency refer to ICAO Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods draft #9A"

Fill in the blank with the number of containers

_____ x 1 kg for quart jars
_____ x 500 g for 8 oz jars
_____ x 40 g for VOA vials



Lids are taped to prevent leaks or loosening. Entire jar is sealed in a zip lock baggie

1) Samples must be shipped in "Strong outer packaging". Fed Ex stated that a rigid plastic cooler like we are currently using would be acceptable.

2) Use one of OHM's custom sample shipping labels. The To/from address portion of the label should be filled out completely including phone numbers. This label should be placed on last and cannot be covered by tape, the Fed-Ex airbill or anything else. This label should go on the TOP of the cooler.

3) Inner packages cannot exceed 1 gallon each, and the entire shipment (cooler & samples) cannot exceed 66 lb.

4) Coolers must be packed with absorbent material (vermiculite or kitty litter) which will absorb any spills or leaks, not react with the sample contents, and which will minimize the chance that inner containers will break. The coolers should also be fastened shut securely using tape or strapping. See the SAP for special instructions.

5) Inner containers should have their lids securly closed and packed in a ziplock baggie to prevent leaks.

6) The materials must be shipped using a Federal Express Hazardous Materials Airbill. Use the example above or call the Hazardous Materials group at Federal Express at (800) GO-FEDEX for more instructions on filling out this form.

7) The COC must be filled out completely, placed in a gallon zip-lock baggie, and taped to the inside lid of the cooler. A copy of the COC should be placed behind the airbill in the pouch on the outside of the cooler.

READ THE DIRECTIONS ON THE AIRBILL SO YOU UNDERSTAND WHAT YOU ARE FILLING OUT. Fill out the Fed-Ex airbill completely. Don't forget to sign the bottom and include the Emergency Response phone number. Changing even one thing from the example above may mean that Fed Ex will refuse to accept the shipment. This procedure has been checked out with Fed Ex several times. If a driver refuses to pick it up make sure you have filled out the airbill right and followed ALL the instructions before you complain.

APPENDIX C

SOPs

QP-650 STANDARD ANALYTICAL DATA DELIVERABLE REQUIREMENTS

QP-618 BAILERS

OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-650	Title Standard Analytical Data Deliverable Requirements

APPROVAL

Name	Title	Signature	Date
Guy Gallello	Midwest Region FAS Manager		
Emma Popek	Western Region FAS Manager		
Mike Quinlan	Eastern Region FAS Manager		
Terry Whitt	Southern Region FAS Manager		

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1		issue	-	-	-	-	-	-	-
2									

3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									

STANDARD OPERATING PROCEDURE

Title: Standard Analytical Data Deliverable **Document #:** QP-650

Date Issued: June 20, 1996 **Rev:** 0 **Date:**

1.0 PURPOSE

1.1 The purpose of this procedure is to set forth guidelines for the standardization of hard copy analytical data packages provided to OHM by Analytical Laboratories. This procedure defines the specific deliverable requirement to be include when a minimum data packages, standard data packages and maximum data packages is requested by OHM employees.

2.0 SCOPE

2.1 These procedures applies to all purchases of analytical services and the analytical data packages provided to OHM by all analytical laboratories.

3.0 RELATED DOCUMENTS

3.1 HAZWRAP, July 1990. Quality Control Requirements for Field Methods DOE/HWP69/R1.

3.2 HAZWRAP, July 1988. Requirements for Quality Assurance of Analytical Data, DOE/HWP-65, Rev. 0, July 1988.

3.3 USEPA , Test Methods for Evaluating Solid Waste Physical/Chemical Methods SW-846

3.4 United States Environmental Protection Agency, 1984. User's Guide to the Contract Laboratory Program, Office of Emergency and Remedial Response, Washington, D.C.

4.0 GENERAL INFORMATION

3.1 In the past OHM has experienced that Each analytical laboratory has a different report format that they call their standard deliverable package. Many times the laboratory's standard deliverable package does not include all of the information required to meet our client's expectations in performing data assessment and data validation of the analytical deliverable. When the additional information has been requested from the laboratories often additional charges are levied. In order to better service our client and to assure each and every laboratory bidding on a given set of samples understands precisely what is required to be included within each analytical report, the following procedures have been developed.

5.0 DEFINITIONS

5.1 Accuracy - A measure of how close a measured value is to a known true value.

5.2 Aliquot - A measured portion of a sample taken for analysis.

5.3 Analytical Batch - Batch size is determined the analytical method and project specific quality assurance requirements. Batch size is ussually set at 20 or less samples of the same matrix being analyzed for the same parameters at the same time. All samples in a batch are prepared and analyzed together with a basic set of QC samples. Specific project requirements are listed in the Quality Assurance Project Plan (QAPP).

5.4 Background Correction - A technique usually employed relative to metals analysis which

compensates for variable background contribution to the instrument signal in the determination of trace elements

5.5 Blank - An artificial sample designed to monitor the introduction of artifacts into the measurement process.

5.6 Calibration - The systematic determination of the relationship of the response of the measurement system to the concentration of a analyte of interest

5.7 Chain-of-Custody - A form used to track the custody of the samples from the time they are taken until the time they are analyzed.

5.8 Continuing Calibration - Subsequent checks on the instrument calibration performed throughout the analysis of samples.

5.9 Data Assessment - A systematic review of the analytical data to assure all method specific requirement were performed.

5.10 Data Quality Objectives - The established quality of the data required to support specific decisions or regulatory actions. DQOs must take into account sampling considerations as well as analytical protocols.

5.11 Data Validation - A systematic effort to review data for identification of errors for the purpose of flagging suspected values to assure the validity of the data for the user.

5.12 Deliverables - Analytical Report Package provide by the analytical laboratory which includes the analytical data and a specified set of supporting documentation.

5.13 Hold Times - The time stipulated in the method or regulations which is allowed to elapse from the time of sampling to the time of extraction and/or analysis. Samples analyzed after the hold times are of questionable usefulness.

5.14 ICP - Inductively coupled argon plasma (also referred to ICAP). An instrument used for metals analysis.

5.15 Internal Standard - A compound added to every standard, blank, matrix spike, matrix spike duplicate, sample and/or sample extract at a known concentration, prior to analysis. Internal standards are used as the basis for quantification of the target compounds.

5.16 Initial Calibration - Instrument calibration performed before any samples are analyzed.

5.17 Laboratory Control Sample - An artificial sample usually prepared in the laboratory, which either contains all or some of the compounds of interest. The sample is processed through the entire procedure including sample preparation and analysis. This sample is used to verify that the method is being performed properly. One laboratory control sample should be analyzed with each analytical batch.

5.18 Matrix Spike - An Aliquot of a sample that has been spiked with a known quantity of specified compounds of interest. The matrix spike is used to measure the accuracy of the analytical system.

5.19 Matrix Spike Duplicate - A second aliquot of the same sample used for the matrix spike spiked the same way as the matrix spike. The matrix spike duplicate is used to measure the precision of the analytical system..

5.20 Maximum Deliverable Package - Specific requirement set forth in this document to be provided to OHM by the Analytical Laboratory when a Maximum Deliverable Package is requested.

5.21 Minimum Deliverable Package - Specific requirement set forth in this document to be provided to OHM by the Analytical Laboratory when a Minimum Deliverable Package is requested.

5.22 Precision - a measure of the analytical method's ability to reproduce analytical results.

5.23 Preparation Logs - An official laboratory record of the sample preparation procedures used in processing a sample prior to analysis.

5.24 Standard Deliverable Package -Specific requirement set forth in this document to be provided to OHM by the Analytical Laboratory when a Standard Deliverable Package is requested.

5.25 Surrogate - An organic compound that is similar to the analytes of interest in chemical composition, extraction and chromatography, but are not normally found in environmental samples. These compounds are spiked into quality control samples, calibration and check standards and samples prior to analysis.

5.26 Tentatively Identified Compounds (TICs) - Compounds detected in samples that are not target compounds. Usually TICs consist of up to 30 peaks identified that are greater than 10 percent of the peak areas or heights of the nearest internal standard are subjected to mass spectral library searches for tentative identification.

5.27 Tuning - A technique used in gas chromatography/mass spectrometry procedures to verify that the instrument is properly calibrated to produce reliable mass spectral information.

6.0 RESPONSIBILITIES

6.1 Regional Field Analytical Manager -. Responsible for the management of the Regional Field Analytical Department. Responsible for distributing these requirements to all subcontract laboratories used within there

7.0 PROCEDURE

7.1 All laboratories providing analytical services to OHM will be provided with a copy of these specification for minimum, standard and maximum data deliverable packages.

7.2 The desired data deliverable package will be selected at the time of procuring the analytical services. All price quotations must include providing OHM with the requested deliverable package.

7.3 All Data packages received must meet the requested requirements as specified in the Data

Deliverables Package Requirements.

1. **ATTACHMENTS**

8.1 Data Deliverables Package Requirements Table**ATTACHMENT 8.1**

DATA DELIVERABLE PACKAGE REQUIEMENTS TABLE

Method	Deliverable Requirement	Equivalent EPA Form	OHM Minimum Level	OHM Standard Level	OHM Maximum Level
Metals	Case Narrative		X	X	X
	Corrective Action Report		X	X	X
	Cross-reference of OHM Sample Numbers, Lab IDs, and analytical QC batches		X	X	X
	Chain-of-Custody Form, Cooler Receipt form		X	X	X
	Data Summary for Each Sample (See Note 1)	I-IN	X	X	X
	Blank Spike or Lab Control Sample (LCS) results (including concentration spiked, percent recovered, percent recovery acceptance limits)	VII-IN	X	X	X
	Matrix Spike (MS) Report (including concentration spiked, percent recovered, percent recovery acceptance limits)	V (PART 1)IN	X	X	X
	Post-digestion Spike Recovery for ICP	V (PART 2)IN	X	X	X
	Duplicate Sample Report		X	X	X
	Blank Results	III-IN	X	X	X
	Initial Calibration Data	III-IN		X	X
	Continuing Calibration Data	II (PART I)-IN		X	X
	ICP Interference Check Sample Report	II (PART I)-IN		X	X
	Standard Addition Results	IV-IN		X	X
	ICP Serial Dilution Results	VIII-IN			X
	Copies of Preparation Logs	IX-IN			X
	Copies of Analysis Run Logs	XIII-IN		X	X
	Copies of Standard Preparation Logs	XIV-IN			X
	Raw Data and Instrument Printouts				X
	Percent Moisture		X	X	X
	PH				X (Note 2)

DATA DELIVERABLE PACKAGE REQUIEMENTS TABLE

Method	Deliverable Requirement	Equivalent EPA Form	OHM Minimum Level	OHM Standard Level	OHM Maximum Level
Organics by	Case Narrative		X	X	X
GC or HPLC	Corrective Action Report		X	X	X
	Cross-reference of OHM Sample Numbers, Lab IDs, and analytical QC batches	IV	X	X	X
	Chain-of-Custody Form, Cooler Receipt form		X	X	X
	Data Summary for each blank and sample (See Note 1)	I	X	X	X
	Blank Spike or Lab Control Sample (LCS) results (including concentration spiked, percent recovered, percent recovery acceptance limits)		X	X	X
	Surrogate Recovery Report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) Report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	III	X	X	X
	Initial Calibration Data for each column (indicate which column was used for quantitation)	VI		X	X
	Continuing Calibration Data (indicate which column was used for quantitation)	VII		X	X
	Chromatograms for each sample (and reruns), confirmation runs, blank, spike, duplicate, and standards			X (Note 4)	X
	Raw Quantitation Report (area vs. retention time)				X
	Copies of Sample Preparation Bench Sheets			X	X
	Copies of Standard Preparation Logs				X
	Copies of Run Logs	VIII			X

DATA DELIVERABLE PACKAGE REQUIEMENTS TABLE

Method	Deliverable Requirement	Equivalent EPA Form	OHM Minimum Level	OHM Standard Level	OHM Maximum Level
Organics	Case Narrative		X	X	X
by GC/MS	Corrective Action Report		X	X	X
	Cross-reference of OHM sample numbers, Lab IDs, and analytical QC batches	IV		X	X
	Chain-of-Custody Form, Cooler Receipt Form		X	X	X
	Data Summary for each blank and sample (See Note 1)	I	X	X	X
	Tentatively Identified Compounds (TICs) for each sample (ten peaks)	I,TIC		X	X
	Blank Spike or Lab Control Sample (LCS) results (including concentration spiked, percent recovered, percent recovery acceptance limits)		X	X	X
	Surrogate Recovery Report (including concentration spiked, percent recovered, and percent recovery acceptance limits)	II	X	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) Report (including concentration spiked, percent recovered, percent recovery acceptance limits, relative percent difference (RPD), and RPD acceptance limits)	III	X	X	X
	Instrument Performance Check (Tuning) Report	V		X	X
	Initial Calibration Data (including acceptance limits)	VI		X	X
	Continuing Calibration Data (including acceptance limits)	VII		X	X
	Internal Standard Areas and Retention Times Reports (including acceptance limits and out-of-control flags)	VIII		X	X
	Reconstructed Ion Chromatogram for each sample and rerun, blank, spike, duplicate, and standard				X
	Raw Quantitation Report				X
	Raw and background subtracted mass spectra for each target analyte found				X
	Mass spectra of TICs with library spectra of 5 best-fit matches				X
	Copies of Sample Preparation Bench Sheets			X	X
	Copies of Standard Preparation Logs				X

Method	Deliverable Requirement	Equivalent EPA Form	OHM Minimum Level	OHM Standard Level	OHM Maximum Level
	Copies of Run Logs				X
	Percent Moisture		X	X	X
	PH				X (Note 3)

DATA DELIVERABLE PACKAGE REQUIEMENTS TABLE

Method	Deliverable Requirement	Equivalent EPA Form	OHM Minimum Level	OHM Standard Level	OHM Maximum Level
Inorganic	Corrective Action Report		X	X	X
Chemistry	Cross-reference of OHM sample numbers, Lab IDs, and analytical QC batches		X	X	X
(Note 2)	Chain-of-Custody Form, Cooler Receipt form		X	X	X
	Data Summary for each blank and sample (See Note 1)		X	X	X
	Blank Spike or Lab Control Sample (LCS) results (including concentration spiked, percent recovered, percent recovery acceptance limits)		X	X	X
	Matrix Spike/Matrix Spike Duplicate (MS/MSD) Report (including concentration spiked, percent recovered, percent recovery acceptance limits)		X	X	X
	Duplicate Sample Report		X	X	X
	Calibration Reports Initial and Continuing			X	X
	Copies of Sample Preparation logs				X
	Raw Data and Instrument Printouts				X
	Percent Moisture		X	X	X

Notes:

1. Must include: OHM sample ID, Lab ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limit, Method Detection Limit, Dilution Factor, comments, approval signature/date.

2. For water samples only.

3. Must include: OHM sample ID, Lab ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limit, Method Detection Limit, Dilution Factor, comments, approval signature/date.

1. For petroleum fuels analyses chromatograms for samples with positive results only.

2. Deliverables depend on method's QC.

STANDARD OPERATING PROCEDURE

Title: Bailers **Document #:** QP-618

Date Issued: January 17, 1994 **Rev:** 0 **Date:** December 17, 1994

1.0 PURPOSE

1.1 To provide general information and procedures for the bailer sampling device.

2.0 SCOPE

2.1 The bailer is designed for obtaining liquid samples. The bailer can be constructed of PVC, Teflon, stainless steel or a combination of these materials. Disposable bailers intended for one time use only are usually made from polyethylene plastic or Teflon.

3.0 RELATED DOCUMENTS

3.1 OHM Field Sampling Manual

4.0 GENERAL INFORMATION

4.1 The bailer is one of the oldest and simplest methods available. It consists of a container attached to a cable which is lowered into a well to retrieve a sample. Bailers can be of various designs. The simplest is a weighted bottle or basally capped length of pipe which fills from the top as it is lowered into the well. Top filling bailers are acceptable for well purging but not for sampling. More sophisticated bailers have a check valve located at the base which allows water to enter from the bottom as it is lowered into the well. When the bailer is lifted, the check valve closes, allowing water in the bailer to be brought to the surface. More sophisticated bailers are available that remain open at both ends while lowered into the well, but can be sealed at both top and bottom by activating a triggering mechanism from the surface. This allows for more reliable sampling at discrete depths within a well. Perhaps the best known bailer of this design is the Kemmerer

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sampler.

4.2 Bailers generally provide an excellent means for collecting samples from monitoring wells. They can be constructed from a wide variety of materials compatible with the parameter of interest. Only Teflon and stainless steel bailers are acceptable for all parameters. Since they are relatively inexpensive, bailers can be easily dedicated to an individual well to minimize cross contamination during sampling. If not dedicated to a well, they can be easily cleaned to prevent cross contamination. Nylon sample string is commonly used to raise and lower bailers. Monofilament line (fishing line), however, is more acceptable.

5.0 DEFINITIONS

5.1 Representativeness - The sample should possess the same qualities or properties (which are relevant to the investigation) as the whole of the material under investigation.

5.2 Grab Sample - A single sample representative of a specific location at a given point in time.

5.3 Composite Sample - Combination of more than one sample collected at various sampling locations and/or different points in time.

5.4 Equipment (field) Blanks - Samples used to verify cleanliness of the sampling equipment. The piece of equipment in question is used to take a sample of distilled or deionized water. One per analyte per piece of equipment per day is recommended.

5.5 Cross Contamination -- The introduction of contaminants into the sample through the sampling and/or sample-handling procedures which can cause an otherwise representative sample to become nonrepresentative.

6.0 RESPONSIBILITIES

6.1 The Sample Technician is responsible for all sample collection, documentation, and decontamination.

7.0 PROCEDURE

7.1 Assemble the decontaminated bailer (if necessary).

7.2 Securely attach sample string to the hole in the top of the bailer.

7.3 Slowly lower the bailer into the liquid to be sampled. Care should be taken not to

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drop the bailer into the structure being sampled.

7.4 Allow the bailer to fill with the liquid being sampled. Usually, a gurgling sound will be apparent when the bailer is filling.

7.5 When the bailer is full, remove it from the structure being sampled by pulling the string.

7.6 Position the hole on the bottom of the bailer over the appropriate sample container and push up on the Teflon ball to release the material. Alternatively the sample material can be poured from the top of the bailer into a sample container if the bailer design is an open top type.

7.7 After each use, the bailer must be decontaminated before using it again at a different sampling point. Check with the Project Chemist or the Site Supervisor for information on the correct decontamination procedures to use for the site where sampling was done.

8.0 EQUIPMENT

* Bailer
* Sample string or Nylon monofilament line
* Appropriate decontamination supplies

9.0 ATTACHMENTS

Figure 9-1 Teflon Bailer

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OHM Corporation

QUALITY POLICY AND PROCEDURE APPROVAL AND REVISION RECORD

Document # QP-638	Title Tap Sampling

APPROVAL

Name	Title	Signature	Date
R. Steven Shirley	QC Officer		5/30/95
Guy Gallello, Jr.	Mngr. Field Tech.		5/30/95
Thomas E. Gran	Dir. Tech. Svcs.		5/30/95

REVISION RECORD

Ltr.	Date	Change Description	Initials						
1		issue	-	-	-	-	-	-	-
2									
3									
4									
5									
6									
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OHM Corporation

STANDARD OPERATING PROCEDURE

Title: Tap Sampling **Document #:** QP-638

Date Issued: May 30, 1995 **Rev:** 0 **Date:** May 30, 1995

1.0 PURPOSE

1.1 To comply with local, state, federal, and customer requirements.

1.2 To establish procedures for sampling from a tap.

1.3 To ensure the data generated from the sample is legally defensible.

1.4 To establish function-specific responsibilities for tap sampling.

2.0 SCOPE

2.1 This procedure includes general methods on how to take samples of liquid streams in such a way that the samples are representative of the liquid stream and that the sampling process does not interfere with any operations taking place in the stream.

2.2 This procedure identifies the required equipment utilized to obtain valid, representative samples from a tap including, but not limited to:

2.2.1 Residential water supply taps

2.2.2 Process line taps

2.2.3 Taps installed on water treatment equipment (e.g. sand filters, between carbon filters)

2.3 Field analyses and in-the-field preservation and handling techniques.

2.4 Information contained in this standard does not necessarily address all of the safety problems that can be associated with the methods described in this procedure. Site specific health and safety plans and site

specific work plans will need to be read and understood prior to implementing the methods found in this procedure.

3.0 RELATED DOCUMENTS

3.1 Site Specific Sampling and Analysis Plan.

3.2 Site Specific Quality Assurance Plan.

3.3 OHM Corporation, Field Sampling Manual, 1993.

3.4 U.S. EPA 1980d. Samplers and Sampling Procedures for Hazardous Waste Streams. EPA-600/2-80-018, Municipal Environmental Research Laboratory, Cincinnati, OH.

3.5 U.S. EPA 1982a. Handbook for Sampling and Sample Preservation of Water and Wastewater. EPA-600/4-82-029, Environmental Monitoring and Support Laboratory, Cincinnati, OH.

3.6 U.S. EPA 1982d. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW846, Third Edition, Office of Solid Waste and Emergency Response, Washington, DC.

3.7 ASTM, Annual Book of ASTM Standards, Section 11. Volume 11.04, F 301-91

4.0 GENERAL INFORMATION

4.1 The sampler must take into consideration the physical condition of the stream to be sampled. Such considerations include but are not limited to:

4.1.1 Pressure - Liquids under high pressure may cause excessive splash hazard as well as breakage of the sample container.

4.1.2 Flow Rate - A high flow rate may cause difficulties in containing excess liquids as well as handling of the sample container.

4.1.3 Temperature - Elevated temperature may require additional personal protective equipment and will create a vacuum or pressurize the sample container.

4.1.4 Vapor Pressure - Liquid with a high vapor pressure may cause the sample containers to pressurize or break violently.

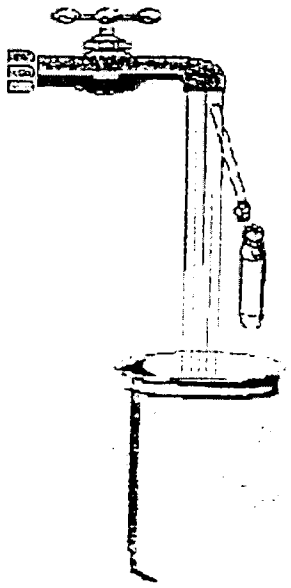
4.2 Sampling Valves - Valves shall be designed to provide a relatively straight-through passageway for the liquid when opened. The sampling valves should be located approximately 12 pipe diameters from the device being sampled.

4.3 If large valves with a high flow rate are to be sampled, an extension tube may be used to remove a sample of the liquid from the stream (see Figure 4.1)

4.4 Applicable preservatives, except for acid preservatives (in the case of samples collected for total dissolved metals analysis), must be added to the sample containers before sampling.

4.4 All sampling equipment must be decontaminated prior to usage.

4.5 Sample containers must be precleaned.



5.0 DEFINITIONS

5.1 Composite Sample - A sample consisting of two or more samples that have been combined.

5.2 Conductivity - The reciprocal (inverse) of the resistance in ohms measured between the opposite faces of a 1 centimeter cube of an aqueous solution at a specified temperature.

5.3 Contractor Laboratory - The laboratory performing analysis of the field samples.

5.4 Dissolved Solids - That matter, exclusive of gasses, which is dispersed in the water to give a single homogenous liquid phase.

5.5 Environmental Sample - Sample of a naturally occurring material such as soil, gravel, or rock; water from groundwater, a stream, or pond; or ambient air or absorbent tubes used in the collection of contaminates from air which may have low levels of chemical contamination, but do not take on the hazardous characteristics of the chemical contaminant as defined by 49 CFR 171.8, 49 CFR 172.101, or 49 CFR Part 173 or 173.2a

5.6 Equipment Blank - Samples consisting of reagent water or solvents collected from a final rinse of sampling equipment after the decontamination procedure has been performed. The purpose of rinsate blanks is to determine whether the sampling equipment is causing cross contamination of the samples.

5.7 pH - The negative logarithm value of the hydrogen ion activity in an aqueous solution.

5.8 Quality Assurance (QA) Samples - Samples sent to an approved QA laboratory by overnight delivery and analyzed to evaluate OHM and/or subcontractor laboratory performance. OHM will coordinate with the designated QA laboratory not less than 48 hours before sampling to assure that the QA laboratory is alerted to receive the QA samples and process them within the time limits specified by applicable USEPA methods and guidelines.

5.9 Quality Control (QC) Samples - Samples analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. QC samples include replicates of field samples, equipment blanks, and field blanks. QC samples are collected by the sampling team for use by OHM's on-site laboratory or subcontracted laboratory. The purpose of the samples is to provide site specific field originated checks that the data generated by OHM's analytical lab are of suitable quality. QC samples will represent approximately

10 percent of the field samples.

5.10 Replicate Samples - Multiple grab samples, collected separately, that are equally representative of a medium at a given time and location.

5.11 Split Samples - Samples that are collected as a single sample, homogenized, divided into two or more equal parts, and placed into separate containers. The sample will be split in the field prior to delivery to a laboratory. Ordinarily, split samples are analyzed by two different laboratories.

5.12 Trip Blank - Containers of organic-free reagent water that are kept with the field sample containers from the time they leave the laboratory until the time they are returned to the laboratory. The purpose of trip blanks is to determine whether samples are being contaminated during transit or sample collection. Trip blanks pertain only to volatile organic analyses; therefore, the containers must contain no headspace. Only one trip blank is needed for one day's sampling and will satisfy trip blank requirements for all matrices for that day if the volatile samples are shipped in the same cooler.

5.13 Turbidity - The reduction in transparency of a sample due to the presence of particulate matter.

6.0 RESPONSIBILITIES

6.1 The sample technologist will be responsible for:

6.1.1 Carrying out all sampling in accordance to approved procedures and methodologies as defined in the Chemical Sampling and Analysis Plan (CSAP).

6.1.2 Generating trip blanks, equipment blanks, and replicate samples as required by the CSAP, Quality Assurance Project Plan (QAPP), or this SOP.

6.1.3 Recording all field data in logbooks.

6.1.4 Filling out chain-of-custody (COC) forms

6.1.5 Packaging and shipping of samples.

7.0 PROCEDURE

7.1 Decontaminate or wash all sampling equipment in accordance with the procedures identified in the site specific Sampling and Analysis Plan.

7.2 Label the sample containers to indicate the project name, project number, the sample number, sample port location, date, time, analysis to be performed, the preservatives, and samplers.

7.3 If a process system is to be sampled, it is imperative that adequate time be given for the system to stabilize. A suggested stabilization time period is three times the ratio of the system volume to system flow rate.

7.4 Remove the protective cover from the sampling valve and wash or decontaminate the sample valve outlet.

7.5 Add the applicable preservative to the sample container. If the applicable preservative is an acid, add the preservative to the sample container after the sample has been taken.

7.6 Position a container of adequate size under the sampling valve to collect the excess liquid stream.

7.7 Turn on the sampling valve and allow the system liquid to purge the sampling port and valve before collecting the sample. (A minimum of 300 ml should be purged before the sample is collected.)

7.8 Under no circumstances should the sample valve be adjusted during the collection of the sample. (Adjustment of the sample valve may lead to bias in such analytes as total suspended solids (TSS) and oil and grease (O&G)).

7.9 The entire liquid stream should be collected in the sample container whenever possible.

7.10 If the flow rate is too high to collect the entire liquid stream and an extension tube is to be used to collect the sample, the following procedures must be followed:

7.10.1 Place the extension tube as illustrated in Figure 4.1 in the liquid stream. Allow the liquid to purge the extension tube with at least three times the volume of the extension tube.

7.10.2 Collect the sample in the proper sampling container.

7.11 The sampler designated to perform tap sampling should keep up-to-date field records which document the following:

7.11.1 Identification of the sampling location.

7.11.2 Description of the process being sampled.

7.11.3 Sample identification numbers.

7.11.4 Tap purging procedures and time.

7.11.5 Sample collection procedures and equipment used.

7.11.6 Date and time of collection.

7.11.7 Types of sample containers utilized.

7.11.8 Preservative(s) used.

7.11.9 Parameters requested for analysis.

7.11.10 Field analysis data and method(s).

7.11.11 Distribution and transportation information for samples.

7.11.12 Field observations on sampling event.

7.11.13 Name of collector.

7.11.14 Number of containers per tap.

7.12 After collection, samples should be handled as little as possible. It is preferable to use self-contained "chemical" ice (e.g., "blue ice") to reduce the risk of contamination. If natural ice is used, it should be bagged and steps taken to ensure that the melted ice does not cause sample containers to be submerged and thus increase the possibility of cross-contamination. All sample containers should be enclosed in plastic bags or cans to prevent cross-contamination. Samples should be secured in the ice chest to prevent movement of sample containers and possible breakage.

8.0 EQUIPMENT

* Sample containers (40 ml VOA, 8oz, 16oz, or 32oz precleaned with Teflon lined lid)
* Coolers for sample shipping and cooling (Rubbermaid or Coleman 48 to 54 quart size)
* Chemical preservatives (See SOP QP-611 for Sample Preservation and Holding Times)
* Appropriate packing cartons, cans, and filler material
* Labels
* COC documents

* Thermocouple thermometer, digital, Type K (Cole-Parmer G-08528-40 with G-93815-10 probe).

* Paper towels

* Latex or nitrile sampling gloves

* Field sampling logbooks

* Plastic trash bags, 30 gallon size

* Indelible marking pens

* Pen: black, permanent ink

* Pails: plastic, graduated, 3-5 gals. capacity

* Decontamination solutions: distilled or deionized water that is analyte free, Alconox or Liquinox, and pesticide free Isopropanol or Hexane

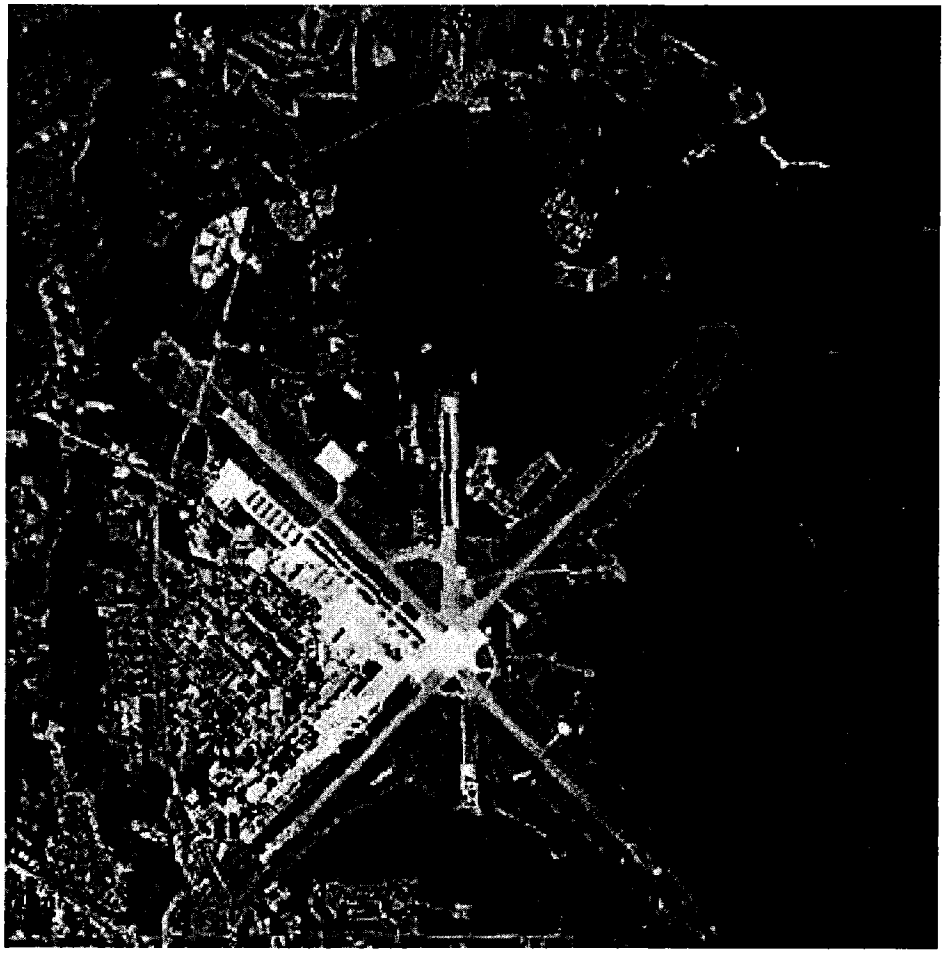
9.0 ATTACHMENTS

Figure 9.1 Tap Water Sampling Form

APPENDIX D

ELECTRONIC DATA DELIVERABLE SUBMITTAL REQUIREMENT

Marine Corps Air Station (MCAS) Cherry Point
Environmental Geographic Information System (EGIS)
Database Standards



Final March 1999

Prepared by:

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661 Andersen Drive
Pittsburgh, PA 15220-2745

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2.0 ACQUISITION OF ANALYTIC DATA 1
3.0 DATABASE STRUCTURE 3

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ATTACHMENT 2 IR SAMPLE NOMENCLATURE SYSTEM

ATTACHMENT 3 UST SAMPLE NOMENCLATURE SYSTEM

ATTACHMENT 4 ELECTRONIC DATA DELIVERABLE REQUIREMENTS FOR ANALYTICAL LABORATORIES

1.0 INTRODUCTION AND PURPOSE

A large amount of environmental data has been collected in support of various environmental programs at Marine Corps Air Station (MCAS) Cherry Point (the Activity). An activity relational database and Environmental Geographic Information System (EGIS) has been developed to manage and analyze this environmental data.

Tetra Tech NUS (TTNUS) Corporation has been contracted by the U.S. Navy, Atlantic Division to prepare this document which provides detail on the standards of the activity relational database and EGIS. This document has also been prepared with input provided by Catlin Engineers and Scientists (Catlin) as detailed in "Contractor Electronic Deliverable Standards and Procedures, UST Long – Term Monitoring Program, MCAS Cherry Point, North Carolina, dated August 10, 1998". TTNUS is collecting information as part of the Installation Restoration (IR) program and Catlin is collecting information as part of the Underground Storage Tank (UST) program.

The purpose of this document is to establish standards and procedures for the management of environmental data collected at the Activity. Typical data collected includes sample location information, groundwater, soil, sediment, and surface water sample information, field measurement data, lithologic and well completion data, and laboratory analytical data.

This document contains text sections and supporting attachments 1 – 4 that define the requirements for data collection and database compilation.

2.0 DATABASE STRUCTURE

This original database structure was developed using the Intergraph Environmental Resource Management Applications (ERMA) in 1994. During development of the database structure, it became apparent that the ERMA software, although being capable of managing such a complex database, could not provide the end user with a relatively simple and low cost means of viewing the relational database and EGIS. Therefore, the database structure was refined to accommodate Environmental Systems

Research Institute's (ESRI) ArcView software. ArcView provided a cost-effective desktop solution to the EGIS for the Activity and its contractors.

A database dictionary has been developed and provided in Attachment 1. The following tables are components of the database in accordance with the database dictionary.

Table	Description
Well.dbf	This table is used to store general coordinate information about the environmental sample locations at the activity. Each location must at a minimum, contain the location name, northing, easting, coordinate datum, and surveying metadata. Elevation information can be provided, where applicable. All coordinate information is to be delivered in North Carolina State Plane System. The acceptable data are North American Datum (NAD) 83 for horizontal control and North American Vertical Datum(NAVD) 88 for vertical control. If current survey data is in any other coordinate system or datum must to be converted to the aforementioned specifications. This table is the parent table to the following tables: Sample_data.dbf Well_completion.dbf Fluid.dbf Lithology.dbf Stratigraphy.dbf
Sample_data.dbf	This table is used to store information that identifies and describes the samples collected at a particular environmental location as defined in well.dbf. This table is the parent table to Analytic_results.dbf
Analytic_results.dbf	This table is used to store analytical results for each sample contained sample_data.dbf.
Well_completion.dbf	This table contains information about the completion of a

	borehole/well.
Fluid.dbf	This table is used to store date specific information about fluids that may be encountered in the subsurface (e.g. groundwater).
Lithology.dbf	This table is used to store lithological descriptions related to a borehole as determined from log analysis, core samples and other means.
Stratigraphy.dbf	This table is used to store information about stratigraphic units of significance to the characterization of the activity.

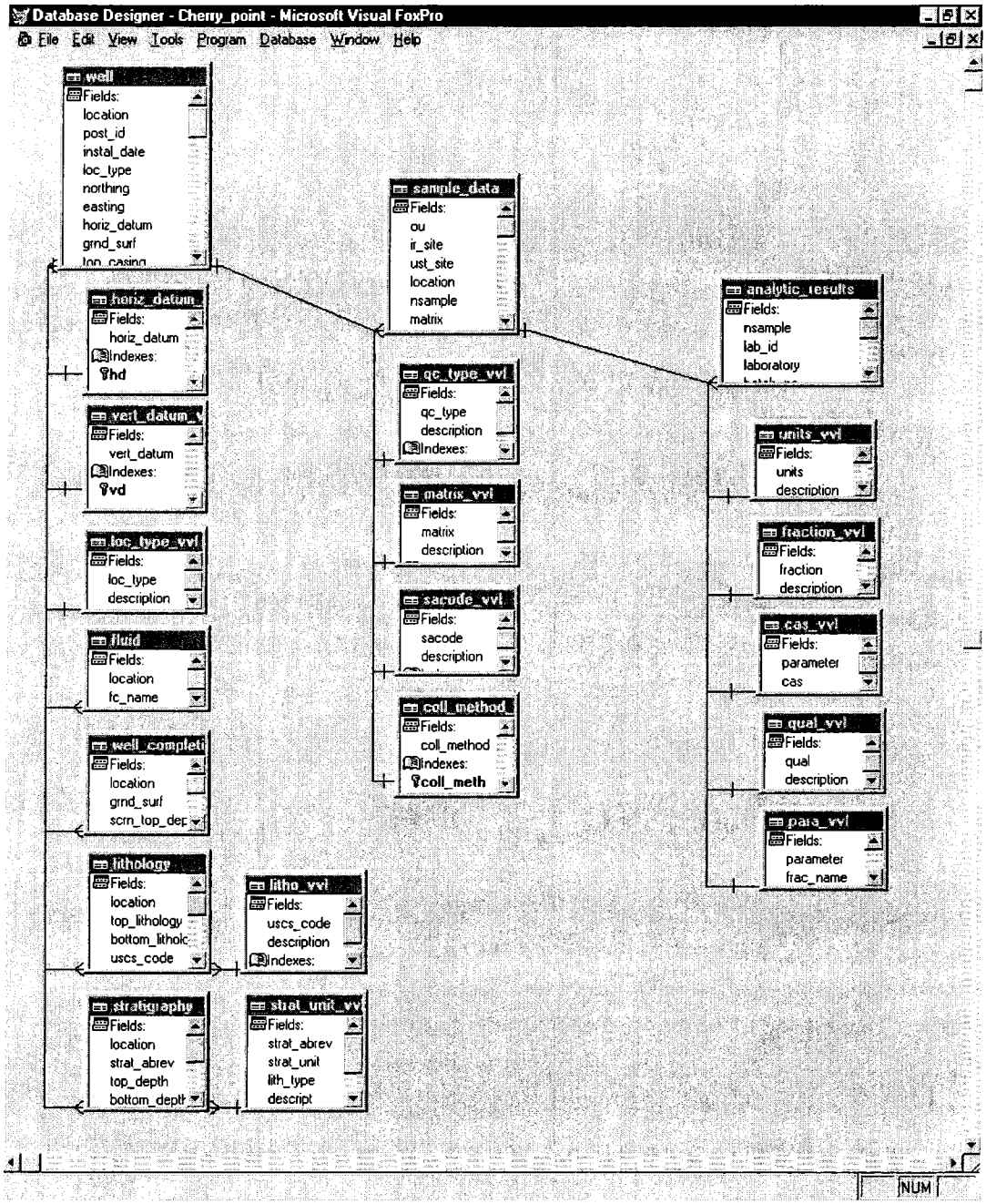
3.0 ACQUISITION OF ANALYTIC DATA

Sampling and analysis of environmental media at the Activity shall establish content and format requirements for the EDD generated by those laboratories performing the analyses. To date, a sample numbering system that is compliant with the relational database has been developed by TTNUS for the IR and Catlin for the UST programs as detailed in Attachments 2 and 3, respectively. A sample laboratory deliverable format for the activity is provided in Attachment 4. This attachment provides a detailed description of the process the laboratory should following along with the data format required for input into EDD.

ATTACHMENT 1

PROJECT DATABASE STRUCTURE & VALID VALUES

The following figure represents the current Visual Foxpro MCAS Cherry Point database design.



A description of the database container contents is provided in the following tables.

TABLE: well
PRIMARY KEY: location

Table Structure

FIELD	TYPE	DESCRIPTION
location	C (25)	Unique location name.
post_id	C (20)	Location name as derived from original source document.
instal_date	D (8)	Date the monitoring well was installed. Null for other location types.
loc_type	C (15)	Type of location.
northing	N (15,4)	Northing coordinate in horizontal datum referenced in the HORIZ_DATUM field. Required units are feet.
easting	N (15,4)	Easting coordinate in horizontal datum referenced in the HORIZ_DATUM field. Required units are feet.
horiz_datum	C (6)	Datum in which the horizontal coordinates were derived.
grnd_surf	N (15,4)	Ground surface elevation with reference to mean sea level in vertical datum referenced in the VERT_DATUM field. Required units are feet.
top_casing	N (8,2)	Elevation of top of well casing/riser in vertical datum found in VERT_DATUM in the well table
top_protective_casing	N (8,2)	Elevation of top of well protective casing in vertical datum found in VERT_DATUM in the well table
vert_datum	C (6)	Datum in which the vertical coordinates were derived.
datum_state	C (2)	State for which datum was developed.
surveyed	L (1)	Logical field denoting whether positional data were surveyed or digitized.
surveyor	C (50)	Company who performed the survey.
survey_date	D (8)	Date in which survey was performed.
surv_method	C (25)	Surveying method used.
longitude	N (15,4)	Longitude
latitude	N (15,4)	Latitude
permit_no	C (20)	Well Permit Number (if applicable)
abn_date	D (8)	Date Abandoned
grade	C (15)	"Above Grade" or "Flush Mount" or "Below Grade". This field can be populated by field inspection or by calculation using grnd_surf, top_casing and top_protective_casing. "Above Grade" if top_protective_casing > grnd_surf "Flush Mount" if top_protective_casing = grnd_surf "Below Grade" if top_protective_casing < grnd_surf

Table Indexes

INDEX	TYPE
location	Primary
hd	Regular
vd	Regular
loc_type	Regular

Table Relations:

Relation 1
*RelatedChild loc_type
*RelatedTable loc_type_vvl
*RelatedTag loc_type

Relation 2
*RelatedChild hd
*RelatedTable horiz_datum_vvl
*RelatedTag hd

Relation 3

*RelatedChild vd
*RelatedTable vert_datum_vvl
*RelatedTag vd

TABLE: loc_type_vvl – Valid value list for LOC_TYPE field in the well table.
PRIMARY KEY: loc_type

Table Structure

FIELD	TYPE	DESCRIPTION
loc_type	C (15)	Location type
description	C (40)	Description of location type

Table Indexes

INDEX	TYPE
loc_type	Primary

TABLE: horiz_datum_vvl – Valid value list for HORIZ_DATUM field in the well table.
PRIMARY KEY: hd (horiz_datum)

Table Structure

FIELD	TYPE	DESCRIPTION
horiz_datum	C (15)	Datum in which x,y coordinates reflect

Table Indexes

INDEX	TYPE
hd (horiz_datum)	Primary

Table Indexes

INDEX	TYPE
loc_type	Primary

TABLE: vert_datum_vvl – Valid value list for VERT_DATUM field in the well table.
PRIMARY KEY: vd (vert_datum)

Table Structure

FIELD	TYPE	DESCRIPTION
Vert_datum	C (15)	Datum in which z coordinate reflects

Table Indexes

INDEX	TYPE
vd (vert_datum)	Primary

TABLE: sample_data – Sample data table
PRIMARY KEY: nsample

Table Structure

FIELD	TYPE	DESCRIPTION
OU	C (10)	Operable Unit
IR_Site	C (40)	IR Site Designation
UST_Site	C (40)	UST Site Designation
location	C (25)	Unique location name.
matrix	C (4)	Sample matrix
nsample	C (45)	Unique sample identification

sample	C (35)	Sample identification as designated on Chain-of-Custody
sacode	C (8)	Sample code for reference to field duplicates
top_depth	N (5,1)	Depth in feet to the top of the sample interval. Applicable for soil and sediment samples.
bottom_depth	N (5,1)	Depth in feet to the bottom of the sample interval. Applicable for soil and sediment samples. *Rule Expression*: if(bottom_depth>0,top_depth<=bottom_depth)
qc_type	C (2)	Quality control type
status	C (10)	Status of sample location – Normal or excavated
sample_date	D (8)	Date in which sample was collected
validated	L (1)	Logical field denoting whether or not data validation was performed on sample
coll_method	C (10)	Sample collection method
cto_proj	C (5)	Project Number or Task Order/Delivery Order number in which the sample was collected.
proj_manager	C (25)	Internal projcect manager for which the data was originally generated (e.g. "Smith, J.").

Table Indexes

INDEX	TYPE
location	Regular
nsample	Primary
sacode	Regular
matrix	Regular
status	Regular
qc_type	Regular
coll_meth	Regular
IR_site	Regular
UST_site	Regular

Table Relations:

Relation 1
*RelatedChild sacode
*RelatedTable sacode_vvl
*RelatedTag sacode

Relation 2
*RelatedChild qc_type
*RelatedTable qc_type_vvl
*RelatedTag qc_type

Relation 3
*RelatedChild matrix
*RelatedTable matrix_vvl
*RelatedTag matrix

Relation 4
*RelatedChild location
*RelatedTable well
*RelatedTag location

Relation 5
*RelatedChild coll_meth
*RelatedTable coll_method_vvl
*RelatedTag coll_meth

Relation 6
*RelatedChild IR_site
*RelatedTable IR_site _vvl

*RelatedTag IR_site
Relation 7
*RelatedChild UST_site
*RelatedTable UST_site _vvl
*RelatedTag UST_site

TABLE: sacode_vvl – Sample code valid value list for SACODE field in sample_data.dbf
PRIMARY KEY: sacode

Table Structure

FIELD	TYPE	DESCRIPTION
Sacode	C (8)	Sample code designating whether sample is a normal environmental sample, a field duplicate or the average of field duplicate pairs
Description	C (30)	Description of sacode entry

Table Indexes

INDEX	TYPE
Sacode	Primary

TABLE: qc_type_vvl – Quality control valid value list for QC_TYPE field in sample_data.dbf
PRIMARY KEY: qc_type

Table Structure

FIELD	TYPE	DESCRIPTION
qc_type	C (10)	Quality control type
Description	C (30)	Description of quality control type

Table Indexes

INDEX	TYPE
qc_type	Primary

TABLE: matrix_vvl – Matrix valid value list for MATRIX field in sample_data.dbf
PRIMARY KEY: matrix

Table Structure

FIELD	TYPE	DESCRIPTION
Matrix	C (4)	Sample matrix
Description	C (25)	Description of sample matrix code

Table Indexes

INDEX	TYPE
Matrix	Primary

TABLE: well_completion
PRIMARY KEY: None

Table Structure

FIELD	TYPE	DESCRIPTION
Location	C (25)	Unique location name
hole_diameter	N (5,1)	Diameter of the drilled hole in inches
riser_diameter	N (5,1)	Diameter of the well riser pipe in inches
scr_aquifer	C (30)	Aquifer name in which the screen resides
screen_material	C (15)	Type of material in which the screen is constructed from

scrn_slot_size	N (5,1)	Screen slot size in thousandths of an inch
scrn_top_depth	N (5,2)	Depth below ground surface to the top of the screen (in feet)
scrn_bot_depth	N(5,2)	Depth below ground surface to the bottom of the screen *Rule Expression*: if(scrn_bot_depth>0,scrn_top_depth<scrn_bot_depth)
scrn_top_elev	N (6,2)	Elevation the top of the screen in vertical datum found in VERT_DATUM in the well table.
scrn_bot_elev	N (6,2)	Elevation the top of the screen in vertical datum found in VERT_DATUM in the well table. *Rule Expression*: if(scrn_bot_elev>0,scrn_top_depth>scrn_bot_depth)
total_depth	N(6,2)	Total depth of well or boring
drill_method	C (20)	Drilling method for well installation
Contractor	C (25)	Drilling contractor
casing_material	C (15)	Type of material in which the casing is constructed from
depth_to_seal	N (8,2)	Depth below ground surface to seal (in feet)
seal_material	C (15)	Type of material in which the seal is constructed from
fill_top_depth	N (6,2)	Depth below ground surface to the top of fill material (in feet)
fill_bot_depth	N (6,2)	Depth below ground surface to the bottom of fill material (in feet). *Rule Expression*: if(fill_bot_depth>0,fill_top_depth<scrn_bot_depth)
fill_material	C (20)	Type of material used for fill.
comments	M (4)	Geologist's comments

Table Indexes

INDEX	TYPE
location	Regular

Table Relations:
Relation 1
*RelatedChild location
*RelatedTable well
*RelatedTag location

TABLE: lithology
PRIMARY KEY: None

FIELD	TYPE	DESCRIPTION
location	C (25)	Unique location name
top_lithology	N (6,2)	Depth in feet below ground surface to the top of lithologic unit
bottom_lithology	N (6,2)	Depth in feet below ground surface to the bottom of lithologic unit
uscs_code	C (5)	Unified Soil Classification Service Code for lithology type
blow_counts	C (8)	Number of blow counts recorded on boring log
description	C (80)	Geologist's description of lithology
comments	M (4)	Geologist's comments.

Table Indexes

INDEX	TYPE
location	Regular
uscs_code	Regular

Table Relations:
Relation 1

*RelatedChild location
*RelatedTable well
*RelatedTag location
Relation 2
*RelatedChild uscs_code
*RelatedTable lithology_vvl
*RelatedTag uscs_code

TABLE: lithology_vvl - Lithology valid value list for USCS_CODE field in lithology.dbf
PRIMARY KEY: uscs_code

Table Structure

FIELD	TYPE	DESCRIPTION
uscs_code	C (4)	Unified Soil Classification Service Code for lithology type
descript	C (70)	Description of lithology for given USCS code

Table Indexes

INDEX	TYPE
uscs_code	Primary

TABLE: coll_method_vvl - Collection method valid value list for COLL_METHOD field in sample_data.dbf
PRIMARY KEY: coll_meth

Table Structure

FIELD	TYPE	DESCRIPTION
coll_method	C (10)	Sample collection method

Table Indexes

INDEX	TYPE
coll_method	Primary

TABLE: IR_site_vvl – IR_site valid value list for IR_site field in sample_data.dbf
PRIMARY KEY: IR_site

Table Structure

FIELD	TYPE	DESCRIPTION
IR_site	C (40)	Installation Restoration Site Name

Table Indexes

INDEX	TYPE
IR_site	Primary

TABLE: UST_site_vvl – UST_site valid value list for UST_site field in sample_data.dbf
PRIMARY KEY: IR_site

Table Structure

FIELD	TYPE	DESCRIPTION
UST_site	C (40)	Underground Storage Tank Site Name

Table Indexes

INDEX	TYPE
UST_site	Primary

TABLE: cas_vvl - CAS number valid value list for CAS field in analytical results.dbf
PRIMARY KEY: cas

Table Structure

FIELD	TYPE	DESCRIPTION
parameter	C (40)	Parameter or chemical name
cas	C (11)	Chemical Abstracts Service Number

Table Indexes

INDEX	TYPE
parameter	Regular
cas	Primary

TABLE: analytic_results
PRIMARY KEY: nfp (nsample+fraction+parameter)

Table Structure

FIELD	TYPE	DESCRIPTION
nsample	C (45)	Unique sample identification
lab_id	C (15)	Laboratory sample identification
laboratory	C (25)	Laboratory name
batch_no	C (10)	Analytical batch number
assoc_blnk	C (15)	Associated blank
extr_date	D (8)	Extraction date
anal_date	D (8)	Analysis date
run_number	I (4)	Sequential analytical run number
sdg	C (15)	Sample delivery group
parameter	C (45)	Parameter or chemical name (using IUPAC nomenclature where appropriate)
cas	C (11)	Chemical Abstracts Service Number
fraction	C (10)	Analtytical fraction
method	C (20)	Analytical method
lab_result	N (20,6)	Analytical result as reported by the laboratory
lab_qual	C (5)	Qualifier as reported by the laboratory
val_res	N (20,6)	Final result (via validation or otherwise)
result	C (20)	Final analytical result with the correct number of significant figures
val_qual	C (3)	Validation qualifer (null if data were not validated)
qual	C (3)	Final qualifer (validation or otherwise)
units	C (8)	Units of measure for the RESULT field
idl	N (15,6)	Instrument detection limit (same units as UNITS field)
mdl	N (15,6)	Method detection limit (same units as UNITS field)
crdl_crql	N (15,6)	Contract required detection/quantitation limit (same units as UNITS field)
dil_factor	N (6,1)	Dilution factor
pct_moist	N (5,1)	Percent moisture
comments	C (20)	Comments from laboratory analyst

Table Indexes

INDEX	TYPE
nfp	Primary
units	Regular
qual	Regular

fraction	Regular
parameter	Regular
nsample	Regular
cas	Regular

Table Relations:

Relation 1
*RelatedChild cas
*RelatedTable cas_vvl
*RelatedTag cas
Relation 2
*RelatedChild units
*RelatedTable units_vvl
*RelatedTag units
Relation 3
*RelatedChild qual
*RelatedTable qual_vvl
*RelatedTag qual
Relation 4
*RelatedChild fraction
*RelatedTable fraction_vvl
*RelatedTag fraction
Relation 5
*RelatedChild parameter
*RelatedTable para_vvl
*RelatedTag para
Relation 6
*RelatedChild nsample
*RelatedTable sample_data
*RelatedTag nsample

TABLE: units_vvl - Units valid value list for UNITS field in analytical_results.dbf
PRIMARY KEY: Units

Table Structure

FIELD	TYPE	DESCRIPTION
units	C (10)	Units of measure for chemical analysis
description	C (50)	Description of units

Table Indexes

INDEX	TYPE
units	Primary

TABLE: qual_vvl
PRIMARY KEY: qual - Qualifier valid value list for QUAL field in analtyic_results.dbf

Table Structure

FIELD	TYPE	DESCRIPTION
qual	C (5)	Final QA qualifier
description	C (60)	Definition of qualifier

Table Indexes

INDEX	TYPE

qual	Primary

TABLE: fraction_vvl - Analytical fraction valid value list for FRACTION field in analytic_results.dbf
PRIMARY KEY: fraction

Table Structure

FIELD	TYPE	DESCRIPTION
fraction	C (10)	Analytical fraction
description	C (35)	Description of fraction

Table Indexes

INDEX	TYPE
fraction	Primary

TABLE: para_vvl
PRIMARY KEY: parameter

Table Structure

FIELD	TYPE	DESCRIPTION
para	C (60)	Parameter or chemical name
frac_name	C (35)	Analytical fraction for given parameter

Table Indexes

INDEX	TYPE
Para	Primary

TABLE: fluid
PRIMARY KEY: None

Table Structure

FIELD	TYPE	DESCRIPTION
location	C (25)	Unique location name
meas_date	D (8)	Date measurement was taken
meas_elev	N (8,2)	Measuring point elevation. Typically top_casing not top_protective_casing.
measurement	C (30)	Type of measurement. Examples: groundwater, free product, pH, etc
result	N (10,2)	Field measurement result
Units	C (16)	Applicable units
field_personnel	C (30)	Person responsible for field measurement

Table Indexes

INDEX	TYPE
location	Regular

Table Relations:
Relation 1
*RelatedChild location
*RelatedTable well
*RelatedTag location

VALID VALUES

Table: loc_type_vvl

loc_type	description
MW	MONITORING WELL
HP	HYDROPUNCH
PZ	PIEZOMETER
TW	TEMPORARY WELL
SS	SURFACE SOIL
SB	SOIL BORING
SD	SEDIMENT
SW	SURFACE WATER
AIR	AIR MONITORING LOCATION
PV	PAVEMENT CORE
EC	ECOLOGICAL TISSUE
PVT	PRODUCTION WELL (PUBLIC WATER SUPPLY)
PW	PRODUCTION WELL
BS	SITE BOUNDARY
SG	STAFF GUAGE
WT	WETLAND BOUNDARY
BL	BUILDING BOUNDARY
RP	REFERENCE POINT
EW	EXTRACTION WELL
IJ	INJECTION WELL
PRG	PURGE WELL
SWLK	LAKE/POND
SEEP	SEEP SAMPLE LOCATION
TP	TEST PIT
OF	OUTFALL
SPR	SPRING
BKSB	BACKGROUND SOIL BORING
BKMW	BACKGROUND MONITORING WELL
ASB	ASBESTOS
ROOF	ROOF LOCATION
WIPE	BULK WIPE
SO	SOIL
SW/SD	SURFACE WATER/SEDIMENT
NOT DEFINED	NOT DEFINED
TYPE I	UST MONITORING WELL
TYPE II	UST MONITORING WELL
TYPE III	UST MONITORING WELL
WASTE	WASTE SAMPLE
AW	ABANDONED WELL
MGA	MAGNATOMETER WITH ANOMALY
MG	MAGNATOMETER WITHOUT ANOMALY
TC	TERRAIN CONDUCTIVITY
VEW	VAPOR EXTRACTION WELL
EX	EXCAVATED SAMPLE LOCATION

Table: horiz_datum_vvl

horiz_datum
NAD 27
NAD 83
UTM

Table: vert_datum_vvl

vert_datum
NGVD 29
NAVD 88
UTM
NA

Table: lithology_vvl

uscs_code	Description
AH	Anhydrite
AK	Akrose
AL	Argillaceous limestone
BR	Breccia
CG	Conglomerate
CH	Inorganic clays of high plasticity
CK	Chalk
CL	Inorganic clays of low to medium plasticity
CO	General coal (carbonaceous)
CY	Clay
DL	Dolomitic limestone
DY	Dykes
DM	Dolomite
EX	Extrusive (volcanic) rocks
GC	Clayey gravels, poorly graded gravel-sand-clay mixtures
GK	Greywacke
GM	Silty gravels, poorly graded gravel-sand-silt mixtures
GP	Poorly graded gravels, gravel-sand mixtures; little or no fines
GV	Gravel
GW	Well-graded gravels, gravel-sand mixtures; little or no fines
IG	Igneous rocks
IN	General intrusives (calcareous)
KM	Potassium and magnesium salts
LC	Limestone (calcareous)
LG	Lignite (brown coal)
LS	Sandy limestone
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils
ML	Inorganic silts and very fine sands with slight plasticity
MM	Metamorphics in general
MR	Marl
MS	Mudstone
NA	Halite
NP	No ASTM classification, problems with sampling
NU	No ASTM classification, reasons unknown
OH	Organic clays of medium to high plasticity
OL	Organic silts and organic silt-clays of low plasticity
PT	Peat and other highly organic soils
QT	Quartzite
SA	Sand
SC	Clayey sands, poorly graded
SH	Shale
SJ	Silt
SL	General salt (saliferous)
SM	Silty-sands, poorly graded sand-silt mixtures
SP	Poorly graded sands, gravely sands; little or no fines
SS	Sandstone
ST	Siltstone
SW	Well-graded sands, gravely sands; little or no fines
TF	Tuff
TI	Tillite diamicitite
VA	Volcanic agglomerate/breccia
Z	Other

Table: strat_unit_vvl

strat_abrev	strat_unit	lith_type	description
SA	SUR	SM	Surficial Aquifer
YC	YOR	CL	Yorktown Confining Unit
YA	YOR	SM	Yorktown Aquifer
PRC	PUN	SC	Pungo River Confining Unit
CA			Castle Hayne Aquifer
NA	DAT	NA	

Table: sacode_vvl

Sacode	Description
NORMAL	NORMAL ENVIRONMENTAL SAMPLE
DUP	FIELD DUPLICATE
AVG	AVERAGE OF FIELD DUPLICATES
MAX	MAXIMUM OF FIELD DUPLICATES

Table: qc_type_vvl

qc_type	description
NM	NORMAL ENVIRONMENTAL SAMPLE
TB	TRIP BLANK
EB	EQUIPMENT BLANK
RB	RINSATE BLANK
MS	MATRIX SPIKE
MSD	MATRIX SPIKE DUPLICATE
FB	FIELD BLANK
QC	QUALITY CONTROL SAMPLE

Table: matrix_vvl

matrix	description
SO	SOIL
GW	GROUNDWATER
GF	FILTERED GROUNDWATER
SW	SURFACE WATER
SF	FILTERED SURFACE WATER
SD	SEDIMENT
TCLP	TCLP
AIR	AIR SAMPLE
PVMT	PAVEMENT SAMPLE
WIPE	WIPE SAMPLE
PW	PORE WATER
DC	DRILL CUTTINGS
FP	FREE PRODUCT
SG	SOIL GAS
WW	WASTE WATER
ET	ECOLOGICAL TISSUE
DR	DRUM CONTENTS
WAST	WASTE
QC	QUALITY CONTROL SAMPLE

Table: coll_method_vvl

coll_method
GRAB
COMPOSITE

Table: IR_site_vvl

CODE	DESCRIPTION	TYPE
NA	NOT AN IR SITE	
A-1	BUILDING 133 MAGNESIUM AND ALODINE TREATMENT	AOI
A-10	BUILDING 4163 HAZARDOUS MATERIALS AREA	AOI
A-11	BUILDING 4173 CONDENSATE CATCH BUCKET	AOI

A-12	BUILDING 4184 HAZARDOUS WASTE STORAGE AREA	AOI
A-13	BUILDING 4225 CLEANING VATS	AOI
A-14	BUILDING 4435 HAZARDOUS WASTE ACCUMULATION AREA	AOI
A-15	BUILDING 4448 HAZARDOUS MATERIALS AREA	AOI
A-16	BUILDING 4525 HAZARDOUS WASTE ACCUMULATION AREA	AOI
A-17	DITCH NEXT TO COAL STORAGE YARD	AOI
A-18	DRAIN OUTSIDE BUILDING 137 STRIPPER BARN	AOI
A-19	DITCH FROM BUILDING 133 TO RUNWAY 5	AOI
A-2	BUILDING 133 VARSOL TANK	AOI
A-20	EMPTY CONTAINER STORAGE AREA	AOI
A-21	OIL/WATER SEPARATORS	AOI
A-22	RADIOACTIVE STORAGE AREA #1	AOI
A-23	RADIOACTIVE WASTE STORAGE AREA #2	AOI
A-24	SUMP NEAR BUILDING 133 FREE PRODUCT RECOVERY SYSTEM	AOI
A-25	SUMP OUTSIDE BUILDING 137 STRIPPER BARN	AOI
A-3	BUILDING 137 CLEANING VATS	AOI
A-4	BUILDING 137 HAZARDOUS WASTE ACCUMULATION AREA	AOI
A-5	BUILDING 137 LEAD FOUNDRY	AOI
A-6	BUILDING 245 SUMP	AOI
A-7	BUILDING 1798 STORM WATER RETENTION BASIN	AOI
A-8	BUILDING 4035 NEW PLATING SHOP	AOI
A-9	BUILDING 4057 OUTDOOR PIPELINE	AOI
B-1	OU1 - BRAC SITE 1 - (MCON P-962T)	BRAC
B-10	OU1 - BRAC SITE 10 - (MCON P-084T)	BRAC
B-11	BRAC SITE 11	BRAC
B-2	OU1 - BRAC SITE 2 - (MCON P-966T)	BRAC
B-3	OU1 - BRAC SITE 3 - (MCON P-966T)	BRAC
B-4	OU1 - BRAC SITE 4 - (MCON P-965T)	BRAC
B-5	OU1 - BRAC SITE 5 - (MCON P-962T)	BRAC
B-6	BRAC SITE 6 - (MCON P-084T)	BRAC
B-8	BRAC SITE 8	BRAC
	OU1 - BUILDING 137 (MCON P-500)	BRAC
N3	SITE N3 - USTs 422-T1 AND 422-T2	IR
N4	SITE N4 - USTs 133-TC1 AND 133-TC2	IR
N5	SITE N5 - USTs 133-HT1	IR
OU1 - SITE 14	OU1 - SITE 14 - MOTOR TRANSPORTATION	IR
OU1 - SITE 15	OU1 - SITE 15 - DITCH AND AREA BEHIND NADEP	IR
OU1 - SITE 16	OU1 - SITE 16 - LANDFILL AT SANDY BRANCH	IR
OU1 - SITE 18	OU1 - SITE 18 - FACILITIES MAINTENANCE COMPOUND	IR
OU1 - SITE 40	OU1 - SITE 40 - NADEP FORMER DRUM STORAGE AREA	IR
OU1 - SITE 42	OU1 - SITE 42 - INDUSTRIAL WASTEWATER TREATMENT PLANT	IR
OU1 - SITE 50	OU1 - SITE 50 - PCB TRANSFORMER SPILL AREA	IR
OU1 - SITE 51	OU1 - SITE 51 - BUILDING 137 PLATING SHOP	IR
OU1 - SITE 52	OU1 - SITE 52 - BUILDING 133 PLATING SHOP AND DITCH	IR
OU1 - SITE 60	OU1 - SITE 60 - UST 152	IR
OU1 - SITE 71	OU1 - SITE 71 - BUILDING 3909 WEAPONS CLEANING AREA	IR
OU1 - SITE 72	OU1 - SITE 72 - HANGAR 130 AVIATION FUEL PIPELINE	IR
OU1 - SITE 74	OU1 - SITE 74 - USTS 3996-1 TO 3996-7	IR
OU1 - SITE 90	OU1 - SITE 90 - CENTRAL HEATING PLANT	IR
OU1 - SITE N2	OU1 - FORMER TANK FARM (N2 SITE)	IR
OU1 - TANK FARM C	OU1 - TANK FARM C	IR
OU10 - SITE 33	OU10 - SITE 33 - VMGR-252 ACCUMULATION AREA	IR
OU10 - SITE 34	OU10 - SITE 34 - CRASH CREW ACCUMULATION AREA	IR
OU10 - SITE 35	OU10 - SITE 35	IR
OU10 - SITE 36	OU10 - SITE 36 - H&HS FORMER ACCUMULATION AREA	IR
OU11 - SITE 3	OU11 - SITE 3 - EOD RANGE	IR
OU11 - SITE 38	OU11 - SITE 38 - DRMO HAZARDOUS WASTE STORAGE	IR

	AREA	
OU11 - SITE 39	OU11 - SITE 39 - FACILITIES MAINTENANCE/HAZARDOUS WASTE STORAGE AREA	IR
OU11 - SITE 43	OU11 - SITE 43 - SEWAGE TREATMENT PLANT	IR
OU11 - SITE 45A	OU11 - SITE 45A CURRENT SLUDGE APPLICATION AREA	IR
OU11 - SITE 45B	OU11 - SITE 45B CURRENT SLUDGE APPLICATION AREA	IR
OU11 - SITE 45C	OU11 - SITE 45C CURRENT SLUDGE APPLICATION AREA	IR
OU11 - SITE 45D	OU11 - SITE 45D CURRENT SLUDGE APPLICATION AREA	IR
OU11 - SITE 45E	OU11 - SITE 45E CURRENT SLUDGE APPLICATION AREA	IR
OU11 - SITE 45F	OU11 - SITE 45F CURRENT SLUDGE APPLICATION AREA	IR
OU13 - SITE 21	OU13 - SITE 21 - BORROW PIT/LANDFILL (SOUTH OF RUNWAY 32)	IR
OU13 - SITE 44B	OU13 - SITE 44B - FORMER SLUDGE APPLICATION AREA	IR
OU13 - SITE19	OU13 - SITE 19 BORROW PIT/LANDFILL (NORTH OF RUNWAY 32)	IR
OU2 - SITE 10	OU2 - SITE 10 - OLD SANITARY LANDFILL	IR
OU2 - SITE 44A	OU2 - SITE 44A - FORMER SLUDGE APPLICATION AREA	IR
OU2 - SITE 46	OU2 - SITE 46 - POLISHING POND 1	IR
OU2 - SITE 46	OU2 - SITE 46 - POLISHING POND 2	IR
OU2 - SITE 76	OU2 - SITE 76 - VEHICLE MAINTENANCE AREA (HOBBY SHOP)	IR
OU3 - SITE 6	OU3 - SITE 6 - FLYASH PONDS	IR
OU3 - SITE 7	OU3 - SITE 7 - OLD INCINERATOR/ADJACENT AREA	IR
OU4 - SITE 4	OU4 - SITE 4 - BORROW PIT/LANDFILL	IR
OU5 - SITE 1	OU5 - SITE 1 - BORROW PIT/LANDFILL	IR
OU5 - SITE 2	OU5 - SITE 2 - BORROW PIT/LANDFILL	IR
OU6 - SITE 12	OU6 - SITE 12 - CRASH CREW OIL/WATER SEPARATOR	IR
OU6 - SITE 12	OU6 - SITE 12 - CRASH CREW TRAINING AREA/BURN PIT	IR
OU6 - SITE 35	OU6 - SITE 35 - MAG 14 ACCUMULATION AREA	IR
OU6 - SITE 35A	OU6 - SITE 35A - HIGH-POWER ENGINE RUN-UP AREA AND TEST CELLS	IR
OU7 - SITE 55	OU7 - SITE 55 - THIRD LIGHT ANTI-AIRCRAFT MISSILES (LAAM) TANK AND UST 1783	IR
OU8 - SITE 17	OU8 - SITE 17 - DRMO STORAGE DRAINAGE DITCH	IR
OU8 - SITE 5	OU8 - SITE 5 - POL STORAGE TANK	IR
OU9 - SITE 37	OU9 - SITE 37 - MWCS 28 ACCUMULATION AREA	IR
OU9 - SITE 49A	OU9 - SITE 49A - MWCS 28 OIL/WATER SEPARATOR AND LEACH FIELD	IR
OU9 - SITE 49B	OU9 - SITE 49B - MACS 6 OIL/WATER SEPARATOR AND LEACH FIELDS	IR
SITE 13	SITE 13 - TANK FARM A	IR
SITE 22	SITE 22 - DUMP SITE	IR
SITE 22	SITE 22 - DUMP SITE AT MCOLF ATLANTIC	IR
SITE 23	SITE 23 - OLD SANITARY LANDFILL	IR
SITE 23	SITE 23 - OLD SANITARY LANDFILL AT MCOLF ATLANTIC	IR
SITE 24	SITE 24 - DUMP SITE	IR
SITE 24	SITE 24 - DUMP SITE AT MCOLF ATLANTIC	IR
SITE 25	SITE 25 - OLD INCINERATOR	IR
SITE 25	SITE 25 - OLD INCINERATOR AT MCOLF ATLANTIC	IR
SITE 26	SITE 26 - SEWAGE TREATMENT LAGOONS	IR
SITE 26	SITE 26 - SEWAGE TREATMENT LAGOONS AT MCOLF ATLANTIC	IR
SITE 27	SITE 27 - OLD INCINERATOR	IR
SITE 27	SITE 27 - OLD INCINERATOR AT MCALF BOGUE	IR
SITE 28	SITE 28 - OLD FUEL BLADDER STORAGE AREA	IR
SITE 28	SITE 28 - OLD FUEL BLADDERS STORAGE AREA AT MCALF BOGUE	IR
SITE 29	SITE 29 - CRASH CREW TRAINING AREA	IR
SITE 29	SITE 29 - CRASH CREW TRAINING AREA AT MCALF BOGUE	IR
SITE 30	SITE 30 - OLD LANDFILL	IR
SITE 30	SITE 30 - OLD LANDFILL AT MCALF BOGUE	IR
SITE 31	SITE 31 - SHELLY POINT LANDFILL	IR
SITE 31	SITE 31 - SHELLY POINT LANDFILL AT MCALF BOGUE	IR

SITE 32	SITE 32 - DUMP NEAR TOWER	IR
SITE 32	SITE 32 - DUMP NEAR TOWER AT POINT OF MARSH BT-11	IR
SITE 54	OU9 - SITE 54 - USTS 1786-1 AND 1786-2	IR
SITE 77	SITE 77 - UST 3907	IR
SITE 8	SITE 8 - TANK FARM B STORAGE AREA	IR
SITE 83	SITE 83 - BUILDING 96 FORMER PESTICIDE MIXING AREA	IR
SITE 9	SITE 9 - TANK FARM D	IR
	OU1 - UST 4032 GS1 THRU 4032 GS5 SITE	IR
OU1	OU1 GENERAL AREA	OU AREA
OU2	OU2 GENERAL AREA	OU AREA
OU3	OU3 GENERAL AREA	OU AREA
C-16	SWMU C-16 - PCB TRANSFORMER STORAGE AREA	SWMU
C-3	SWMU C-3 - PCB-CONTAMINATED SOIL PILE	SWMU
C-6	SWMU C-6 - FLY ASH HOLDING TANK	SWMU
C-7	SWMU C-7 - COAL YARD CATCHMENT BASIN	SWMU
C-8	SWMU C-8 - CONSTRUCTION LANDFILL	SWMU
C-9	SWMU C-9 - ASBESTOS DISPOSAL AREA	SWMU
F-1	SWMU F-1 - HMS 14 WASH RACK	SWMU
F-10	SWMU F-10 - MAG 32 PAINT BOOTH	SWMU
F-11	SWMU F-35 - VMA 542 WASTE OIL ABOVEGROUND STORAGE TANK	SWMU
F-12	SWMU F-12 - MAG 32 AIRCRAFT WASH RACK AND SUMP	SWMU
F-13	SWMU F-13 - CRASH CREW BURN PIT	SWMU
F-14	SWMU F-14 - CRASH CREW BURN PIT OIL/WATER SEPARATOR	SWMU
F-15	SWMU F-15 - CRASH CREW FUEL TANKER	SWMU
F-16	SWMU F-16 - HMS 14 ACCUMULATION AREA	SWMU
F-17	SWMU F-17 - HMS 14 SPENT BATTERY STORAGE AREA	SWMU
F-18	SWMU F-18 - MS 14 GSE #1 ACCUMULATION AREA	SWMU
F-19	SWMU F-19 - MS 14 GFE #1 ACCUMULATION AREA	SWMU
F-2	SWMU F-2 - HMS 14 UNDERGROUND STORAGE TANK	SWMU
F-20	SWMU F-20 - VMGR 253 #1 ACCUMULATION AREA	SWMU
F-21	SWMU F-21 - VMGR 253 #2 ACCUMULATION AREA	SWMU
F-23	SWMU F-18 - VMAQ 2 ACCUMULATION AREA	SWMU
F-24	SWMU F-24 - HMS 14 ACCUMULATION AREA	SWMU
F-25	SWMU F-25 - VMA 332 ACCUMULATION AREA	SWMU
F-26	SWMU F-26 - VMA 533 ACCUMULATION AREA	SWMU
F-27	SWMU F-27 - SOES ACCUMULATION AREA	SWMU
F-28	SWMU F-28 - VMAT 203 ACCUMULATION AREA	SWMU
F-29	SWMU F-29 - HMS 32 #1 ACCUMULATION AREA	SWMU
F-3	SWMU F-3 - HANGAR 250 SUMP	SWMU
F-30	SWMU F-30 - HMS 32 #2 ACCUMULATION AREA	SWMU
F-31	SWMU F-31 - HMS 32 GSE #1 ACCUMULATION AREA	SWMU
F-32	SWMU F-32 - HMS 32 GSE #2 ACCUMULATION AREA	SWMU
F-33	SWMU F-33 - VMA 223 ACCUMULATION AREA	SWMU
F-34	SWMU F-34 - VMA 542 #1 ACCUMULATION AREA	SWMU
F-35	SWMU F-35 - VMA 542 #2 ACCUMULATION AREA	SWMU
F-36	SWMU F-36 - VMA 231 ACCUMULATION AREA	SWMU
F-37	SWMU F-37 - VMA 332 ACCUMULATION AREA	SWMU
F-39	SWMU F-39 - HMS 32 ACCUMULATION AREA	SWMU
F-4	SWMU F-4 - VMGR 252 AIRCRAFT WASH RACK	SWMU
F-40	SWMU F-40 - CRASH CREW BURN PIT ACCUMULATION AREA	SWMU
F-41	SWMU F-41 - MAG 32 #1 ACCUMULATION AREA	SWMU
F-5	SWMU F-5 - VMAQ 2 AIRCRAFT WASH RACK	SWMU
F-6	SWMU F-6 - VMA 322 AIRCRAFT WASH RACK	SWMU
F-7	SWMU F-7 - HMS 32 WASH RACK	SWMU
F-8	SWMU F-8 - MAG 32 UNDERGROUND WASTE OIL STORAGE TANK	SWMU
F-9	SWMU F-9 - MAG 32 UNDERGROUND WASTE HYDRAULIC FLUID STORAGE TANK	SWMU
I-12	SWMU I-12 - CRASH CREW TRAINING AREA	SWMU

N-1	SWMU N-1 - PAINT SHOP WATER CURTAIN	SWMU
N-10	SWMU N-10 - DOWN DRAFT PAINT SUMP	SWMU
N-12	SWMU N-12 - PLATING SYSTEM TANK	SWMU
N-13	SWMU N-13 - ANODIZING SOLUTION TANK (PRESENT LOCATION)	SWMU
N-14	SWMU N-14 - TYPICAL CONTAINER ACCUMULATION AREA	SWMU
N-15	SWMU N-15 - ELECTROPLATING SHOP SUMP	SWMU
N-16	SWMU N-16 - PAINT SHOP WATER CURTAIN	SWMU
N-17	SWMU N-17 - CLEANING VATS	SWMU
N-18	SWMU N-18 - AIRCRAFT PAINT STRIPPING SHOP SUMP	SWMU
N-19	SWMU N-19 - CENTRAL TRANSFER AREA	SWMU
N-2	SWMU N-2 - PLATING SHOP CLEANING VATS	SWMU
N-20	SWMU N-20 - DOWN DRAFT AIRCRAFT PAINT BOOTH	SWMU
N-21	SWMU N-21 - PLASTIC MEDIA BLASTING CYCLONE	SWMU
N-3	SWMU N-3 - METAL PLATING SHOP DEGREASER	SWMU
N-4	SWMU N-4 - METAL CLEANING SHOP VATS	SWMU
N-5	SWMU N-5 - CLEANING SHOP VATS	SWMU
N-6	SWMU N-6 - CHEMICAL STRIPLINE CLEANING VATS	SWMU
N-7	SWMU N-7 - PHOTO LAB AND CLEANING SHOP HOLDING TANK	SWMU
N-8	SWMU N-8 - SILVER RECOVERY TANK IN PHOTO SHOP	SWMU
N-9	SWMU N-9 - ROTO HEAD SHOP SOLVENT PARTS CLEANER	SWMU
OU2 - SITE 44A	FORMER SLUDGE IMPOUNDMENT AREA	SWMU
S-1	SWMU S-1 - BOAT DOCK WASTE OIL ABOVEGROUND STORAGE TANK	SWMU
S-10	SWMU S-10 - MASS 1 WASH RACK AND OIL/WATER SEPERATOR	SWMU
S-12	SWMU S-12 - PESTICIDE MIXING AREA NEW AHOP	SWMU
S-2	SWMU S-2 - NAVY BOAT DOCK ACCUMULATION AREA	SWMU
S-3	SWMU S-3 - GENERATOR SHOP ACCUMULATION AREA	SWMU
S-4	SWMU S-4 - MWSS 271 ACCUMULATION AREA	SWMU
S-5	SWMU S-5 - MWSS 274 ACCUMULATION AREA	SWMU
S-7	SWMU S-7 - MACS 6 ACCUMULATION AREA	SWMU
S-8	SWMU S-8 - MACS 6 WASH RACK	SWMU
S-9	SWMU S-9 - MASS 1 ACCUMULATION AREA	SWMU
SITE 11	SITE 11 - MAG 14 SITE (SWMU I-11)	SWMU
SITE 20	SITE 20 - TRAINING AREA FOUR (SWMU I-20)	SWMU
SITE 67	SITE 67 - FS SMOKE BUILDING 1234	SWMU
SITE 67	SITE 67 - FS SMOKE BUILDING 1235	SWMU
SITE 68	SITE 68 - CRYOGENICS AREA	SWMU
SITE 80	SITE 80 - (MALS 14) GUNSHOP	SWMU
SITE 84	SITE 84 - GOLF COURSE MAINTENANCE AREA	SWMU
SITE 85	SITE 85 - AREA WEST OF HOBBY SHOP	SWMU
	OU9 - MACS 6 BATTERY SERVICE ROOM LEACH FIELD	SWMU

Table: UST_site_vvl

Facility	UST_site	UST_description
	NA	Not an UST Site
MCAS CHERRY POINT	MTF	Marine Transfer Facility (formerly Barge Off-Load)
MCAS CHERRY POINT	TFB	Tank Farm B
MCAS CHERRY POINT	TFC	Tank Farm C
MCAS CHERRY POINT	TFD	Tank Farm D
MCAS CHERRY POINT	MTFP	Marine Transfer Facility Pipeline (formerly Fuel Docks Pipeline)
MCAS CHERRY POINT	P15	Pit 15
MCAS CHERRY POINT	130	Building 130
MCAS CHERRY POINT	133	Building 133TC
MCAS CHERRY POINT	137	Building 137
MCAS CHERRY POINT	152	Building 152/152-10
MCAS CHERRY POINT	160	Tank 160
MCAS CHERRY POINT	168	Tank 168
MCAS CHERRY POINT	175	Building 175
MCAS CHERRY POINT	177	Building 177

MCAS CHERRY POINT	296	Tanks 296-1, 296-2, and 296-3
MCAS CHERRY POINT	298	Tank 298
MCAS CHERRY POINT	486	Tank 486
MCAS CHERRY POINT	487	Tank 487
MCAS CHERRY POINT	490	Building 490
MCAS CHERRY POINT	491	Tank 491
MCAS CHERRY POINT	492	Building 492
MCAS CHERRY POINT	493	Building 493
MCAS CHERRY POINT	494	Building 494
MCAS CHERRY POINT	495	Building 495
MCAS CHERRY POINT	496	Building 496
MCAS CHERRY POINT	498	Building 498
MCAS CHERRY POINT	927	Building 927
MCAS CHERRY POINT	1005	Tanks 1005-1/1005-2
MCAS CHERRY POINT	1083	Building 1083
MCAS CHERRY POINT	1502	Building 1502
MCAS CHERRY POINT	1640	Tank 1640
MCAS CHERRY POINT	1647	Building 1647
MCAS CHERRY POINT	1648	Tank 1648
MCAS CHERRY POINT	1672	Tank 1672
MCAS CHERRY POINT	1696	Tank 1696
MCAS CHERRY POINT	1773	Tank 1773
MCAS CHERRY POINT	1783	Tank 1783
MCAS CHERRY POINT	1786	Tank 1786
MCAS CHERRY POINT	1787	Building 1787
MCAS CHERRY POINT	1788	Tank 1788
MCAS CHERRY POINT	1958	Building 1958
MCAS CHERRY POINT	3422	Building 3422
MCAS CHERRY POINT	3899	Building 3899
MCAS CHERRY POINT	3904	Tank 3904/3905
MCAS CHERRY POINT	3907	Building 3907
MCAS CHERRY POINT	3909	Building 3909
MCAS CHERRY POINT	3967	Building 3967
MCAS CHERRY POINT	3982	Building 3982
MCAS CHERRY POINT	3996	Building 3996, Tanks 3996-4/3996-6
MCAS CHERRY POINT	4032	Building 4032
MCAS CHERRY POINT	4048	Building 4048
MCAS CHERRY POINT	4049	Building 4049
MCAS CHERRY POINT	4066	Building 4066
MCAS CHERRY POINT	4075	Building 4075, Tank Farm A, Pit 4, Pipeline from Tank Farm A to B
MCAS CHERRY POINT	4182	Building 4182
MCAS CHERRY POINT	4213	Tank 4213
MCOLF-ATLANTIC	7012	Tank 7012
MCALF-BOGUE	TAFDS	TAFDS
MCALF-BOGUE	8049	Building 8049
MCALF-BOGUE	8052	Tank 8052
MCALF-BOGUE	8076	Tank 8076
MCALF-OAK GROVE	82	UST 82-OG
MCALF-OAK GROVE	83	UST 83/84-OG
MCALF-OAK GROVE	85	Tanks 85/86

Table: cas_vvl

parameter	cas
#2 FUEL OIL	GIS-130-11
1,1,1,2-TETRACHLOROETHANE	630-20-6
1,1,1-TRICHLOROETHANE	71-55-6
1,1,2,2-TETRACHLOROETHANE	79-34-5
1,1,2-TRICHLOROETHANE	79-00-5
1,1,2-TRICHLOROTRIFLUOROETHANE	76-13-1

1,1-BIPHENYL	
1,1-DICHLOROETHANE	75-34-3
1,1-DICHLOROETHENE	75-35-4
1,1-DICHLOROPROPENE	563-58-6
1,2 DICHLOROBENZENE	95-50-1
1,2,3-TRICHLOROPROPANE	96-18-4
1,2,4 TRICHLOROBENZENE	120-82-1
1,2,4,5-TETRACHLOROBENZENE	95-94-3
1,2,4-TRICHLOROBENZENE	120-82-1
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8
1,2-DIBROMOETHANE	106-93-4
1,2-DICHLOROBENZENE	95-50-1
1,2-DICHLOROETHANE	107-06-2
1,2-DICHLOROETHENE (TOTAL)	540-59-0
1,2-DICHLOROPROPANE	78-87-5
1,2-DIPHENYLHYDRAZINE	122-66-7
1,3 DICHLOROBENZENE	541-73-1
1,3,5-TRINITROBENZENE	99-35-4
1,3-DICHLOROBENZENE	541-73-1
1,3-DICHLOROPROPANE	142-28-9
1,3-DICHLOROPROPENE	542-75-6
1,3-DINITROBENZENE	99-65-0
1,4 DICHLOROBENZENE	106-46-7
1,4-DICHLOROBENZENE	106-46-7
1,4-DIOXANE	123-91-1
1,4-NAPHTHOQUINONE	130-15-4
1H-INDENE, 2,3-DIHYDRO-	496-11-7
1-NAPHTHYLAMINE	134-32-7
2,2-DICHLOROPROPANE	594-20-7
2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1
2,2-OXYBIS(PROPANE)	108-20-3
2,3,4,5,6-D5-ANILINE	
2,3,4,6-TETRACHLOROPHENOL	58-90-2
2,4,5-T	93-76-5
2,4,5-TP (SILVEX)	93-72-1
2,4,5-TRICHLOROPHENOL	95-95-4
2,4,6-TRICHLOROPHENOL	88-06-2
2,4-D	94-75-7
2,4-DB	94-82-6
2,4-DICHLOROPHENOL	120-83-2
2,4-DIMETHYLPHENOL	105-67-9
2,4-DINITROPHENOL	51-28-5
2,4-DINITROTOLUENE	121-14-2
2,6-DICHLOROPHENOL	87-65-0
2,6-DINITROTOLUENE	606-20-2
2-ACETYLAMINOFLUORENE	53-96-3
2-BUTANONE	78-93-3
2-CHLOROETHYL VINYL ETHER	110-75-8
2-CHLORONAPHTHALENE	91-58-7
2-CHLOROPHENOL	95-57-8
2-HEXANONE	591-78-6
2-METHYL-4,6-DINITROPHENOL	534-52-1
2-METHYLNAPHTHALENE	91-57-6
2-METHYLPHENOL	95-48-7
2-NAPHTHYLAMINE	91-59-8
2-NITROANILINE	88-74-4
2-NITROPHENOL	88-75-5
2-PICOLINE	109-06-8
2-SEC-BUTYL-4-6-DINITROPHENOL (DINOSEB)	88-85-7
3,3'-DICHLOROBENZIDINE	91-94-1
3,3'-DIMETHYLBENZIDINE	119-93-7
3-METHYLCHOLANTHRENE	56-49-5
3-METHYLPHENOL	108-39-4

3-NITROANILINE	99-09-2
4,4'-DDD	72-54-8
4,4'-DDE	72-55-9
4,4'-DDT	50-29-3
4,6-DINITRO-2-METHYLPHENOL	534-52-1
4-AMINOBIPHENYL	92-67-1
4-BROMOPHENYL PHENYL ETHER	101-55-3
4-CHLORO-3-METHYLPHENOL	59-50-7
4-CHLOROPHENYL PHENYL ETHER	7005-72-3
4-METHYL-2-PENTANONE	108-10-1
4-METHYLPHENOL	106-44-5
4-NITROANILINE	100-01-6
4-NITROPHENOL	100-02-7
4-NITROQUINOLINE-1-OXIDE	56-57-5
5-NITRO-O-TOLUIDINE	99-55-8
7,12-DIMETHYLBENZ(A)ANTHRACENE	57-97-6
ACENAPHTHENE	83-32-9
ACENAPHTHYLENE	208-96-8
ACETONE	67-64-1
ACETONITRILE	75-05-8
ACETOPHENONE	98-86-2
ACROLEIN	107-02-8
ACRYLONITRILE	107-13-1
ALACHLOR	15972-60-8
ALDRIN	309-00-2
ALLYL CHLORIDE	107-05-1
ALPHA, ALPHA-DIMETHYLPHENETHYLAMINE	122-09-8
ALPHA-BHC	319-84-6
ALPHA-CHLORDANE	5103-71-9
ALUMINUM	7429-90-5
ANILINE	62-53-3
ANTHRACENE	120-12-7
ANTIMONY	7440-36-0
ARAMITE	140-57-8
AROCLOR-1016	12674-11-2
AROCLOR-1221	11104-28-2
AROCLOR-1232	11141-16-5
AROCLOR-1242	53469-21-9
AROCLOR-1248	12672-29-6
AROCLOR-1254	11097-69-1
AROCLOR-1260	11096-82-5
ARSENIC	7440-38-2
BARIUM	7440-39-3
BENDIOCARB	22781-23-3
BENZENE	71-43-2
BENZIDINE	92-87-5
BENZO(A)ANTHRACENE	56-55-3
BENZO(A)PYRENE	50-32-8
BENZO(B)FLUORANTHENE	205-99-2
BENZO(G,H,I)PERYLENE	191-24-2
BENZO(K)FLUORANTHENE	207-08-9
BENZOIC ACID	65-85-0
BENZYL ALCOHOL	100-51-6
BERYLLIUM	7440-41-7
BETA-BHC	319-85-7
BIS(2-CHLOROETHOXY)METHANE	111-91-1
BIS(2-CHLOROETHYL)ETHER	111-44-4
BIS(2-CHLOROISOPROPYL) ETHER	108-60-1
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7
BROMIDE	24959-67-9
BROMOBENZENE	108-86-1
BROMOCHLOROMETHANE	74-97-5
BROMODICHLOROMETHANE	75-27-4

BROMOFORM	75-25-2
BROMOMETHANE	74-83-9
BUTYLBENZYL PHTHALATE	85-68-7
CADMIUM	7440-43-9
CALCIUM	7440-70-2
CARBARYL	63-25-2
CARBAZOLE	86-74-8
CARBON DIOXIDE	124-38-9
CARBON DISULFIDE	75-15-0
CARBON TETRACHLORIDE	56-23-5
CHLORDANE	57-74-9
CHLOROBENZENE	108-90-7
CHLOROBENZILATE	510-15-6
CHLOROETHANE	75-00-3
CHLOROFORM	67-66-3
CHLOROMETHANE	74-87-3
CHLOROPRENE	126-99-8
CHLORPYRIFOS	2921-88-2
CHROMIUM	7440-47-3
CHRYSENE	218-01-9
CIS-1,2-DICHLOROETHENE	156-59-2
CIS-1,3-DICHLOROPROPENE	10061-01-5
COBALT	7440-48-4
COLOR	
COPPER	7440-50-8
CORROSIVITY (pH)	
CYANIDE	57-12-5
DALAPON	127-20-8
DELTA-BHC	319-86-8
DIALLATE	2303-16-4
DIAZINON	33-41-5
DIBENZO(A,H)ANTHRACENE	53-70-3
DIBENZOFURAN	132-64-9
DIBROMOCHLOROMETHANE	124-48-1
DIBROMOMETHANE	74-95-3
DICAMBA	1918-00-9
DICHLORODIFLUOROMETHANE	75-71-8
DICHLOROMETHANE	75-09-2
DICHLOROPROPENE	120-36-5
DIELDRIN	60-57-1
DIESEL RANGE ORGANICS	
DIETHYL PHTHALATE	84-66-2
DIMETHOATE	60-51-5
DIMETHYL PHTHALATE	131-11-3
DI-N-BUTYL PHTHALATE	84-74-2
DI-N-OCTYL PHTHALATE	117-84-0
DIPHENYLAMINE	122-39-4
DISULFOTON	298-04-4
EICOSANE,N	112-95-8
ENDOSULFAN I	959-98-8
ENDOSULFAN II	33213-65-9
ENDOSULFAN SULFATE	1031-07-8
ENDRIN	72-20-8
ENDRIN ALDEHYDE	7421-93-4
ENDRIN KETONE	53494-70-5
EPICHLOROHYDRIN	106-89-8
ETHOPROP	13194-48-4
ETHYL METHACRYLATE	97-63-2
ETHYL METHANESULFONATE	62-50-0
ETHYLBENZENE	100-41-4
FAMPHUR	52-85-7
FLASHPOINT	
FLUORANTHENE	206-44-0

FLUORENE	86-73-7
FLUORIDE	16984-48-8
FREON-113	76-13-1
GAMMA-BHC (LINDANE)	58-89-9
GAMMA-CHLORDANE	5566-34-7
GASOLINE RANGE ORGANICS	86290-81-5
HEPTACHLOR	76-44-8
HEPTACHLOR EPOXIDE	1024-57-3
HEXACHLOROBENZENE	118-74-1
HEXACHLOROBUTADIENE	87-68-3
HEXACHLOROCYCLOPENTADIENE	77-47-4
HEXACHLOROETHANE	67-72-1
HEXACHLOROPHENE	70-30-4
HEXACHLOROPROPENE	1888-71-7
HEXANE	110-54-3
IGNITABILITY	
INDENO(1,2,3-CD)PYRENE	193-39-5
IRON	7439-89-6
ISOBUTYL ALCOHOL	78-83-1
ISODRIN	465-73-6
ISOPHENPHOS	25311-71-1
ISOPHORONE	78-59-1
ISOSAFROLE	120-58-1
KEPONE	143-50-0
LAYERS	
LEAD	7439-92-1
M+P-XYLENES	
MAGNESIUM	7439-95-4
MALATHION	121-75-5
MANGANESE	7439-96-5
MCPA	94-74-6
MCPP	7085-19-0
MERCURY	7439-97-6
METHACRYLONITRILE	126-98-7
METHAPYRILENE	91-80-5
METHOXYCHLOR	72-43-5
METHYL IODIDE	74-88-4
METHYL METHACRYLATE	80-62-6
METHYL METHANESULFONATE	66-27-3
METHYL PARATHION	298-00-0
METHYL TERT-BUTYL ETHER	1634-04-4
METHYLENE BROMIDE	74-95-3
METHYLENE CHLORIDE	75-09-2
MIREX	2385-85-5
MOLYBDENUM	7439-98-7
M-XYLENE	108-38-3
NAPHTHALENE	91-20-3
NICKEL	7440-02-0
NITROBENZENE	98-95-3
N-NITROSODIETHYLAMINE	55-18-5
N-NITROSODIMETHYLAMINE	62-75-9
N-NITROSODI-N-BUTYLAMINE	924-16-3
N-NITROSO-DI-N-PROPYLAMINE	621-64-7
N-NITROSODIPHENYLAMINE	86-30-6
N-NITROSOMETHYLETHYLAMINE	10595-95-6
N-NITROSOMORPHOLINE	59-89-2
N-NITROSOPIPERIDINE	100-75-4
N-NITROSOPYRROLIDINE	930-55-2
NONANE	111-84-2
O,O,O-TRIETHYL PHOSPHOROTHIOATE	126-68-1
O,O-DIETHYL-O-2-PYRAZINYL PHOSPHOROTHIOA	297-97-2
O-CHLOROTOLUENE	95-49-8
OIL & GREASE	

O-TOLUIDINE	95-53-4
O-XYLENE	95-47-6
P-(DIMETHYLAMINO)AZOBENZENE	60-11-7
PARATHION	56-38-2
P-CHLOROANILINE	106-47-8
P-CHLOROTOLUENE	106-43-4
PENTACHLOROBENZENE	608-93-5
PENTACHLOROETHANE	76-01-7
PENTACHLORONITROBENZENE	82-68-8
PENTACHLOROPHENOL	87-86-5
PH	
PHENACETIN	62-44-2
PHENANTHRENE	85-01-8
PHENOL	108-95-2
PHORATE	298-02-2
PHYSICAL CHARACTERISTICS	
POTASSIUM	7440-09-7
P-PHENYLENEDIAMINE	106-50-3
PROMETON	1610-18-0
PRONAMIDE	23950-58-5
PROPIONITRILE	107-12-0
PROPOXUR	114-26-1
P-XYLENE	106-42-3
PYRENE	129-00-0
PYRETHRIN I	121-21-1
PYRETHRIN II	121-29-9
PYRIDINE	110-86-1
REACTIVITY	
SAFROLE	94-59-7
SELENIUM	7782-49-2
SILVER	7440-22-4
SODIUM	7440-23-5
SPECIFIC GRAVITY (60F)	
STYRENE	100-42-5
SULFIDE	18496-25-8
TETRACHLOROETHENE	127-18-4
TETRAETHYL DITHIOPYROPHOSPHATE	3689-24-5
THALLIUM	7440-28-0
TIN	7440-31-5
TOLUENE	108-88-3
TOTAL METHYLPHENOL	
TOTAL ORGANIC HALOGENS	
TOTAL PHOSPHORUS	7723-14-0
TOTAL SOLIDS	
TOXAPHENE	8001-35-2
TRANS-1,2-DICHLOROETHENE	156-60-5
TRANS-1,3-DICHLOROPROPENE	10061-02-6
TRANS-1,4-DICHLORO-2-BUTENE	110-57-6
TRICHLOROETHENE	79-01-6
TRICHLOROFLUOROMETHANE	75-69-4
VANADIUM	7440-62-2
VINYL ACETATE	108-05-4
VINYL CHLORIDE	75-01-4
XYLENES, TOTAL	1330-20-7
ZINC	7440-66-6

Table:units_vvl

units	description
MG/KG	milligrams per kilogram (parts per million)
UG/KG	micrograms per kilogram (parts per billion)
UG/L	micro grams per liter (parts per billion)
MG/L	milligrams per liter (parts per million)
NG/L	nanograms per liter (parts per trillion)

%	percent
G/CM3	grams per cubic centimeter
(#/100ML)	colonies per milliliter
FEET	depth equivalence
PCI/L	picocuries per liter (radiological measurement)
UMHOS/CM	resistivity measurement
BTU/L	british thermal unit measurement
CM/SEC	centimeters per second
MV	millivolts
CST	viscosity measurement
UG/100CM	microgram per 100 centimeters
UG/M3	micrograms per cubic meter
CFU/ML	bacterialogical counts
ML/L	wettable solids
UG/2-TUB	btex/dro
UG/TUBE	dro
PPBV	air flow volumetric measurement
(C°)	degrees celsius
NU	turbidity units
(F°)	degrees fahrenheit
UNITLESS	pH unitless
FIBER	asbestos measurement

Table: qual_vvl

qual	description
U	Value is not detected
UJ	Value is not detected and estimated
UR	Value is not usable, but was reported as not detected
J	Value is estimated
R	Value is not usable

Table: fraction_vvl

fraction	description
ASB	ASBESTOS
AVS/SEM	AVS/SIMULTANEOUSLY EXTRACTED METALS
DIOX	DIOXINS/FURANS
EXP	EXPLOSIVES
HERB	HERBICIDES
M	METALS
MISC	MISCELLANEOUS PARAMETERS
PEST/PCB	PESTICIDES/PCBs
RAD	RADIONUCLIDES
RCRA	RCRA CHARACTERISTICS
OS	SEMIVOLATILES
OS/502.2	SEMIVOLATILES METHOD 502.2
OS/601	SEMIVOLATILES METHOD 601
OS/602	SEMIVOLATILES METHOD 602
OS/610	SEMIVOLATILES METHOD 610
OS/625	SEMIVOLATILES METHOD 625
OS/802	SEMIVOLATILES METHOD 802
OS/807	SEMIVOLATILES METHOD 807
PET	PETROLEUM HYDROCARBONS
OV	VOLATILES
OV/502.2	VOLATILES METHOD 502.2
OV/601	VOLATILES METHOD 601
OV/602	VOLATILES METHOD 602
OV/802	VOLATILES METHOD 802
OV/824	VOLATILES METHOD 824
OV/ZHE	VOLATILES-ZERO HEADSPACE EXTRACTION
OV/PID	VOLATILES-PHOTOIONIZATION DETECTOR
OV/ECLD	VOLATILES-ELECTROLYTIC COND. DETECT
OS/TCLP	SEMIVOLATILE TCLP EXTRACTION

Table: para_vvl

Parameter	frac_name
ASBESTOS	ASBESTOS
DIBUTYLTIN	BUTYLTIN
MONOBUTYLTIN	BUTYLTIN
TETRABUTYLTIN	BUTYLTIN
TRIBUTYLTIN	BUTYLTIN
CYCLOHEXANE	CYCLOHEXANES
CYCLOHEXANOL	CYCLOHEXANES
CYCLOHEXANONE	CYCLOHEXANES
CYCLOHEXENE	CYCLOHEXANES
1,2,3,4,6,7,8-HPCDD	DIOXINS/FURANS
1,2,3,4,6,7,8-HPCDF	DIOXINS/FURANS
1,2,3,4,7,8,9-HPCDF	DIOXINS/FURANS
1,2,3,4,7,8-HXCDD	DIOXINS/FURANS
1,2,3,4,7,8-HXCDF	DIOXINS/FURANS
1,2,3,6,7,8-HXCDD	DIOXINS/FURANS
1,2,3,6,7,8-HXCDF	DIOXINS/FURANS
1,2,3,7,8,9-HXCDD	DIOXINS/FURANS
1,2,3,7,8,9-HXCDF	DIOXINS/FURANS
1,2,3,7,8-PECDD	DIOXINS/FURANS
1,2,3,7,8-PECDF	DIOXINS/FURANS
2,3,4,6,7,8-HXCDF	DIOXINS/FURANS
2,3,4,7,8-PECDF	DIOXINS/FURANS
2,3,7,8-TCDD	DIOXINS/FURANS
2,3,7,8-TCDF	DIOXINS/FURANS
OCTACHLORODIBENZOFURAN	DIOXINS/FURANS
OCTACHLORODIBENZO-P-DIOXIN	DIOXINS/FURANS
TOTAL HPCDD	DIOXINS/FURANS
TOTAL HPCDF	DIOXINS/FURANS
TOTAL HXCDD	DIOXINS/FURANS
TOTAL HXCDF	DIOXINS/FURANS
TOTAL PECDD	DIOXINS/FURANS
TOTAL PECDF	DIOXINS/FURANS
TOTAL TCDD	DIOXINS/FURANS
TOTAL TCDF	DIOXINS/FURANS
1,2-DINITROTOLUENE	EXPLOSIVES
1,3 DINITROBENZENE	EXPLOSIVES
1,3,5 TRINITROBENZENE	EXPLOSIVES
1,3-DINITROTOLUENE	EXPLOSIVES
1,4-DINITROTOLUENE	EXPLOSIVES
2,4 DINITROTOLUENE	EXPLOSIVES
2,4,6 TRINITROTOLUENE	EXPLOSIVES
2,4,6-TRINITROTOLUENE	EXPLOSIVES
2,4-DNT/2,6-DNT	EXPLOSIVES
2,6 DINITROTOLUENE	EXPLOSIVES
2-AMINO-4,6-DINITROTOLUENE	EXPLOSIVES
2-NITROTOLUENE	EXPLOSIVES
3-NITROTOLUENE	EXPLOSIVES
4-AMINO-2,6-DINITROTOLUENE	EXPLOSIVES
4-NITROTOLUENE	EXPLOSIVES
AMINO-DINITROTOLUENES	EXPLOSIVES
AMINO-DNTs	EXPLOSIVES
HMX	EXPLOSIVES
NITROBENZENE	EXPLOSIVES
NITROCELLULOSE	EXPLOSIVES
NITROGLYCERIN	EXPLOSIVES
NITROGUANIDINE	EXPLOSIVES
PENTAERYTHRITOL TETRANITRATE	EXPLOSIVES
RDX	EXPLOSIVES
TETRYL	EXPLOSIVES
2,4,5-T	HERBICIDES
2,4,5-TP (SILVEX)	HERBICIDES

2,4-D	HERBICIDES
DIMETHOATE	HERBICIDES
DINOSEB	HERBICIDES
DISULFOTON	HERBICIDES
ETHYL PARATHION	HERBICIDES
METHYL PARATHION	HERBICIDES
PHORATE	HERBICIDES
SULFOTEP	HERBICIDES
THIONAZIN	HERBICIDES
ALUMINUM	METALS
ANTIMONY	METALS
ARSENIC	METALS
BARIUM	METALS
BERYLLIUM	METALS
BORON	METALS
CADMIUM	METALS
CALCIUM	METALS
CERIUM	METALS
CHROMIUM	METALS
COBALT	METALS
COPPER	METALS
CYANIDE	METALS
HEXAVALENT CHROMIUM	METALS
IRON	METALS
LANTHANUM	METALS
LEAD	METALS
MAGNESIUM	METALS
MANGANESE	METALS
MERCURY	METALS
MOLYBDENUM	METALS
NICKEL	METALS
NIOBIUM	METALS
OSMIUM	METALS
POTASSIUM	METALS
RUBIDIUM	METALS
SELENIUM	METALS
SILICON	METALS
SILVER	METALS
SODIUM	METALS
STRONTIUM	METALS
THALLIUM	METALS
TIN	METALS
TITANIUM	METALS
VANADIUM	METALS
YTTERBIUM	METALS
YTTRIUM	METALS
ZINC	METALS
ZIRCONIUM	METALS
ACID VOLATILE SULFIDE	MISCELLANEOUS PARAMETERS
ACIDITY	MISCELLANEOUS PARAMETERS
ALKALINITY AS CACO3	MISCELLANEOUS PARAMETERS
AMMONIA	MISCELLANEOUS PARAMETERS
AMMONIA, AS NITROGEN	MISCELLANEOUS PARAMETERS
ASH (%)	MISCELLANEOUS PARAMETERS
AXIAL STRAIN	MISCELLANEOUS PARAMETERS
BACTERIA (AEROBIC)	MISCELLANEOUS PARAMETERS
BICARBONATE	MISCELLANEOUS PARAMETERS
BICARBONATE ALKALINITY	MISCELLANEOUS PARAMETERS
BIOCHEMICAL OXYGEN DEMAND	MISCELLANEOUS PARAMETERS
BIOLOGICAL OXYGEN DEMAND	MISCELLANEOUS PARAMETERS
BROMIDE	MISCELLANEOUS PARAMETERS
CARBONATE	MISCELLANEOUS PARAMETERS
CARBONATE ALKALINITY	MISCELLANEOUS PARAMETERS

CATION EX. CAPACITY	MISCELLANEOUS PARAMETERS
CHEMICAL OXYGEN DEMAND	MISCELLANEOUS PARAMETERS
CHLORIDE	MISCELLANEOUS PARAMETERS
CLAY	MISCELLANEOUS PARAMETERS
COLOR	MISCELLANEOUS PARAMETERS
COMBUSTION (BTU)	MISCELLANEOUS PARAMETERS
COMPLEXED CYANIDE	MISCELLANEOUS PARAMETERS
COMPRESSIVE STRENGTH	MISCELLANEOUS PARAMETERS
CONDUCTIVITY	MISCELLANEOUS PARAMETERS
DEPTH TO GROUNDWATER	MISCELLANEOUS PARAMETERS
DISSOLVED OXYGEN	MISCELLANEOUS PARAMETERS
EXTRACTABLE ORGANIC HALOGENS	MISCELLANEOUS PARAMETERS
FECAL COLIFORM	MISCELLANEOUS PARAMETERS
FIELD SP. CONDUCTANCE	MISCELLANEOUS PARAMETERS
FLASHPOINT	MISCELLANEOUS PARAMETERS
FLUORIDE	MISCELLANEOUS PARAMETERS
HALOGENATED SOLVENTS	MISCELLANEOUS PARAMETERS
HARDNESS AS CaCO3	MISCELLANEOUS PARAMETERS
IGNITABILITY	MISCELLANEOUS PARAMETERS
IODIDE	MISCELLANEOUS PARAMETERS
LAYERS	MISCELLANEOUS PARAMETERS
LIQUID LIMIT	MISCELLANEOUS PARAMETERS
M & P-CRESOL	MISCELLANEOUS PARAMETERS
MAJOR PRINCIPAL STRESS	MISCELLANEOUS PARAMETERS
METHYL IODIDE	MISCELLANEOUS PARAMETERS
METHYLENE BLUE	MISCELLANEOUS PARAMETERS
MICROSCOPIC EXAMINATION	MISCELLANEOUS PARAMETERS
MINOR PRINCIPAL STRESS	MISCELLANEOUS PARAMETERS
NITRATE	MISCELLANEOUS PARAMETERS
NITRATE, AS NITROGEN	MISCELLANEOUS PARAMETERS
NITRATE/NITRITE	MISCELLANEOUS PARAMETERS
NITRATE/NITRITE, AS N	MISCELLANEOUS PARAMETERS
NITRITE	MISCELLANEOUS PARAMETERS
NITRITE, AS NITROGEN	MISCELLANEOUS PARAMETERS
NON-COLIFORM GROWTH	MISCELLANEOUS PARAMETERS
OIL FINGERPRINTING	MISCELLANEOUS PARAMETERS
ORGANIC BROMINE	MISCELLANEOUS PARAMETERS
ORGANIC CHLORINE	MISCELLANEOUS PARAMETERS
ORGANIC CONTENT	MISCELLANEOUS PARAMETERS
ORGANIC IODINE	MISCELLANEOUS PARAMETERS
ORTHOPHOSPHATE	MISCELLANEOUS PARAMETERS
PERCENT LIPIDS	MISCELLANEOUS PARAMETERS
PERCHLORATES	MISCELLANEOUS PARAMETERS
PERMEABILITY	MISCELLANEOUS PARAMETERS
PETROLEUM SCAN	MISCELLANEOUS PARAMETERS
PH	MISCELLANEOUS PARAMETERS
PHENOLICS	MISCELLANEOUS PARAMETERS
PHENOLS	MISCELLANEOUS PARAMETERS
PHOSPHATE	MISCELLANEOUS PARAMETERS
PHOSPHORUS	MISCELLANEOUS PARAMETERS
PHYSICAL CHARACTERISTICS	MISCELLANEOUS PARAMETERS
PLASTICITY INDEX	MISCELLANEOUS PARAMETERS
PSEUDOMONAS	MISCELLANEOUS PARAMETERS
REACTIVITY	MISCELLANEOUS PARAMETERS
REDOX POTENTIAL	MISCELLANEOUS PARAMETERS
SILICATE	MISCELLANEOUS PARAMETERS
SILICON DIOXIDE	MISCELLANEOUS PARAMETERS
SPECIFIC CONDUCTIVITY	MISCELLANEOUS PARAMETERS
SPECIFIC GRAVITY	MISCELLANEOUS PARAMETERS
STATIC WATER LEVEL	MISCELLANEOUS PARAMETERS
STRAIN AT FAILURE	MISCELLANEOUS PARAMETERS
SULFATE	MISCELLANEOUS PARAMETERS
SULFATE REDUCING BACTERIA	MISCELLANEOUS PARAMETERS

SULFIDE	MISCELLANEOUS PARAMETERS
SULFUR	MISCELLANEOUS PARAMETERS
TEMPERATURE	MISCELLANEOUS PARAMETERS
TOTAL COLIFORM	MISCELLANEOUS PARAMETERS
TOTAL DISSOLVED RESIDUE	MISCELLANEOUS PARAMETERS
TOTAL DISSOLVED SOLIDS	MISCELLANEOUS PARAMETERS
TOTAL KJELDAHL NITROGEN	MISCELLANEOUS PARAMETERS
TOTAL ORGANIC CARBON	MISCELLANEOUS PARAMETERS
TOTAL ORGANIC HALIDES	MISCELLANEOUS PARAMETERS
TOTAL ORGANIC HALOGENS	MISCELLANEOUS PARAMETERS
TOTAL ORGANIC NITROGEN	MISCELLANEOUS PARAMETERS
TOTAL PHENOL	MISCELLANEOUS PARAMETERS
TOTAL PHOSPHORUS	MISCELLANEOUS PARAMETERS
TOTAL PLATE COUNT	MISCELLANEOUS PARAMETERS
TOTAL SOLIDS	MISCELLANEOUS PARAMETERS
TOTAL SUSPENDED SOLIDS	MISCELLANEOUS PARAMETERS
VISCOSITY	MISCELLANEOUS PARAMETERS
VSS	MISCELLANEOUS PARAMETERS
WETTABLE SOLIDS	MISCELLANEOUS PARAMETERS
YEAST AND MOLD	MISCELLANEOUS PARAMETERS
2,4-DB	PESTICIDES/PCBs
4,4'-DDD	PESTICIDES/PCBs
4,4'-DDE	PESTICIDES/PCBs
4,4'-DDT	PESTICIDES/PCBs
ALACHLOR	PESTICIDES/PCBs
ALDRIN	PESTICIDES/PCBs
ALPHA-BHC	PESTICIDES/PCBs
ALPHA-CHLORDANE	PESTICIDES/PCBs
AROCLOR, TOTAL	PESTICIDES/PCBs
AROCLOR-1016	PESTICIDES/PCBs
AROCLOR-1221	PESTICIDES/PCBs
AROCLOR-1232	PESTICIDES/PCBs
AROCLOR-1242	PESTICIDES/PCBs
AROCLOR-1248	PESTICIDES/PCBs
AROCLOR-1254	PESTICIDES/PCBs
AROCLOR-1254/1260	PESTICIDES/PCBs
AROCLOR-1260	PESTICIDES/PCBs
AROCLOR-1262	PESTICIDES/PCBs
BETA-BHC	PESTICIDES/PCBs
CARBARYL	PESTICIDES/PCBs
CARBOFURAN	PESTICIDES/PCBs
CHLORDANE	PESTICIDES/PCBs
CHLORDANE (ALPHA & GAMMA)	PESTICIDES/PCBs
CYANAZINE	PESTICIDES/PCBs
DELTA-BHC	PESTICIDES/PCBs
DIELDRIN	PESTICIDES/PCBs
EICOSANE, N	PESTICIDES/PCBs
ENDOSULFAN I	PESTICIDES/PCBs
ENDOSULFAN II	PESTICIDES/PCBs
ENDOSULFAN SULFATE	PESTICIDES/PCBs
ENDRIN	PESTICIDES/PCBs
ENDRIN ALDEHYDE	PESTICIDES/PCBs
ENDRIN KETONE	PESTICIDES/PCBs
ETHOPROP	PESTICIDES/PCBs
ETHYL TRITHION	PESTICIDES/PCBs
GAMMA-BHC (LINDANE)	PESTICIDES/PCBs
GAMMA-CHLORDANE	PESTICIDES/PCBs
HEPTACHLOR	PESTICIDES/PCBs
HEPTACHLOR EPOXIDE	PESTICIDES/PCBs
ISOPHENPHOS	PESTICIDES/PCBs
MCPA	PESTICIDES/PCBs
MCPP	PESTICIDES/PCBs
METHOXYCHLOR	PESTICIDES/PCBs

METHYL TRITHION	PESTICIDES/PCBs
METOLACHLOR	PESTICIDES/PCBs
METRIBUZIN	PESTICIDES/PCBs
MIREX	PESTICIDES/PCBs
O,P-DDD	PESTICIDES/PCBs
O,P-DDE	PESTICIDES/PCBs
O,P-DDT	PESTICIDES/PCBs
PARATHION	PESTICIDES/PCBs
PROMETON	PESTICIDES/PCBS
PROPOXUR	PESTICIDES/PCBS
PYRETHRIN I	PESTICIDES/PCBS
PYRETHRIN II	PESTICIDES/PCBS
SIMIZINE	PESTICIDES/PCBs
TOTAL PCBS	PESTICIDES/PCBs
TOXAPHENE	PESTICIDES/PCBs
TRITHION	PESTICIDES/PCBs
#2 FUEL OIL	PETROLEUM HYDROCARBONS
NAPHTHA	PETROLEUM HYDROCARBONS
OILS AND GREASE, SOXHLET	PETROLEUM HYDROCARBONS
DIESEL RANGE ORGANICS	PETROLEUM HYDROCARBONS
DRO/GRO	PETROLEUM HYDROCARBONS
GASOLINE RANGE ORGANICS	PETROLEUM HYDROCARBONS
JET FUEL	PETROLEUM HYDROCARBONS
LBPH AS GASOLINE	PETROLEUM HYDROCARBONS
OIL & GREASE	PETROLEUM HYDROCARBONS
TOTAL PETROLEUM HYDROCARBONS	PETROLEUM HYDROCARBONS
TPH C18-C22	PETROLEUM HYDROCARBONS
TPH C18-C28	PETROLEUM HYDROCARBONS
TPH C7	PETROLEUM HYDROCARBONS
TPH C7-C18	PETROLEUM HYDROCARBONS
TPH-DIESEL	PETROLEUM HYDROCARBONS
TPH-DIESEL-#6 FUEL OIL	PETROLEUM HYDROCARBONS
TPH-DIESEL-FUEL #2	PETROLEUM HYDROCARBONS
TPH-DIESEL-JP-5	PETROLEUM HYDROCARBONS
TPH-DIESEL-KEROSENE	PETROLEUM HYDROCARBONS
TPH-DIESEL-MINERAL SPIRITS	PETROLEUM HYDROCARBONS
TPH-DIESEL-MOTOR OIL	PETROLEUM HYDROCARBONS
TPH-JP4	PETROLEUM HYDROCARBONS
ACTINIUM-227	RADIONUCLIDES
AMERCIUM-241	RADIONUCLIDES
CESIUM-137	RADIONUCLIDES
GAMMA SPEC (K40)	RADIONUCLIDES
GROSS ALPHA	RADIONUCLIDES
GROSS BETA	RADIONUCLIDES
NEPTUNIUM-237	RADIONUCLIDES
PB-210	RADIONUCLIDES
PLUTONIUM-238	RADIONUCLIDES
PLUTONIUM-239	RADIONUCLIDES
PLUTONIUM-239/240	RADIONUCLIDES
POLONIUM-210	RADIONUCLIDES
POTASSIUM-40	RADIONUCLIDES
PROTACTINIUM-231	RADIONUCLIDES
RADIUM, TOTAL	RADIONUCLIDES
RADIUM-224	RADIONUCLIDES
RADIUM-226	RADIONUCLIDES
RADIUM-228	RADIONUCLIDES
RUTHENIUM-106	RADIONUCLIDES
STRONTIUM-90	RADIONUCLIDES
TECHNETIUM-99	RADIONUCLIDES
THORIUM	RADIONUCLIDES
THORIUM, CALCULATED	RADIONUCLIDES
THORIUM, TOTAL	RADIONUCLIDES
THORIUM-228	RADIONUCLIDES

THORIUM-230	RADIONUCLIDES
THORIUM-232	RADIONUCLIDES
THORIUM-234	RADIONUCLIDES
URANIUM, TOTAL	RADIONUCLIDES
URANIUM-233	RADIONUCLIDES
URANIUM-234	RADIONUCLIDES
URANIUM-235	RADIONUCLIDES
URANIUM-235/236	RADIONUCLIDES
URANIUM-236	RADIONUCLIDES
URANIUM-238	RADIONUCLIDES
CORROSIVITY (pH)	RCRA CHARACTERISTICS
REACTIVE CYANIDE	RCRA CHARACTERISTICS
REACTIVE SULFIDE	RCRA CHARACTERISTICS
1,1-BIPHENYL	SEMIVOLATILES
1,1-DICHLOROPROPENE	SEMIVOLATILES
1,2,3-TRICHLOROBENZENE	SEMIVOLATILES
1,2,4,5-TETRACHLOROBENZENE	SEMIVOLATILES
1,2,4-TRICHLOROBENZENE	SEMIVOLATILES
1,2,4-TRIMETHYLBENZENE	SEMIVOLATILES
1,2-DICHLOROBENZENE	SEMIVOLATILES
1,2-DIPHENYLHYDRAZINE	SEMIVOLATILES
1,3,5-TRIMETHYLBENZENE	SEMIVOLATILES
1,3,5-TRINITROBENZENE	SEMIVOLATILES
1,3-DICHLOROBENZENE	SEMIVOLATILES
1,3-DICHLOROPROPANE	SEMIVOLATILES
1,3-DINITROBENZENE	SEMIVOLATILES
1,4-BENZENEDIAMINE	SEMIVOLATILES
1,4-DICHLOROBENZENE	SEMIVOLATILES
1,4-NAPHTHOQUINONE	SEMIVOLATILES
1-CHLOROHEXANE	SEMIVOLATILES
1-CHLORONAPHTHALENE	SEMIVOLATILES
1H-INDENE, 2,3-DIHYDRO-	SEMIVOLATILES
1-METHYLNAPHTHALENE	SEMIVOLATILES
1-METHYLPHENOL	SEMIVOLATILES
1-NAPHTHYLAMINE	SEMIVOLATILES
1-PICOLINE	SEMIVOLATILES
2,2-DICHLOROPROPANE	SEMIVOLATILES
2,2'-OXYBIS(1-CHLOROPROPANE)	SEMIVOLATILES
2,3,4,5,6-D5-ANILINE	SEMIVOLATILES
2,3,4,6-TETRACHLOROPHENOL	SEMIVOLATILES
2,3-DIHYDRO-METHYL-1H-INDENE ISOMER	SEMIVOLATILES
2,3-DINITROTOLUENE	SEMIVOLATILES
2,4,5-TRICHLOROPHENOL	SEMIVOLATILES
2,4,6-TRICHLOROPHENOL	SEMIVOLATILES
2,4-DICHLOROPHENOL	SEMIVOLATILES
2,4-DIMETHYLPHENOL	SEMIVOLATILES
2,4-DINITROPHENOL	SEMIVOLATILES
2,4-DINITROTOLUENE	SEMIVOLATILES
2,6-DICHLOROPHENOL	SEMIVOLATILES
2,6-DINITROTOLUENE	SEMIVOLATILES
2-ACETYLAMINOFLUORENE	SEMIVOLATILES
2-BENZYL-4-CHLOROPHENOL	SEMIVOLATILES
2-CHLORO-3-METHYLPHENOL	SEMIVOLATILES
2-CHLOROMETHYL METHYL ETHER	SEMIVOLATILES
2-CHLORONAPHTHALENE	SEMIVOLATILES
2-CHLOROPHENOL	SEMIVOLATILES
2-CHLOROTOLUENE	SEMIVOLATILES
2-ETHOXYETHANOL	SEMIVOLATILES
2-METHYL-4,6-DINITROPHENOL	SEMIVOLATILES
2-METHYLNAPHTHALENE	SEMIVOLATILES
2-METHYLPHENOL	SEMIVOLATILES
2-NAPHTHYLAMINE	SEMIVOLATILES
2-NITROANILINE	SEMIVOLATILES

2-NITROPHENOL	SEMIVOLATILES
2-NITROPROPANE	SEMIVOLATILES
2-PHENYLNAPHTHALENE	SEMIVOLATILES
2-PICOLINE	SEMIVOLATILES
2-SEC-BUTYL-4,6-DINITROPHENOL	SEMIVOLATILES
3&4-METHYLPHENOL	SEMIVOLATILES
3,3'-DICHLOROBENZIDINE	SEMIVOLATILES
3,3'-DIMETHYLBENZIDINE	SEMIVOLATILES
3,4-BENZOFLUORANTHENE	SEMIVOLATILES
3,5-DINITROANILINE	SEMIVOLATILES
3-METHYLCHOLANTHRENE	SEMIVOLATILES
3-METHYLPHENOL	SEMIVOLATILES
3-NITROANILINE	SEMIVOLATILES
4,4 METHYLENEDIANILINE	SEMIVOLATILES
4,6-DINITRO-2-METHYLPHENOL	SEMIVOLATILES
4-AMINOBIPHENYL	SEMIVOLATILES
4-BROMOPHENYL PHENYL ETHER	SEMIVOLATILES
4-CHLORO-3-METHYLPHENOL	SEMIVOLATILES
4-CHLOROANILINE	SEMIVOLATILES
4-CHLOROPHENYL PHENYL ETHER	SEMIVOLATILES
4-METHYLPHENOL	SEMIVOLATILES
4-METHYLPHENOLPROPHYL ETHER	SEMIVOLATILES
4-NITROANILINE	SEMIVOLATILES
4-NITROPHENOL	SEMIVOLATILES
4-NITROQUINOLINE-1-OXIDE	SEMIVOLATILES
5-NITRO-O-TOLUIDINE	SEMIVOLATILES
7,12-DIMETHYLBENZ(A)ANTHRACENE	SEMIVOLATILES
A,A-DIMETHYLPHENETHYLAMINE	SEMIVOLATILES
ACENAPHTHENE	SEMIVOLATILES
ACENAPHTHYLENE	SEMIVOLATILES
ACETOPHENONE	SEMIVOLATILES
ALPHA, ALPHA-DIMETHYLPHENETHYLAMINE	SEMIVOLATILES
ANILINE	SEMIVOLATILES
ANTHRACENE	SEMIVOLATILES
ARAMITE	SEMIVOLATILES
ATRAZINE	SEMIVOLATILES
AZINPHOSMETHYL	SEMIVOLATILES
AZOBENZENE	SEMIVOLATILES
BENDIOCARB	SEMIVOLATILES
BENZIDINE	SEMIVOLATILES
BENZO(A)ANTHRACENE	SEMIVOLATILES
BENZO(A)PYRENE	SEMIVOLATILES
BENZO(B)AND/OR(K)FLUORANTHENE	SEMIVOLATILES
BENZO(B)FLUORANTHENE	SEMIVOLATILES
BENZO(G,H,I)PERYLENE	SEMIVOLATILES
BENZO(K)FLUORANTHENE	SEMIVOLATILES
BENZOIC ACID	SEMIVOLATILES
BENZYL ALCOHOL	SEMIVOLATILES
BENZYL CHLORIDE	SEMIVOLATILES
BIS(2-CHLOROETHOXY)METHANE	SEMIVOLATILES
BIS(2-CHLOROETHYL)ETHER	SEMIVOLATILES
BIS(2-CHLOROETHYL)PHTHALATE	SEMIVOLATILES
BIS(2-CHLOROISOPROPYL) ETHER	SEMIVOLATILES
BIS(2-ETHYLHEXYL)PHTHALATE	SEMIVOLATILES
BIS(METHYL-2-CHLOROETHYL)ETHER	SEMIVOLATILES
BIS-CHLOROMETHYL ETHER	SEMIVOLATILES
BROMOBENZENE	SEMIVOLATILES
BUTANOIC ACID, METHYL ESTER	SEMIVOLATILES
BUTYLBENZYL PHTHALATE	SEMIVOLATILES
CAPROLACTAM	SEMIVOLATILES
CARBAZOLE	SEMIVOLATILES
CHLORACETALDEHYDE	SEMIVOLATILES
CHLORAL	SEMIVOLATILES

CHLOROBENZILATE	SEMIVOLATILES
CHLOROMETHYL METHYL ETHER	SEMIVOLATILES
CHLOROPHENYL PHENYL ETHER	SEMIVOLATILES
CHLORPYRIFOS	SEMIVOLATILES
CHRYSENE	SEMIVOLATILES
CUMENE	SEMIVOLATILES
DALAPON	SEMIVOLATILES
DBCP (NEMAGON)	SEMIVOLATILES
DEMETON	SEMIVOLATILES
DIALLATE	SEMIVOLATILES
DIAZINON	SEMIVOLATILES
DIBENZO(A,H)ANTHRACENE	SEMIVOLATILES
DIBENZOFURAN	SEMIVOLATILES
DICAMBA	SEMIVOLATILES
DICHLOROBENZENE (TOTAL)	SEMIVOLATILES
DIETHYL PHTHALATE	SEMIVOLATILES
DIISOPROPYL ETHER	SEMIVOLATILES
DIMETHYL PHTHALATE	SEMIVOLATILES
DIMETHYLPHENOL	SEMIVOLATILES
DI-N-BUTYL PHTHALATE	SEMIVOLATILES
DI-N-OCTYL PHTHALATE	SEMIVOLATILES
DIOXATHION	SEMIVOLATILES
DIPHENYLAMINE	SEMIVOLATILES
ETHION	SEMIVOLATILES
ETHYL METHACRYLATE	SEMIVOLATILES
ETHYL METHANESULFONATE	SEMIVOLATILES
FAMPHUR	SEMIVOLATILES
FLUORANTHENE	SEMIVOLATILES
FLUORENE	SEMIVOLATILES
FONOFOS	SEMIVOLATILES
HEXACHLOROBENZENE	SEMIVOLATILES
HEXACHLOROBUTADIENE	SEMIVOLATILES
HEXACHLOROCYCLOPENTADIENE	SEMIVOLATILES
HEXACHLOROETHANE	SEMIVOLATILES
HEXACHLOROPHENE	SEMIVOLATILES
HEXACHLOROPROPENE	SEMIVOLATILES
INDENO(1,2,3-CD)PYRENE	SEMIVOLATILES
ISODRIN	SEMIVOLATILES
ISOPHORONE	SEMIVOLATILES
ISOPROPYLBENZENE	SEMIVOLATILES
ISOSAFROLE	SEMIVOLATILES
KEPONE	SEMIVOLATILES
LINURON	SEMIVOLATILES
MALATHION	SEMIVOLATILES
M-BUTYLALCOHOL	SEMIVOLATILES
METHAPYRILENE	SEMIVOLATILES
METHYL METHANESULFONATE	SEMIVOLATILES
NAPHTHALENE	SEMIVOLATILES
NAPHTHALENES, POLYCHLORIDE	SEMIVOLATILES
N-BUTYLBENZENE	SEMIVOLATILES
NITROBENZENE	SEMIVOLATILES
N-NITROSODIETHYLAMINE	SEMIVOLATILES
N-NITROSODIMETHYLAMINE	SEMIVOLATILES
N-NITROSODI-N-BUTYLAMINE	SEMIVOLATILES
N-NITROSO-DI-N-PROPYLAMINE	SEMIVOLATILES
N-NITROSODIPHENYLAMINE	SEMIVOLATILES
N-NITROSOMETHYLETHYLAMINE	SEMIVOLATILES
N-NITROSOMORPHOLINE	SEMIVOLATILES
N-NITROSOPIPERIDINE	SEMIVOLATILES
N-NITROSOPYRROLIDINE	SEMIVOLATILES
N-PROPYLBENZENE	SEMIVOLATILES
O,O,O-TRIETHYLPHOSPHOROTHIOATE	SEMIVOLATILES
O,O-DIETHYL-O-2-PYRAZINYLPHOSPHOROTHIOATE	SEMIVOLATILES

O-CHLOROTOLUENE	SEMIVOLATILES
O-TOLUIDINE	SEMIVOLATILES
P-(DIMETHYLAMINO)AZOBENZENE	SEMIVOLATILES
P-CHLOROTOLUENE	SEMIVOLATILES
P-DIMETHYLAMINOAZOBENZENE	SEMIVOLATILES
PENTACHLOROBENZENE	SEMIVOLATILES
PENTACHLORONITROBENZENE	SEMIVOLATILES
PENTACHLOROPHENOL	SEMIVOLATILES
PHENACETIN	SEMIVOLATILES
PHENANTHRENE	SEMIVOLATILES
PHENOL	SEMIVOLATILES
PHENOLS	SEMIVOLATILES
PHOSPHOROTRITHIOIC ACID	SEMIVOLATILES
P-ISOPROPYLTOLUENE	SEMIVOLATILES
POLYCHLORINATED NAPHTHALENES	SEMIVOLATILES
P-PHENYLENEDIAMINE	SEMIVOLATILES
PRONAMIDE	SEMIVOLATILES
PYRENE	SEMIVOLATILES
PYRIDINE	SEMIVOLATILES
SAFROLE	SEMIVOLATILES
SEC-BUTYLBENZENE	SEMIVOLATILES
TERBUFOS	SEMIVOLATILES
TERT-BUTYLBENZENE	SEMIVOLATILES
TETRAETHYL DITHIOPYROPHOSPHATE	SEMIVOLATILES
TETRAETHYLPYROPHOSPHATE	SEMIVOLATILES
TOTAL METHYLPHENOL	SEMIVOLATILES
TRIBUTYL PHOSPHATE	SEMIVOLATILES
TRICHLOROPROPANE	SEMIVOLATILES
1,1,1,2-TETRACHLOROETHANE	VOLATILES
1,1,1-TRICHLOROETHANE	VOLATILES
1,1,2,2-TETRACHLOROETHANE	VOLATILES
1,1,2,2-TETRACHLOROETHANE/TETRACHLOROETHENE	VOLATILES
1,1,2-TRICHLOROETHANE	VOLATILES
1,1,2-TRICHLOROETHENE/1,1,1-TRICHLOROETHANE	VOLATILES
1,1,2-TRICHLOROTRIFLUOROETHANE	VOLATILES
1,1-DICHLOROETHANE	VOLATILES
1,1-DICHLOROETHENE	VOLATILES
1,2 DICHLOROBENZENE	VOLATILES
1,2,3-TRICHLORODIFLUOROMETHANE	VOLATILES
1,2,3-TRICHLOROPROPANE	VOLATILES
1,2,3-TRIMETHYLBENZENE	VOLATILES
1,2,4 TRICHLOROBENZENE	VOLATILES
1,2-DC-1,1,2,2-TFA (F114)	VOLATILES
1,2-DIBROMO-3-CHLOROPROPANE	VOLATILES
1,2-DIBROMOETHANE	VOLATILES
1,2-DIBROMOETHENE	VOLATILES
1,2-DIBROMOMETHANE	VOLATILES
1,2-DICHLOROETHANE	VOLATILES
1,2-DICHLOROETHENE (TOTAL)	VOLATILES
1,2-DICHLOROPROPANE	VOLATILES
1,2-DICHLOROPROPENE	VOLATILES
1,2-DIETHYLBENZENE	VOLATILES
1,3 DICHLOROBENZENE	VOLATILES
1,3-DICHLOROPROPENE	VOLATILES
1,4 DICHLOROBENZENE	VOLATILES
1,4-DICHLORO-2-BUTANE	VOLATILES
1,4-DICHLORO-2-BUTENE	VOLATILES
1,4-DIOXANE	VOLATILES
2,2-OXYBIS(PROPANE)	VOLATILES
2-BROMO-1-CHLOROPROPANE	VOLATILES
2-BUTANONE	VOLATILES
2-CHLORO-1,3-BUTADIENE	VOLATILES

2-CHLOROETHYL VINYL ETHER	VOLATILES
2-HEXANONE	VOLATILES
3-CHLOROPROPENE	VOLATILES
4-ETHYLTOLUENE	VOLATILES
4-METHYL-2-PENTANONE	VOLATILES
ACETONE	VOLATILES
ACETONITRILE	VOLATILES
ACROLEIN	VOLATILES
ACRYLONITRILE	VOLATILES
ALLYL CHLORIDE	VOLATILES
BENZENE	VOLATILES
BROMOCHLOROMETHANE	VOLATILES
BROMODICHLOROMETHANE	VOLATILES
BROMOETHANE	VOLATILES
BROMOFORM	VOLATILES
BROMOMETHANE	VOLATILES
BULK DENSITY	VOLATILES
CARBON DIOXIDE	VOLATILES
CARBON DISULFIDE	VOLATILES
CARBON TETRACHLORIDE	VOLATILES
CHLOROBENZENE	VOLATILES
CHLOROETHANE	VOLATILES
CHLOROETHYL VINYL ETHER	VOLATILES
CHLOROFORM	VOLATILES
CHLOROMETHANE	VOLATILES
CHLOROPRENE	VOLATILES
CHLOROTOLUENE	VOLATILES
CIS-1,2-DICHLOROETHENE	VOLATILES
CIS-1,3-DICHLOROPROPENE	VOLATILES
DIBROMOCHLOROMETHANE	VOLATILES
DIBROMOFLUOROMETHANE	VOLATILES
DIBROMOMETHANE	VOLATILES
DICHLORODIFLUOROMETHANE	VOLATILES
DICHLOROFLUOROMETHANE	VOLATILES
DICHLOROMETHANE	VOLATILES
DICHLOROPROPENE	VOLATILES
DIETHYL ETHER	VOLATILES
EPICHLOROHYDRIN	VOLATILES
ETHANOL	VOLATILES
ETHYL ACETATE	VOLATILES
ETHYL CYANIDE	VOLATILES
ETHYL ETHER	VOLATILES
ETHYL METHACRYLATE	VOLATILES
ETHYLBENZENE	VOLATILES
ETHYLENE DIBROMIDE	VOLATILES
FLUOROBENZENE	VOLATILES
FLUORODICHLOROMETHANE	VOLATILES
FREON-113	VOLATILES
HEXANE	VOLATILES
IODOMETHANE	VOLATILES
ISOBUTYL ALCOHOL	VOLATILES
ISOPROPYL ALCOHOL	VOLATILES
M+P-XYLENES	VOLATILES
METHACRYLONITRILE	VOLATILES
METHANOL	VOLATILES
METHYLENE BROMIDE	VOLATILES
METHYLENE CHLORIDE	VOLATILES
M-XYLENE	VOLATILES
N-HEXYL CHLORIDE	VOLATILES
NONANE	VOLATILES
N-PROPYL BENZENE/2-CHLOROTOLUENE	VOLATILES
O+P-XYLENES	VOLATILES
O-XYLENE	VOLATILES

PENTACHLOROETHANE	VOLATILES
P-ISOPROPYL TOLUENE/1,4-DICHLOROBENZENE	VOLATILES
PROPIONITRILE	VOLATILES
P-XYLENE	VOLATILES
STYRENE	VOLATILES
TETRACHLOROETHENE	VOLATILES
TOLUENE	VOLATILES
TOTAL CHLORINATED ETHANES	VOLATILES
TRANS-1,2-DICHLOROETHENE	VOLATILES
TRANS-1,2-DICHLOROPROPENE	VOLATILES
TRANS-1,3-DICHLOROPROPENE	VOLATILES
TRANS-1,4-DICHLORO-2 BUTENE	VOLATILES
TRIBROMOMETHENE	VOLATILES
TRICHLOROETHENE	VOLATILES
TRICHLOROFLUOROMETHANE	VOLATILES
VINYL ACETATE	VOLATILES
VINYL CHLORIDE	VOLATILES
VOLATILES SCAN	VOLATILES
XYLENES, TOTAL	VOLATILES

ATTACHMENT 2

IR SAMPLE NOMENCLATURE SYSTEM

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1.0 PURPOSE

The purpose of this document is to specify a consistent sample nomenclature system that will facilitate subsequent data management in a cost-effective manner. The sample nomenclature system has been devised such that the following objectives can be attained:

- Sorting of data by matrix.
- Sorting of data by depth.
- Maintenance of consistency (field, laboratory, and data base sample numbers).
- Accommodation of all project-specific requirements on a global basis.
- Accommodation of laboratory sample number length constraints (10 characters).

2.0 SCOPE

The methods described in this procedure shall be used consistently for all projects requiring electronic data handling by personnel contracted to the Installation Restoration Program.

3.0 GLOSSARY

None.

4.0 RESPONSIBILITIES

Program Manager - It shall be the responsibility of the Program Manager (or designee) to inform contract-specific Project Managers of the existence and requirements of this Standard Operating Procedure.

Project Manager - It shall be the responsibility of the Project Manager to determine the applicability of this Standard Operating Procedure based on: (1) program-specific requirements, and (2) project size and objectives. It shall be the responsibility of the Project Manager (or designee) to ensure that the sample nomenclature is thoroughly specified in the relevant project planning document (e.g., sampling and analysis plan) and is consistent with this Standard Operating Procedure if relevant. It shall be the responsibility of the project manager to ensure that the Field Operations Leader is familiar with the sample nomenclature system.

Field Operations Leader - It shall be the responsibility of the Field Operations Leader to ensure that all field technicians or sampling personnel are thoroughly familiar with this Standard Operating Procedure and the project-specific sample nomenclature system. It shall be the responsibility of the Field Operations Leader to ensure that the sample nomenclature system is used during all project-specific sampling efforts.

5.0 PROCEDURES

5.1 Introduction

The sample numbering system consists of 12 distinct alpha-numeric characters, only 10 of which will be provided to the laboratory on the sample labels and chain-of-custody forms. The sample number provided to the lab shall be as follows where "A" indicates "alpha," "N" indicates "numeric," and "E" indicates "either"):

$$\overline{E}\ \overline{E}\ \overline{E}\ \overline{A}\ \overline{A}\ \overline{E}\ \overline{E}\ \overline{E}\ \overline{N}\ \overline{N}$$

Once the analytical results are received from the laboratory the sample number will be revised by a subroutine such that the sample number is more user friendly (i.e., dashes will be inserted). The sample number will then appear as follows:

$$\overline{E}\ \overline{E}\ \overline{E}\ -\ \overline{A}\ \overline{A}\ -\ \overline{E}\ \overline{E}\ \overline{E}\ -\ \overline{N}\ \overline{N}$$

If multiple sampling events occur (or are planned) for a given matrix, a subroutine within the database will be used to append two additional characters such that the sample number will appear as follows:

$$\overline{E}\ \overline{E}\ \overline{E}\ -\ \overline{A}\ \overline{A}\ -\ \overline{E}\ \overline{E}\ \overline{E}\ -\ \overline{N}\ \overline{N}\ -\ \overline{N}\ \overline{N}$$

Site Type Location Depth Round

5.2 Sample Number Field Requirements

The various fields in the sample number will include the following:

- Site Identifier
- Sample Type
- Sample Location
- Sample Depth Indicator
- Sampling Round

The site identifier must be a three-character field (numeric characters, alpha characters, or a mixture of alpha and numeric characters may be used). A site number is necessary since many facilities/sites have multiple individual sites, SWMUs, operable units, etc.

The sample type must be a two-character alpha field. Suggested codes are provided in Section 5.3 of this SOP.

The sample location must be a three-character field (alpha, numeric, or a mixture).

The depth field must be provided for all samples, regardless if it is strictly applicable (as discussed in Section 5.3).

The sampling round is optional, but, if provided, must be two numeric characters.

5.3 Example Sample Field Designations

Examples of each of the fields are as follows:

Site Number - Examples of site numbers/designations are as follows:

A01 - Area of Concern Number 1
125 - Solid Waste Management Unit Number 125
000 - Base or Facility Wide Sample (e.g., upgradient well)
BBG - Base Background

The examples cited are only suggestions. Each Project Manager (or designee) must designate appropriate (and consistent) site designations for their individual project.

Sample Type - Examples of sample types are as follows:

AS - Air Sample
BS - Biota Sample (See Note)
CP - Composite Sample
CS - Chip Sample

DS - Drum Sample
DU - Dust Sample
FP - Free Product
ID - Investigation Derived Waste Sample
LT - Leachate Sample
MW - Monitoring Well
OF - Outfall Sample
RW - Residential Well Sample
SB - Soil Boring Sample
SD - Sediment Sample
SC - Scrape Sample
SG - Soil Gas Sample
SP - Seep Sample
SS - Surface Soil Sample
SU - Subsurface Soil Sample
SW - Surface Water Sample
TP - Test Pit Sample
TW - Temporary Well Sample
WC - Well Construction Material Sample
WI - Wipe Sample
WP - Well Point Sample
WS - Waste/Sludge Sample

Note: The biota sample designation may be contingent upon the type of biota sampled (e.g., BL - Lobster; BF - Finfish; BC - Clam; BO - Oyster). Numerous other examples can be cited but will be site-specific.

This field will also be used to designate field Quality Control Samples, as follows:

TB - Trip Blank
FB - Field Blank
RB - Rinsate Blank (Equipment Blank)
BB - Bottle Blank
AB - Ambient Condition Blank

Field quality control samples should be numbered sequentially (e.g., RB-001; FB-010, etc.).

Filtered/unfiltered surface water or groundwater samples shall be handled in an separate manner, as subsequently discussed.

Location - Examples of the location field are as follows:

A01 - Grid node A1
001 - Monitoring Well 1

It is important that consistency be maintained with respect to the use of the characters "0" and O. Data base subroutines will not sort correctly if a mixture are used (e.g, AO1 and A02).

Depth - Formerly, depth specifications were indicated with a four digit field (e.g., 0002 - 0 to 2 feet). While this is effective for depth sorting, it is difficult to include this level of detail in a 10-character lab number (FormMaster limitations). In addition, this approach will not accommodate non-integer depths (e.g., 2.5 feet to 4.5 feet).

Based on such potential problems, the following approach shall be used: Sample depths will simply represent the horizon from which the sample was obtained: For example, if ten split-spoon samples are collected from a boring, they will be numbered 01 through 10. The sample log sheet will be used to record the specific depth of the sample, and this information will be entered in a separator field in the data base.

Similar nomenclature will be used for depth-specific surface water and sediment samples, etc. If no depth

information is required (e.g., groundwater samples), the field must still be filled (e.g., ι, ι).

This field will also be used for the designation of filtered and unfiltered samples. An unfiltered groundwater sample shall be designated as U0, if and only if, a corresponding filtered sample is collected. Such as sample shall be designated as F0.

Sampling Round - The sampling round field is straightforward. It can range from 01 to 99.

5.4 Example Sample Numbers

Examples of complete sample numbers (field/data base versus laboratory) are as follows:

Field/Data Base ID	Lab ID	Description
101-SB-A01-01	101SBA0101	The first sample (e.g., 0 to 2 feet) from soil boring A01 (grid) at Site 101.
101-SB-A01-02	101SBA0102	The second sample from boring A01 (could be the next depth interval or a duplicate of 101-SB-A01-01).
125-MW-001-01-01	125MW00101	A groundwater sample from monitoring well MW001 (first sampling round)
125-MW-001-02-01	125MW00102	A duplicate groundwater sample from monitoring well MW001 (first sampling round)
130-MW-003-U1-01	130MW003U1	An unfiltered groundwater sample from monitoring well MW003 (first sampling round)
130-MW-003-F1-01	130MW003F1	A filtered groundwater sample from monitoring well MW003 (first sampling round)
137-RB-001-00-01	137RB00100	The first rinsate blank collected at site 137.
137-TB-004-00-02	137TB00400	The fourth trip blank collected during the second sampling event at Site 137.
155-SW-003-01-01	155SW00301	A surface water sample collected from the surface of a pond at Site 155.
155-SW-003-02-01	155SW00302	A surface water sample collected from the bottom of the water column in a pond at Site 155.

ATTACHMENT 3

UST SAMPLE NOMENCLATURE SYSTEM

The nomenclature for well/sample location entries is as follows:

(Area #) (Type of Sample) (Location Number)

Type of sample:

GW =	Ground Water
SW =	Surface Water
PW =	Potable Water
SD =	Sediment Sample
SB =	Soil Sample
SG =	Soil Gas Sample
HP =	Hydropunch

Location Number:
Each location of a given type of sample will be assigned a unique identification number for each site. If there are existing locations, a new location will be given the next available number for this site.

Example: **72GW14**

72 GW 14	Area Number 72
72 **GW** 14	Ground Water Sample Location
72 GW **14**	Location 14

ATTACHMENT 4

ELECTRONIC DATA DELIVERABLE REQUIREMENTS FOR ANALYTICAL LABORATORIES

ELECTRONIC DATA FORMAT REQUIREMENTS

1.0 INTRODUCTION

The laboratory is to provide 3.5" high density diskette(s) containing separate database (DBF) files in the format specified in this Attachment. The electronic deliverable includes all environmental samples, sample dilutions, sample reanalyses, and laboratory quality control samples. **All entries in the electronic deliverable must agree exactly with the final entries reported on the hardcopy data package sample result summaries**. Any corrections made to the hardcopy data must also be made to the electronic file. Appropriate qualifiers as identified by the analytical protocol must also be designated; laboratory QC non-compliance codes are not to be depicted.

Each diskette is to be properly labeled with the laboratory name, project name, file name(s), and laboratory point of contact. Electronic files should be delivered in the same fashion as are the hard copy data packages. A separate .dbf file shall be made for each analytical fraction (by method) and each sample delivery group (SDG). The files shall be named with the first character being the analytical fraction designator, followed by an underscore, followed by the SDG name. For example, the file for the volatile fraction for SDG TT001 should be named V_TT001.DBF. Additionally, the laboratory must provide a hardcopy listing all electronic files saved to the diskette, indicating what analytical fraction and matrix the file data contained therein pertain to. All electronic data deliverables are due within the same time established for the associated hardcopy data packages.

In addition, the laboratory QC officer must read and sign a copy of the Quality Assurance Review Form displayed on the next page of this Attachment. Electronic deliverables are not considered to be complete without the accompanying Quality Assurance Review Form.

I _____, as the designated Quality Assurance Officer, hereby attest that all electronic deliverables have been thoroughly reviewed and are in agreement with the associated hardcopy data. The enclosed electronic files have been reviewed for accuracy (including significant figures), completeness and format. The laboratory will be responsible for any labor time necessary to correct enclosed electronic deliverables that have been found to be in error. I can be reached at (_____)_____if there are any questions or problems with the enclosed electronic deliverables.

Signature:_____ Title: _____ Date: _____

Revision 4
KAC 03-24-98

The analytical data shall be delivered electronically in a Dbase III file format (filename.dbf). The exact structure of the database is described in the table below. It shall be the responsibility of the laboratory to ensure that all electronic entries are in strict accordance with the information provided on the Form I.

An example database shall be sent for review prior to the first electronic deliverable in Dbase III format. The example file will be examined for completeness and comments will be sent to the laboratory. Any questions regarding the electronic deliverable shall be directed to Patrick Hooper at Tetra Tech NUS (412)921-8250.

DATA FIELD	DATA TYPE	FIELD WIDTH	DATA FIELD DESCRIPTION
SAMPLE_NO	C	25	Field sample ID as listed on the chain-of-custody. The sample number indicated in this field should never be truncated. The only exception for this field not matching the chain-of-custody is for reanalyses and matrix spike results in which a RE or MS suffix will be added to the sample number respectively.
TRUNCATE	C	15	If the field sample ID listed on the Chain of Custody is truncated by the laboratory for use with the laboratory software, the truncated sample ID should appear in this field.
LAB_ID	C	15	Laboratory number for the given sample.
LABORATORY	C	25	Laboratory name.
BATCH_NO	C	10	Laboratory code for batch of samples included in a given run.
ASSOC_BLNK	C	15	Laboratory name of the method blank associated with that particular batch of samples.
QC_TYPE	C	15	Normal Environmental Sample = "NORMAL", Laboratory Duplicate = "DUPLICATE", Matrix Spike = "MS", Matrix Spike Duplicate = "MSD", Laboratory Control Sample = "LCS", Laboratory Control Sample Duplicate = "LCSD", Method Blank = "M_BLANK", Preparation Blank = "P_BLANK".
SAMP_DATE	D	8	Date of sample collection as indicated on the Chain of Custody. Example: 11/07/93.
REC_DATE	D	8	Date sample was received by the laboratory.
EXTR_DATE	D	8	Date sample was extracted or prepared by the laboratory.
ANAL_DATE	D	8	Date sample was analyzed by the laboratory.
RUN_NUMBER	N	2 (0)	The number of the analytical run for a given sample in sequence. For example, if a sample is diluted and reanalyzed, the original run number would be 1 and the reanalysis would be 2.
SDG	C	15	Sample delivery group identifier assigned by the laboratory. This number should exactly match the SDG designated on the hardcopy data package.

DATA FIELD	DATA TYPE	FIELD WIDTH	DATA FIELD DESCRIPTION
PROJECT_NO	C	10	Identification of Project Number or Task Order/Delivery Order number.
PROJ_MNGR	C	25	The Project Manager's last name, followed by a comma, followed by the first initial of the Project Manager (e.g. Smith, J).
PARAMETER	C	45	Chemical or analyte name exactly as reported on Form I.
CAS_NO	C	10	Chemical Abstract Service number for the parameter listed. The CAS number should be reported exactly as it is listed in publications such as the Merck Index. This field should be left blank for those parameters not having CAS numbers (e.g. Total Organic Carbon).
FRACTION	C	5	Metals = 'M', Volatiles = 'OV', Semivolatiles/BNAs = 'OS', Pesticides = 'PEST', Herbicides = 'HERB', Polychlorinated Biphenyls = 'PCB', Explosives = 'EXP', Any petroleum hydrocarbon or fuel = 'PET', Wet Chemistry = 'WET', Radionuclide = 'RAD', Miscellaneous = 'MISC'
METHOD	C	20	Analytical method used to quantitate parameter concentrations as listed in the laboratory technical specification (e.g. '8270A' for SW-846 Method 8270A.
LAB_RESULT	N	20 (6)	Reported value in units specified in the UNITS field containing the proper number of significant digits. The % Recovery shall be placed in this field for matrix spike and laboratory control sample results.
UNITS	C	5	The units of measure as reported on the Form I.
LAB_QUAL	C	2	The laboratory qualifier as reported on the Form I. For example, a 'U' qualifier should be used for all nondetected results.
IDL	N	15 (6)	Instrument detection limit in units specified in the UNITS field.
MDL	N	15 (6)	Method detection limit in units specified in the UNITS field and method specified in the METHOD field.
CRDL_CRQL	N	15 (6)	Contract Required Detection/Quantitation Limit in the units specified in the UNITS field. RDL for non-CLP parameters.
DIL_FACTOR	N	6 (1)	Dilution factor.
PCT_MOIST	N	5 (1)	Percent moisture for soil samples; blank for water samples.
COMMENTS	C	20	Analytical result qualifier or comment other than that listed in the LAB_QUAL field. Example: 'Reanalysis'.

C = Character string (everything shall be reported in capital letters)
N = Numeric string (decimal places are in parentheses in field width column)
D = Date (Ex: 05/25/97)

Appendix C

Environmental Protection Plan with Erosion and Sediment Control Plan

ENVIRONMENTAL PROTECTION PLAN
FOR
AIR SPARGING SYSTEM
OPERABLE UNIT 03, SITE 07
MCAS CHERRY POINT, NORTH CAROLINA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000
Delivery Order 0010
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Naval Facilities Engineering Command
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Program Manager

June 1999
OHM Project No. 920694

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1.0 INTRODUCTION

OHM Remediation Services Corp. (OHM), a subsidiary of OHM Corp., is pleased to submit this Environmental Protection Plan (EPP) for the remedial action at Operable Unit 3, Site 7 at the MCAS Cherry Point, North Carolina. The site is shown in the Vicinity Map (Figure 1 in the Work Plan). The activities described herein are to be conducted as part of the tasks required by the Department of the Navy under Contract No. D62470-97-D5000. In January 1999, OHM's project engineers met with the Navy's Technical Representative and performed a pre-construction survey of Operable Unit 03, Site 07 for the purpose of verifying site conditions.

1.1 PURPOSE

This plan fulfills the requirements set forth under contract No. D62470-97-D-5000, as well as meeting requirements outlined in the following documents:

- Code of Federal Regulations (CFR)
  - 40 CFR 300: National Oil and Hazardous Substances Pollution Contingency Plan

- Corps of Engineers (COE)
  - COE EP-1110-1-8: 1988 Construction equipment Ownership and Operating Expense Schedule
  - COE EM 385-1-1: 1992 Safety and Health Requirements Manual

- National Fire Protection Association (NFPA)
  - NFPA 241: (1989) Safeguarding Construction, Alteration

- Demolition Operations

This plan is intended for use during the construction stage of the remediation at the site. Guidelines established herein must be followed during activities at the site and must be used in conjunction with the other project plans and documents.

2.0 *ORGANIZATION STRUCTURE FOR IMPLEMENTATION*

The following sections describe the personnel and required chain of command that will control and direct EPP activities at the site.

2.1 RESPONSIBLE PARTIES

This section details each responsible party and their respective task(s).

Department of Navy/Marine Corps Air Station, Cherry Point - The Marine Corps Air Station, Cherry Point is the Owner of the site and the responsible party for the site removal activities. The Navy has contracted Ohm to perform the remediation activities. As part of the contractual arrangements with OHM, the Navy's technical representative will delegate the responsibility for the implementation of this EPP to OHM. Throughout the duration of the site remediation activities, OHM will notify the Navy and MCAS of any EPP incident as soon as possible.

OHM is responsible for implementing EPP procedures and is responsible for all information contained in this EPP. Figure 2.1 depicts OHM's organizational structure for EPP and emergency situations.

2.2 EMERGENCY SERVICES

A summary of local and state emergency service agencies with phone numbers is provided in Table 2.1. Individual emergency agencies and responsibilities are as follows:

Police - The Marine Corps Air Station Base police will provide police support for blocking traffic, directing traffic, and other related duties during EPP situations. Unlawful entry into the site will also be reported to the Marie Corps Air Station Base Police.

Fire Department - All EPP situations requiring fire department personnel and equipment will be reported to the Marine Corps Air Station Base Fire Department.

2.3 COORDINATION RESPONSIBILITIES

All EPP provisions will be implemented by means of OHM's organizational structure shown on Figure 2.1. OHM is responsible for coordination, training, drills, notification, and other aspects of this EPP.

2.3.1 Project Manager

The Project Manager is ultimately responsible for completion of the project in accordance with the plans. He delegates the responsibility for the implementation, maintenance, and compliance of the project activities with the EPP and the OHM Site Health and Safety Plan (SHSP) to the site health and safety officer (SSO).

2.3.2 Site Health and Safety Officer

The SSO will be responsible for all EPP and health and safety activities for air monitoring activities, overseeing the decontamination of equipment and materials leaving the contaminated area and for providing and enforcing the use of personal protective equipment and clothing, decontamination procedures and emergency response procedures. A Health and Safety professional will be responsible for training of on-site personnel. The SSO has the authority to stop any operation that threatens the health and/or safety of the team or surrounding populace. The daily EPP inspections and health and safety activities may be conducted by the SSO or the on-site superintendent.

2.3.3 On-Site superintendent

The on-site superintendent is responsible for field implementation of the EPP procedures and the health and safety program when the SSO is not present. This responsibility includes advising site workers of the specific health and safety requirements and consulting with the SSO regarding appropriate changes to the EPP and health and safety plan.

2.3.4 Emergency Coordinator (EC)

The emergency coordinator will implement and coordinate all EPP procedures during spills and releases. During an emergency, the EC will activate alarm systems, notify emergency response agencies, identify the problem, assess the health or environmental hazards, and take all reasonable measures to stabilize the situation. The EC will also be responsible for follow-up activities after the incident such as treating, storing, or disposing of residues and impacted soil, decontamination and maintenance of emergency equipment, and submission of any reports. The EC is also responsible for personnel training and evacuation drills. The on-site during all remediation operations. If neither the on-site superintendent nor the SSO are on-site, then the responsibility of the EC will be reassigned to a qualified individual and so noted in the Health and Safety Meeting Notes prior to any work commencing any given day.

2.3.5 Site Personnel

All site personnel will be responsible for working in a safe and healthy manner. They will be required to comply with all applicable local, State, and Federal rules and regulations.

Table 2.1
LOCAL AND STATE EMERGENCY SERVICE AGENCIES AND PHONE NUMBERS

Local Agencies - All Services	
City of Havelock	
Police Department	911
Sheriff	911
Fire Department	911
New Bern Ambulance	911
Hospital	
Carteret General Hospital 3500 Arendell St. Morehead City	(919) 247-1616
On-Base Facilities	
Health Clinic	(919) 466-3960 or 4241
Emergency Medical	466-4419 or 911
Emergency Fire	466-3333 or 911
Fire Chief - Cecil Moore	466-3615
Police	(919) 466-3615
Regional Poison Control Center	800-672-1697
State Agencies	
State Highway Patrol	800-441-6127
Division of Emergency Management	800-858-0368
Federal Agencies	
EPA Region Branch Response Center	(404_ 347-3931
National Response Center	800-424-8802
Agency for Toxic Substance and Disease Registry	(404) 639-0615 (24 hours)
Navy ROICC/NTR - Ens Jeff Divenney	(919) 466-4736
U.S. Coast Guard	(804) 484-8192
National Response Center	800-424-8802
OHM Project Personnel	
Steven Bivone, Project Manager	(770) 453-7637
OHM Corporation (24 hours)	800-537-9540

Note: Additional phone numbers are provided in Section 2.0 of the SHSP.

3.0 *MATERIALS INVENTORY AND COMPATIBILITY*

The following section contains information regarding the materials that may be involved in a spill or release. Table 3.1 lists quantities of the materials present on site by their type.

Table 3.1

MATERIAL INVENTORY

Material	Unit	Location
Diesel fuel	1 gallon	Fuel storage area
Gasoline	1 gallon	Fuel storage area
Oil	1 quart	Fuel storage area
Acids	TBD (2)	Decontamination trailer
Cement	40-pound bags	Blower Pad area

Notes:
1) Amount and storage requirements will be determined based on need and laydown space availability.
2) Quantity and type of sample preservatives will be identified by need based on the Contractor=s Sampling and Analysis Plan.

3.1 ON-SITE MATERIALS

The constituents of concern for the remedial action include benzene, 2-methyl-naphthalene and various other chlorinated and volatile organic compounds. These contaminants maybe present in ground water and soils at the site.

3.2 ORGANIC VAPOR

Organic vapor releases may occur during remedial activities. Organic vapor concentrations in the air during excavation, drilling activities, system startup will be monitored using air monitoring equipment such as a photoionization detector (PID). Air monitoring requirements are described in Section 7.5.

Physical boundaries will be established to assist in the prevention of the uncontrolled release of dust or debris.

3.3 FUEL AND FLAMMABLE LIQUIDS

To complete the project, OHM will construct an on-site fuel depot that will contain fuels and oils for construction vehicles. The types of materials that may be stored at the fuel depot are as follows:

- Diesel Fuel
- Gasoline
- Motor and Transmission oils
- Greases
- Used Oil

3.4 OTHER MATERIALS OF CONCERN

Other materials necessary to complete the project that have the potential for spills and releases are listed below. The exact quantity and type of these materials will be determined during remedial activities:

- Acids for sample preparation
- Agricultural Lime
- Fertilizer
- Acetone
- Pipe Sealents
- Adhesives

Agricultural lime and fertilizer will be used as construction materials during the restoration of grassy areas along the piping routes. Acetone, pipe sealants, and adhesives will be utilized in the cleaning and connection of pipe joints.

3.5 MATERIAL COMPATIBILITY

The materials mentioned in Section 3.1 to 3.4 are not anticipated to be mixed or combined during site operations. All of the compatibility data that exist for each material are noted on each MSDS provided in the site-specific health and safety plan.

4.0 EMERGENCY AND DECONTAMINATION EQUIPMENT

The section discusses the equipment necessary for emergencies, spill responses, and decontamination of site equipment.

4.1 EMERGENCY EQUIPMENT

Small-and large-scale equipment that will be used for emergency and activities are described as follows:

- Small-scale Emergency Equipment
- Dry-chemical, ABC-rated fire extinguishers
- Spill control equipment
- Absorbent materials
- Decontamination equipment
- Breathing respirators
- Radio and telephone equipment
- Wind socks
- Various hand tools

This equipment will be made accessible to all on-site workers. Locations of equipment will be posted at OHM's trailer.

- Large-Scale Equipment
- Front-end loader
- Backhoe
- Bulldozer
- Excavator

Large-scale emergency equipment will include the equipment used in the ongoing construction activities. Other emergency equipment will be available from the local fire department and other agency's equipment if needed. Some of the equipment listed may be present on-site for use under different delivery orders; however, in the case of emergency all OHM equipment and rental equipment may be utilized by direction from the site superintendent, SSO or EC.

4.2 SPILL RESPONSE EQUIPMENT

OHM will provide adequate spill response equipment and materials. Spill response equipment

will include absorbent materials, sand, chemical neutralizers, and other spill containment devices necessary to prevent spill migration. Other equipment will include construction equipment used in ongoing construction activities.

All equipment will be tested and maintained as necessary to assure its proper operation in time of emergency. After an emergency, all equipment will be decontaminated, cleaned, and fit for its intended use before normal operations resume.

4.3 DECONTAMINATION EQUIPMENT

Equipment necessary for decontamination activities will be provided, installed, and verified in working order prior to any site operations. Equipment for the decontamination area includes the following items:

- Temporary Decontamination Pad and Sump (as needed for drilling activities)
- Clean Water Supply
- Detergent Solution
- Brushes
- Waste Containers

Permanent storage pad and sump have been constructed in the "OHM lay down" area on base for use under all delivery orders. Depending on the nature of the work and the location of the work temporary facilities may be required. The decision of the need for temporary facilities will be discussed and locations/type will be determined at the pre-construction meeting.

5.0 *SITE EVACUATION PLAN*

The following sections provide details regarding the evacuation of the site in the case of an emergency.

5.1 SAFE DISTANCES AND PLACES OF REFUGE

The emergency coordinator for all activities will be the SSO. No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies which could occur. Safe distances can only be determined at the time of an emergency based on a combination of site and incident-specific criteria. However, the following measures are established to serve as general guidelines.

In the event of minor hazardous materials releases (small spills of low toxicity), workers in the affected area will report initially to the contamination reduction zone. Small spills or leaks (generally less than 55 gallons) will require initial evacuation of at least 50 feet in all directions to allow for cleanup and to prevent exposure. After initial assessment of the extent of the release and potential hazards, the emergency coordinator or his designee will determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to secure the boundaries.

In the event of a major hazardous material release (large spills of high toxicity/greater than 55 gallons), workers will be evacuated from the building/site. Workers will assemble at the entrance to the site for a head count by their foremen and to await further instruction.

If an incident may threaten the health or safety of the surrounding community, the public will be informed and, if necessary, evacuated from the area. The emergency coordinator, or his designee will inform the proper agencies in the event that this is necessary. Telephone numbers are listed in Table 2.1.

Places of refuge will be established prior to the commencement of activities. These areas must be identified for the following incidents:

- Chemical release
- Fire/explosion
- Power loss

- Medical emergency
- Hazardous weather

In general evacuation will be made to the crew trailers, unless the emergency coordinator determines otherwise. It is the responsibility of the emergency coordinator to determine when it is necessary to evacuate personnel to off-site locations.

In the event of an emergency evacuation, all the employees will gather at the entrance to the site until a head count establishes that all are present and accounted for. No one is to leave the site without notifying the emergency coordinator.

5.2 EVACUATION ROUTES AND PROCEDURES

All emergencies require prompt and deliberate action. In the event of an emergency, it will be necessary to follow an established set of procedures. Such established procedures will be followed as closely as possible. However, in specific emergency situations, the emergency coordinator may deviate from the procedures to provide a more effective plan for bringing the situation under control. The emergency coordinator is responsible for determining which situations require site evacuation.

5.2.1 Evacuation Signals and Routes

Two-way radio communication and air horn will be used to notify employees of the necessity to evacuate an area or building involved in a release/spill of a hazardous material. Each crew supervisor will have a two-way radio. A base station will be installed in the OHM office trailer to monitor for emergencies. Total site evacuation will be initiated only by the emergency coordinator; however, in his absence, decision to preserve the health and safety of employees will take precedence. Evacuation routes will be posted in each outside work area. Periodic drills will be conducted to familiarize each employee with the proper routes and procedures.

5.2.2 Evacuation Procedures

In the event evacuation is necessary, the following actions will be taken:

- The emergency signal will be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site
- will cease in order to allow safe exit of personnel and movement of emergency equipment.

- Shut off all machinery if safe to do so.
- ALL on-site personnel, visitors, and contractors in the support zone will assemble at the entrance to the site for a head count and await further instruction from the emergency coordinator.
- ALL persons in the exclusion zone and contamination reduction zone will be accounted for by their immediate crew leaders (e.g., foreman). Leaders will determine the safest exits for employees and will also choose an alternate exit if the first choice is inaccessible.
- During exit, the crew leader should try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the emergency coordinator.
- Contract personnel and visitors will also be accounted for.
- The names of emergency response team members involved will be reported to the emergency spill control coordinator.
- A final tally of persons will be made by the emergency coordinator or designee. No attempt to find persons not accounted for will involve endangering lives of OHM or other employees by re-entry into emergency areas.
- In all questions of accountability, immediate crew leaders will be held responsible for those persons reporting to them. Visitors will be the responsibility of those employees they are seeing. Contractors and truck drivers are the responsibility of the on-site superintendent. The security guard will aid in accounting for visitors, contractors, and truckers by reference to sign-in sheets available from the guard shack.
- Personnel will be assigned by the emergency coordinator to be available at the main gate to direct and brief emergency responders.
- Re-entry into the site will be made only after clearance is given by the emergency coordinator. At his direction, a signal or other notification will be given for re-entry into the facility.
- Drills will be held periodically to practice all of these procedures and will be treated with the same seriousness as an actual emergency.

6.0 *SPILL PREVENTION AND RESPONSE*

This section outlines areas of potential spill and the procedures necessary to prevent them. The Air Station Order 11010.1E is included in Appendix A and should be reviewed by all personnel in conjunction with other procedures Set forth herein. A copy of the draft Air Station Order 5090.7 is also included in Appendix B. OHM will elect to follow the more stringent of these two orders.

6.1 POTENTIAL SPILL SOURCES AND PREVENTION PRACTICES

The following section details OHM's procedures for implementing this portion of the EPP. Potential activities include containment, collection, and material disposal or reuse.

6.1.1 Fuel Storage

Vehicle fuels and oils will be stored in fuel depot areas in approved storage containers. The fuel tanks will be anchored to the ground, stabilized on skids, or placed on saddles to prevent over turning and rolling. Containers will be placed outside of the maximum turning radius of all vehicles, as well as turnaround or unloading zones. Secondary containment is required for all fuel containers larger than 5- gallons. Secondary containment will be 110% of the aggregate storage volume. All tanks will be placarded with the National Fire Safe system for hazardous material classification and the tanks will be properly electrically grounded.

6.1.2 Hauling Activities

Any spillage that occurs during any hauling and transport activities will be contained within the containers at OHM lay down area until appropriate characterization of waste stream and disposal is identified. All vehicles prior to leaving the site shall be inspected and routed to the decontamination area for either dry and/or wet decontamination of exterior and/or wheels.

6.2 EXTERNAL FACTORS

The following describes actions to be taken to alleviate effects to public health and safety or the environment from factors external to the site.

Operable Unit 01, Site 16

6.2.1 Power Outages

Power will be from utility service drops and/or contractor supplied generators. OHM will have access to a backup generator in case of failure of the primary service drops and/or generator(s) where such failure may impact the public health or safety of the environment.

6.2.2 Pooling of Water

Pooling of water in open excavation has the potential to be a spill instigation factor at this site. Since open trenching is subject to pooling water (water may be contaminated due to contact of soil in contaminated areas). The On-Site Superintendent will be charged with the watch for storm events. Should conditions indicate that a squall line is moving towards the site, measures will be taken to cover exposed excavated areas with earth, stone, sand, or visqueen if severe weather or flooding is eminent. To prepare for this contingency, sufficient quantities of visqueen will be stockpiled on site to line the excavation. If clean material is used with the approval of the ROICC, he clean material maybe placed in the excavated area even if piping is not placed. It is recognized that the use of clean material is a judgment call by the ROICC in that additional contaminated material could be created. All pooled water should be contained and sampled prior to disposal.

6.2.3 Severe Weather

Short-duration, high-intensity rain showers may create unexpected erosion and drainage problems such as slope and containment berm erosion. Immediately after such events, all containment devices will be closely inspected for structural and practical integrity. Also, spillage or leakage will be immediately corrected. Repair to these containment devices will be made as soon as possible or at least before construction continues. All excavated materials should be covered and secured as when possible. See Erosion Control Plan for a more detailed discussion.

6.2.4 Hurricanes

When a hurricane warning is issued equipment should be removed to a safe location as time provides. Evacuation of personnel should follow the designated inland route and abide with directions given by the local emergency management agency.

6.3 PROTECTION OF NATURAL RESOURCES

Protection of natural resources will be in accordance with the Erosion Control Plan.

In general, OHM will limit the extent of clearing operations to the areas required for access to hot spot areas and support facilities. All reasonable attempts will be made to keep the construction areas to a minimum; similarly, the size of staging and support zones will be kept to a minimum. Where possible, piping is to be located along the roadway. Mounding of soil over the piping is preferred to trenching.

All reasonable attempts will be made to minimize landscape defacement. Wetlands areas will

be avoided when possible. This will include the trimming of trees and brush instead of removal, wherever possible. It is anticipated that some of the trees along the piping route will be removed. Operation of equipment will be limited to the confines of the construction areas to minimize the potential for residual damage to cap.

It is expected that restoration of the grassy areas along the piping route will be needed. Like flora and grasses will be used.

7.0 PREVENTATIVE ACTIONS

This section discusses the daily inspections that will be performed to ensure a safe working environment for both site and base personnel.

7.1 INSPECTION

Daily inspections of site areas will be performed by OHM's site-superintendent to ensure that procedures for proper storage, handling, and transport of materials are being followed. Inspection and monitoring methods will be through visual observation. Monitoring equipment as described in Section 7.5 will be used when necessary. Such areas include the following:

- Trench areas
- Road crossings
- Fuel depots - Various fuels and oils.
- Erosion control measures

Other areas and items that will be monitored and noted in the site logbook:

- Evidence of spilled materials along drainage ditches
- Effectiveness of housekeeping practices
- Various shipping and storage containers used throughout the site
- Disposal staging areas
- Proper placards and labeling of truck and tank contents.

7.2 EQUIPMENT MAINTENANCE

All construction equipment will be properly maintained to ensure safe operation. Equipment (especially trucks) will be properly maintained to minimize spillage or leakage which may occur during on-site transport operations. Further preventive maintenance on trucks is described in Section 7.4.2.

7.3 CALIBRATION OF MONITORING EQUIPMENT

It is important that all environmental monitoring equipment be calibrated so that accurate readings of potential spilled or leaked materials may be detected upon inspection. Calibration frequency and procedures will be followed as per the manufacturer's recommendations. OHM will retain calibration records on site.

7.4 HOUSEKEEP PROGRAM

OHM's housekeeping program includes many items such as: neat and orderly storage of materials, proper truck and tank placards, prompt removal of spillage, regular refuse pickup and disposal, maintenance of roads and surfaces, and provisions for the storage of material and equipment to keep them from protruding into walkways, or roads.

Orange construction fencing and straw bales and lighted barricades may be utilized to prevent foot traffic and vehicle traffic from inadvertently slipping or backing into open trenches. No road crossings will be left opened over night.

7.4.1 Small Spillage

Small spills may include solid materials or liquid materials being mishandled, dumped, leaked, knocked over, etc. Any material spillage will be immediately contained and collected and placed on the pad for later disposal located at OHM's lay down area. Excavation of trenches and treatment pad area will be performed such that exposed source material remains within the limits of excavation or transported to the OHM's soil staging area for characterization and ultimate disposal. All spilled liquids will be contained and collected by absorbent materials and the materials taken to the OHM's staging area for characterization and ultimate disposal. Spilled fuel and impacted soil will be transported to the staging pad for later disposal.

7.4.2 Trucking

All hauling vehicles will be maintained in good operating condition. Tires will be properly inflated and will have adequate tread depth as per the tire manufacturers' recommendations. Trucks will not be overloaded, since overloaded trucks increase the possibility of material spillage. Truck and gates will be inspected to ensure they close and seal properly.

7.4.3 Vehicle Decontamination

Vehicle decontamination will be dry brush as needed when leaving the trenching area. This will reduce the amount of material that falls onto base's streets, which same will be removed as described in the Small Spillage Section 7.4.1.

7.4.4 Worker Training

All employees with the potential of exposure to hazardous substances will be required to attend and complete an Occupational Health and Safety Administration (OSHA) 40-hour Health and Safety Course (Hazardous Waste Operations and Emergency Response) as per 29 CFR 1910-120. Employees having this training will attend an 8-hour OSHA refresher course if the

40-hour class was taken over 1 year before that employee is to be on site.

The site specific training program will involve at lease one hour of instruction per employee. At a minimum, the training program will ensure that personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures and emergency equipment systems including, where applicable: procedures for using, inspecting, repairing, and replacing emergency and monitoring equipment; key parameters for automatic cut-off systems; communication and alarm procedures; response to fires and explosions; site evacuation procedures; and, shut-down of operations. In addition, the employee training program will address other aspects of the EPP, such as preventive maintenance, inspection and monitoring, housekeeping practices, etc.

Job specific EPP and health and safety instructions will be reviewed before beginning each new phase of work. Weekly, or more often if conditions require, the SSO or On-Site Superintendent will conduct follow-up training related to the change in operations or any other training deemed necessary by the SSO. OHM will hold daily safety meetings prior to work to discuss the current project site safety considerations.
Site evacuation training will be provided as described in Section 5.0.

7.5 AIR MONITORING REQUIREMENTS

Air monitoring will be performed as required in the SHSP. A PID will be used to provide real-time, semi-quantitative data on total organic vapor concentrations in and around the breathing zone of workers and downwind of site activities. This instrument will be calibrated daily and organic vapor concentration will be monitored during site activities.

The SHSP identifies additional air monitoring instrumentation. It also defines action levels for upgrading employee protection and instituting emergency actions. The air monitoring will determine concentrations of site contaminants within the ambient air and workers' breathing zone. The air monitoring measurements will be compared to OSHA standards which are the basis for defining the site action levels. The SSO will make the decision regarding equipment upgrades and emergency action based on the air quality measurements.

A wind sock will be installed to monitor the wind direction. The wind direction will be noted by the EC and other evacuation leaders so that evacuation procedures place personnel upwind of the situation. The wind sock will be placed in the project trailer area. Ribbons or

"mini-socks" maybe employed along the trenching activities and during startup procedures to assist the SSO in gauging wind direction for small activities.

8.0 *EROSION AND SEDIMENTATION CONTROL*

This section discusses general erosion and sedimentation control measures for the project. Details for erosion and sedimentation control can be found in the Erosion Control Plan.

8.1 FEATURES OF PROJECT AREAS

Figures _ _ and _ _ in the Work Plan depict the selected route for the piping lines and the location of the AS equipment. If any notations or directions differ from those contained the Control Plan and this report, then the Erosion Control Plan will be modified to govern the activities of the site following the requirements of the plan.

8.2 UPGRADIENT WATERSHED

Piping lines - the existing drainage ditches and swells in the topography along the piping routes will be used to divert upgradient run-on around the construction areas. The diverted water will follow the existing drainage flow pattern where ever possible.

8.3 PROJECT ACTIVITIES

The anticipated project activities that require erosion and sedimentation controls are described in the following sections.

8.3.1 Site Preparation

The SVE System site will be cleared and grubbed and silt curtains placed. These sedimentation devices will be monitored and repaired as necessary until project completion and acceptable germination of grass.

8.3.2 Site Regrading and Revegetation

The final task at the site will involve the regrading and revegetation of the project areas. All silt fence will be removed after vegetation is established. The areas disturbed for any ancillary features will also be seeded after the facilities have been removed.

8.3.3 Soil Excavation

Excavation of potentially contaminated soil along the selected piping route could occur as the project continues. Excavated soils will be stockpiled, tested for appropriate disposal. All excavated soil will be disposed as CERCLA waste at an approved facility by USEPA RCRA branch for acceptance of CERCLA waste.

8.4 TEMPORARY CONTROL MEASURES

The specific use and types of the controls will be described in Erosion Control Plan. All controls will comply with the technical specifications and the drawings presented in that report.

8.4.1 Silt Fence

Silt fence will be utilized as a temporary sedimentation control measure around the construction areas. Silt fence will also be placed as necessary to accommodate site conditions at the direction of the site superintendent and/or ROICC along the piping runs.

8.4.2 Straw Bale Barriers

Straw bales will be used in places where flow over disturbed areas must be minimized while vegetation is established. Locations of the straw bales, if used, will be decided in the field.

8.5 PERMANENT CONTROL MEASURES

This section describes the various permanent erosion and sedimentation controls that will be used during and upon completion of excavation and trenching activities at the site. All controls will comply with any technical specifications presented in the Design Submission and the Erosion Control Plan.

8.5.1 Vegetative Establishment

All access areas will be vegetated upon project completion with a long-term seed mixture. No other permanent control measures are anticipated. Trees destroyed along the pipe line will not be replanted.

These trees will be left in woody area for wildlife habitat.

8.6 MAINTENANCE PROGRAM

Maintenance of the erosion and sedimentation controls during the project will be performed by OHM site superintendent or his designated representative in his absence from the site. All controls will be inspected daily, as well as after each storm event. Any changes to the Erosion Control Plan will be documented in red on a control sheet. A weekly record will be turned into the ROICC showing any and all changes that occurred in the implementation of the Erosion Control Plan. Sediment removed from controls will be collected and bulked with excavation materials for off-site disposal.

EROSION AND SEDIMENT CONTROL PLAN
FOR
REMEDIATION OF GROUNDWATER
OPERABLE UNIT 03, SITE 07
MCAS CHERRY POINT, NORTH CAROLINA

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1.0 INTRODUCTION

The Department of the Navy, Atlantic Division, Naval Facilities Engineering Command, has requested OHM Remediation Services Corp. (OHM) to provide an air injection system at Operable Unit No. 03 (OU-1) Site 07, at Marine Corps Air Station (MCAS), Cherry Point, North Carolina, complete and ready for use. The preconstruction deliverables include preparation of an Erosion and Sedimentation Control Plan in accordance with the Erosion and Sediment Control Planning and Design Manual, North Carolina Sediment Control Commission, December 1, 1993.

2.0 PROJECT OBJECTIVE AND SCOPE OF WORK

The remedial objective of the project is to address the contaminated groundwater flowing beneath Operable Unit 03, Site 07 located on the Marine Corps Air Station (MCAS), Cherry Point, North Carolina. Environmental investigations have shown that the soil contaminated with Benzene and 2-methyl-naphthalene. The selected remedy is an air sparging system to remove volatile organic compounds (VOCs).

The remedial system scope of work involves the following components:

- Vapor extraction installation
- Piping system installation
- Well and wellhead installation
- Utility construction
- Treatment equipment installation
- Site restoration

OHM will operate and maintain the system for one year after system start-up.

3.0 CONSTRUCTION SITE DESCRIPTION

The Marine Corps Air Station (MCAS), Cherry Point is a military installation located north of the town of Havelock in southeastern Craven County, North Carolina. The air station covers over 11,000 acres. MCAS, Cherry Point boundaries are the Neuse River to the North, Hancock Creek to the East, North Carolina Highway 101 to the south, and a boundary line approximately 3/4 mile west of Slocum Creek. The entire facility is located on a peninsula north of Core and Bogue Sounds and south of the Neuse River.

OU 03 is located the in the southeastern portion of the Air Station. The OU 03, Site 7 is located next to the base Sewage Treatment Plant. The construction sites involve the installation of injection wells, gathering lines, and an equipment compound site. Land use in the vicinity is industrial. The soil description from the surface to groundwater at the construction sites is fine to medium sand with silty to clayey sand interbeds.

4.0 PLANNED EROSION SEDIMENT CONTROL

Prior to disturbance of vegetation and soil, temporary erosion / sediment control will be established on the down gradient side of each excavation. Control techniques to be utilized will involve sediment fencing (silt fencing). Silt fencing will be installed with the fabric a minimum of 6 inches below grade and extending 36 inches above grade and fastened to posts no more that 6 feet apart. The posts will be installed with a minimum of 24 inches below grade and extend a minimum of 36 inches above grade. fabric will be attached to the up-slope side of the posts using 1-inch staples or tie wires. Silt fences will be inspected after every rain and daily during extended rain fall. Inspections will be documented according to the Contractor Quality Control Plan found in Appendix D of this Work Plan. Accumulated sediment will be removed before the depth reaches 12 inches. Open excavations or stockpiled soil vulnerable to creating erosion problems during construction activities will be held to a minimum. Appendix A contains the Practice Standards and Specifications for Sediment Fence (Silt Fence) drawn from Erosion and Sediment Control Planning and Design Manual, North Carolina Sediment Control Commission, December 1, 1993. Certification of the filter fabric for conformance to the same specifications as previously approved under Navy Technical Representative's past project (OU 03, Site 07) unless otherwise directed.

5.0 CONSTRUCTION SCHEDULE AND MAINTENANCE ACTIVITIES

The following steps list the construction schedule and maintenance activities for the Erosion and Sediment Control Plan:

1. Obtain plan approval and other applicable permits.

2. Hold preconstruction conference at least one week prior to starting construction.

3. Flag work limits and create buffer area for protection.

4. Install silt fences at the treatment facility location, along the pipeline route, and at the well locations.

5. Install air sparge wells.

6. Install piping collection system.

7. Identify any areas or locations that require additional erosion control devices.

8. All erosion and sediment control practices will be inspected daily and after rainfall events. Accumulated sediment will be removed before the depth reaches 12 inches. Needed repairs will be made immediately.

9. After site is stabilized all erosion and sediment control structures may be removed.

10. After completion of the field construction activities the disturbed areas will be seeded. Prior to seeding and fertilization, lime will be applied as a soil amendment for pH adjustment at a rate of approximately 40 pound per acre. Any trees or other landscape features will be restored, if practical, by trimming of damaged limbs and application of tree dressing. Soil will be placed and compacted around root systems exposed during excavation activities.

The erosion and sediment controls will remain in place approximately three to six months, depending on the construction activity.

6.0 FINANCIAL RESPONSIBILITY/OWNERSHIP FORM

A completed Financial Responsibility/Ownership Form can be found in Appendix B.

APPENDIX A

PRACTICE STANDARDS AND SPECIFICATIONS, SEDIMENT FENCE (SILT FENCE), EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL, NORTH CAROLINA SEDIMENT CONTROL COMMISSION, DECEMBER 1, 1993

6.62 SEDIMENT FENCE (SILT FENCE)

Definition

A temporary sediment barrier consisting of filter fabric buried at the bottom, stretched, and supported by posts.

Purpose

To retain sediment from small disturbed areas by reducing the velocity of sheet flows to allow sediment deposition.

Conditions Where Practice Applies

Below small disturbed areas less than 1/4 acre per 100 ft of fence.

Where runoff can be stored behind the sediment fence without damaging the fence or the submerged area behind the fence.

Do not install sediment fences across streams, ditches, or waterways.

Planning Considerations

A sediment fence is a permeable barrier that should be planned as a system to retain sediment on the construction site. The fence retains sediment primarily by retarding flow and promoting deposition. In operation, generally the fence becomes clogged with fine particles, which reduce flow rate. This causes a pond to develop more quickly behind the fence. The designer should anticipate ponding and provide sufficient storage areas and overflow outlets to prevent flows from overtopping the fence. Since sediment fences are not designed to withstand high heads, locate them so that only shallow pools can form. Tie the ends of a sediment fence into the landscape to prevent flow around the end of the fence before the pool reaches design level. Provide stabilized outlets to protect the fence system and release stormflows that exceed the design storm.

Deposition occurs as the storage pool forms behind the fence. The designer can direct flows to specified deposition areas through appropriate positioning of the fence or by providing an excavated area behind the fence. Plan deposition areas at accessible points to promote routine cleanout and maintenance. Show deposition areas in the erosion and sedimentation control plan. A sediment fence acts as a diversion if placed slightly off the contour. This may be used by the designer to control shallow, uniform flows from small disturbed areas and to deliver sediment-laden water to deposition areas.

Sediment fences serve no function along ridges or near drainage divides where there is little movement of water. Confining or diverting runoff unnecessarily with a sediment fence may create erosion and sedimentation problems that would not otherwise occur.

Design Criteria

Ensure that the drainage area is no greater than 1/4 acre per 100 ft of fence.

Make the fence stable for the 10-yr peak storm runoff.

Where all runoff is to be stored behind the fence, ensure that the maximum slope length behind a sediment fence does not exceed the specifications shown in Table 6.62a.

Ensure that the depth of impounded water does not exceed 1.5 ft at any point along the fence.

If nonerosive outlets are provided, slope length may be increased beyond that shown in Table 6.62a, but runoff from the area should be determined and by-pass capacity and erosion potential along the fence must be checked. The velocity of the flow at the outlet or along the fence should be in keeping with Table 8.05d, *Appendix 8.05*.

Table 6.62a Maximum Slope Length and Slope for which Sediment Fence is Applicable

Slope	Slope Length (ft)
< 2%	100
2 to 5%	75
5 to 10%	50
10 to 20%	25
>20%	15

Provide a riprap splash pad or other outlet protection device for any point where flow may overtop the sediment fence, such as natural depressions or swales. Ensure that the maximum height of the fence at a protected, reinforced outlet does not exceed 1 ft and that support post spacing does not exceed 4 ft.

The design life of a synthetic sediment fence should be 6 months. Burlap is only acceptable for periods up to 60 days.

Construction Specifications

MATERIALS

1. Use a synthetic filter fabric or a pervious sheet of polypropylene, nylon, polyester, or polyethylene yarn, which is certified by the manufacturer or supplier as conforming to the requirements shown in Table 6.62b.

Synthetic filter fabric should contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 to 120° F.

2. Ensure that posts for sediment fences are either 4-inch diameter pine, 2-inch diameter oak, or 1.33 lb/linear ft steel with a minimum length of 4 ft. Make sure that steel posts have projections to facilitate fastening the fabric.

3. For reinforcement of standard strength filter fabric, use wire fence with a minimum 14 gauge and a maximum mesh spacing of 6 inches.

Table 6.62b Specifications For Sediment Fence Fabric

Physical Property	Requirements
Filtering Efficiency	85% (min)
Tensile Strength at 20% (max.) Elongation	Standard Strength- 30 lb/lin in (min)
	Extra Strength- 50 lb/lin in (min)
Slurry Flow Rate	0.3 gal/sq ft/min (min)

CONSTRUCTION

1. Construct the sediment barrier of standard strength or extra strength synthetic filter fabrics.

2. Ensure that the height of the sediment fence does not exceed 18 inches above the ground surface. (Higher fences may impound volumes of water sufficient to cause failure of the structure.)

3. Construct the filter fabric from a continuous roll cut to the length of the barrier to avoid joints. When joints are necessary, securely fasten the filter cloth only at a support post with overlap to the next post.

4. Support standard strength filter fabric by wire mesh fastened securely to the upslope side of the posts using heavy duty wire staples at least 1 inch long, or tie wires. Extend the wire mesh support to the bottom of the trench.

5. When a wire mesh support fence is used, space posts a maximum of 8 ft apart. Support posts should be driven securely into the ground to a minimum of 18 inches.

6. Extra strength filter fabric with 6-ft post spacing does not require wire mesh support fence. Staple or wire the filter fabric directly to posts.

7. Excavate a trench approximately 4 inches wide and 8 inches deep along the proposed line of posts and upslope from the barrier (Figure 6.62a).

8. Backfill the trench with compacted soil or gravel placed over the filter fabric.

9. Do not attach filter fabric to existing trees.

Maintenance

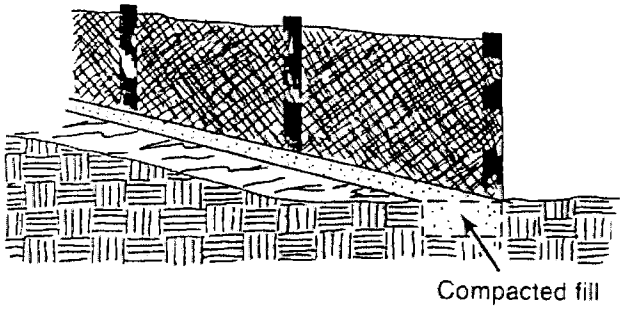
Inspect sediment fences at least once a week and after each rainfall. Make any required repairs immediately.

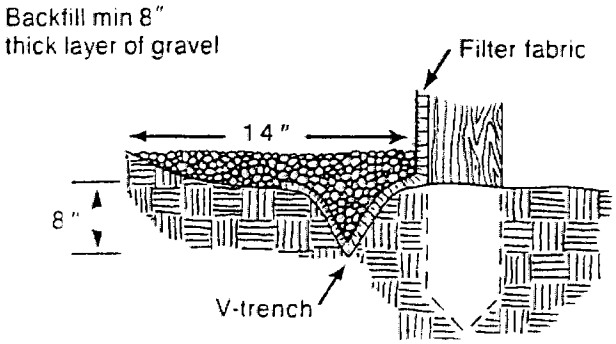
Should the fabric of a sediment fence collapse, tear, decompose or become ineffective, replace it promptly. Replace burlap every 60 days.

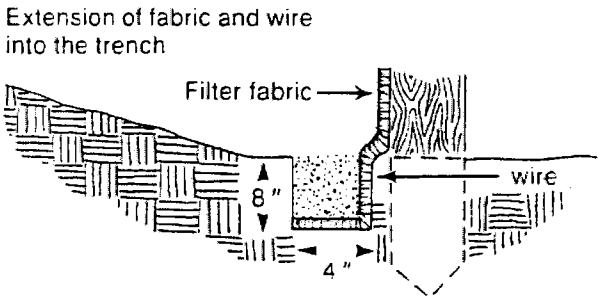
Remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence. Take care to avoid undermining the fence during cleanout.

Remove all fencing materials and unstable sediment deposits and bring the area to grade and stabilize it after the contributing drainage area has been properly stabilized.

Figure 6.62a Installation detail of a sediment fence







References

Runoff Control Measures
6.20, Temporary Diversions

Outlet Protection
6.41, Outlet Stabilization Structure

Sediment Traps and Barriers
6.60, Temporary Sediment Trap
6.61, Sediment Basin

Appendix
8.03, Estimating Runoff

APPENDIX B

COMPLETED FINANCIAL RESPONSIBILITY/ OWNERSHIP FORM

FINANCIAL RESPONSIBILITY/OWNERSHIP FORM
SEDIMENTATION POLLUTION CONTROL ACT

No person may initiate a land-disturbing activity on one or more acres as covered by the Act before this form and an acceptable erosion and sedimentation control plan have been completed and approved by the Land Quality Section, NC Department of Environment, and Natural Resources. (Please type or print and, if question is not applicable, place N/A in the blank).

Part A.

1. Project Name _____

2. Location of land-disturbing activity: County _____,

   City or Township _____, and Highway/Street_____.

3. Approximate date land-disturbing activity will be commenced: _____

4. Purpose of development (residential, commercial, industrial, etc.):_____

5. Total acreage disturbed or uncovered (including off-site borrow and waste areas):

   _____

6. Amount of fee enclosed $_____

7. Has an erosion and sedimentation control plan been filed? Yes _____ No_____

   Enclosed _____

8. Person to contact should sediment control issues arise during land-disturbing activity.

   Name _____ Telephone _____

9. Landowner(s) of Record (Use blank page to list additional owners):

   _____ _____
   Name(s)

   _____ _____
   Current Mailing Address Current Street Address

   _____ _____
   City State Zip City State Zip

10. Recorded in Deed Book No. _____ Page No. _____

Part B.

Person(s) or firm(s) who are financially responsible for this land-disturbing activity (Use a blank page to list additional persons or firms):

_____ _____
Name of Person(s) or Firm(s)

_____ _____
Current Mailing Address Current Street Address

_____ _____
City State Zip City State Zip

_____ _____
Telephone Telephone

2. (a) If the Financially Responsible Party is not a resident of North Carolina give name and street address of a North Carolina Agent.

Name	
Mailing Address	Street Address
City State Zip	City State Zip
Telephone	Telephone

(b) If the Financially Responsible Party is a Partnership or other person engaging in business under an assumed name, attach a copy of the certificate of assumed name. If the Financially Responsible Party is a Corporation give name and street address of the Registered Agent.

Name of Registered Agent	
Mailing Address	Street Address
City State Zip	City State Zip
Telephone	Telephone

The above information is true and correct to the best of my knowledge and belief and was provided by me under oath. (This form must be signed by the financially responsible person if an individual or his attorney-in-fact or if not an individual by an officer, director, partner, or registered agent with authority to execute instruments for the financially responsible person). I agree to provide corrected information should there be any change in the information provided herein.

Type or print name Signature	Title or Authority Date

I, _____, a Notary Public of the County of _____

State of North Carolina, hereby certify that _____ appeared personally before me this day and being duly sworn acknowledged that the above form was executed by him.

Witness my hand and notarial seal, this _____ day of _____, 19_____

Seal

Notary

My commission expires_____

Appendix D

QC Plan

QUALITY CONTROL PLAN
AIR SPARGE
REMEDIATION SYSTEM
SITE 07 SOILS, OPERABLE UNIT NO.3
MCAS CHERRY POINT, N.C.

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-97-D-5000
Delivery Order No. 0010

Prepared by:

OHM Remediation Services Corp.
Trenton, New Jersey

P. Taylor Sword CPG
Project Manager

Charles W. Hunter
Program QC Manager

Roland Moreau P.E.
Program Manager

December 22, 1999, REV. 6/99

OHM Project No. 920655 QCP

OHM Project No. 920694QC

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STATEMENT OF QC PROGRAM

OHM Remediation Services Corporation (OHM), a subsidiary of IT Corporation, will provide and maintain an effective Quality Control (QC) Program. This program will be performed in accordance with the approved Program Quality Control Plan (PQCP) developed specifically to be responsive to the contract specification, Contract No. N62470-97-D-5000, Atlantic Division, Naval Facilities Engineering Command and to the Delivery Order (DO) specification(s) made applicable to each project, task or work activity. OHM will perform the inspections and tests required to ensure that materials, workmanship, and construction conform to drawings, specifications, and contract requirements.

Note to Employees

Quality control should not be considered a person or an organization of personnel, but a concept to perform in such a manner that the end product of our efforts meet established criterion, the customer's needs. The quality control individual or group cannot inspect quality into the final product, but only inspect and document the results of our efforts. The only people that can build quality into the product are the individuals performing the task of producing the end product.

It should be noted by all employees that the documentation requirements of OHM procedures, plans, and the delivery order specifications are considered equally as important as the end product itself. When it is stated that the documentation will be approved prior to the start of work, this is exactly what is intended. To eliminate problems in this area requires careful planning and execution by everyone.

We would do well to remember that our livelihood depends on how well we satisfy our customer. To accomplish this requires teamwork and attention to detail by all employees and contractors.

I. QUALITY CONTROL ORGANIZATION

The QC organization is depicted in the Organizational Chart, Figure I-1.

II. IDENTIFICATION OF PERSONNEL ASSIGNED TO THE QC ORGANIZATION

Figure II-1 provides the resume of the Site QC Manager / Representative. The resumes of any additional QC staff members will be submitted to the CO for approval prior to assignment. This action will be performed in accordance with the contract specification Section C, Part 6.5.

III. APPOINTMENT LETTERS

The Site QC Manager / Representative appointment letter is provided as Figure III-1. Similar letters will be provided when necessary to describe the duties and authorities of personnel assigned to the position of Alternate or Assistant QC Manager.

IV. OUTSIDE ORGANIZATIONS

A list of outside organizations such as architectural and consulting engineering firms, and subcontractors employed by OHM for work under this task or delivery order is provided in Exhibit IV-1. This list provides each firm's name and address and a description of the services each firm will provide. This list will be maintained current and will be available for review.

V. INITIAL SUBMITTAL REGISTER & REVIEWER

V.1 Submittal Register

The Submittal Register is provided as Exhibit V-1.

V.2 Personnel Authorized to Review and Certify Submittals

Personnel authorized to review and certify submittals other than the Site QC Manager / Representative are identified on Exhibit V-2. Any additional personnel assigned to perform submittal review and certification must be approved by the CO, prior to performance.

VI. TESTING LABORATORY ACCREDITATION

Testing laboratory accreditation requirements are addressed in the contract specification Section C, Part 6.12.

VII. TESTING PLAN & LOG PREPARATION

A Testing Plan and Log has been prepared for this DO and is provided as Exhibit VII-1.

VIII. QUALITY CONTROL INSPECTION PLAN

The Quality Control Inspection Plan, Exhibit VIII-1, lists each specification section and definable feature of work with provisions for recording the corresponding checklist/report for each phase of the three phase control process. As each control phase is satisfactorily preformed, the Site QC Manager/ Representative will record the corresponding checklist/report number.

Note: A definable feature of work is a task which is separate and district from other tasks and requires separate control procedures.

This list has been prepared and maintained in accordance with the contract specification Section C, Part 6.7 and will be agreed upon during the Coordination and Mutual Understanding Meeting. The list will be keyed to the construction schedule. Each preparatory, initial and follow-up phase checklist/report will reflect the construction activity number derived from the construction schedule, and will reference the procedures followed for each control phase.

IX. PERSONNEL MATRIX

The Site QC Manager / Representative will prepare and maintain the personnel matrix, Exhibit IX-1, showing each section of the DO specification with identification of who will review and approve submittals, who will perform and document the three phases of control, and who will perform and document testing. This matrix should be completed as much as possible prior to and during site mobilization. The matrix will be maintained current by the Site QC Manager / Representative and will be available for review.

Figure 1.1
OHM Remediation Services Corporation
Delivery Order No. 0010
QC Organization Chart

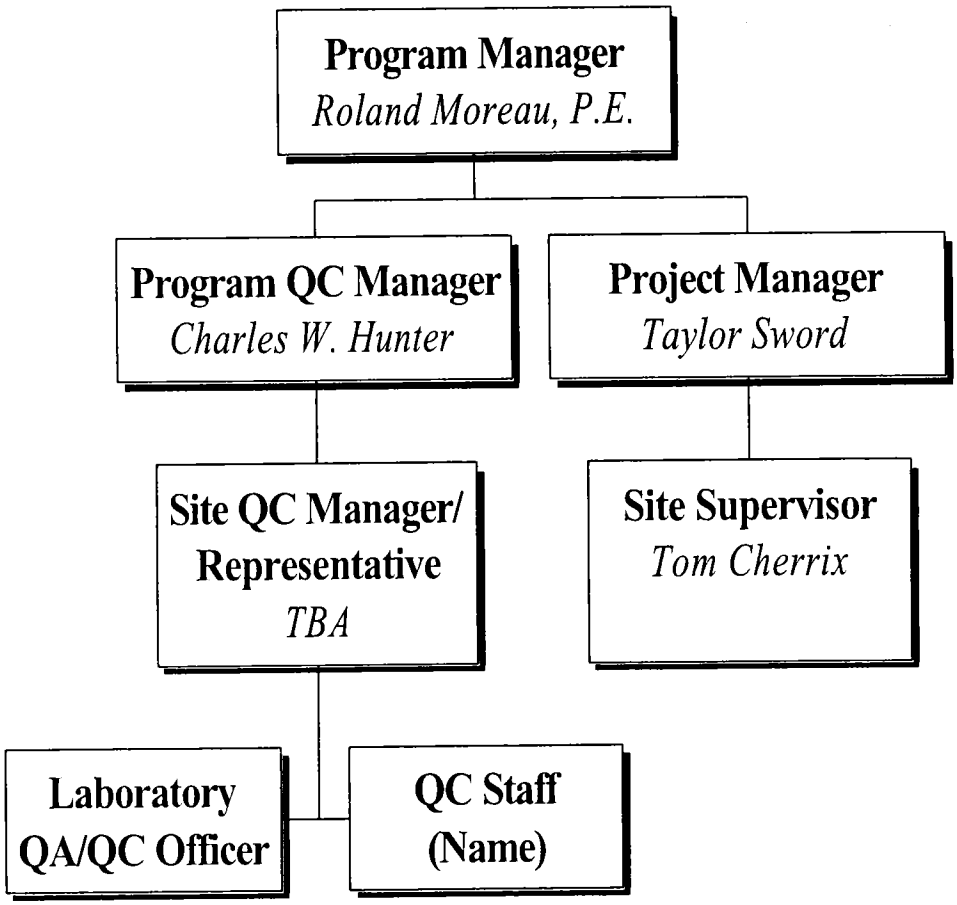

Figure II-1

Site QC Manager / Representative Resume

(To Be Announced)

MICHAEL A. SLADE

As an Environmental Engineer, Mr. Slade is responsible for administering quality assurance/quality control procedures at project sites, ensuring the work performed meets job specifications; documenting and reporting on-site activities; providing field surveys; procuring materials; and assisting the project manager in various job related tasks.

Prior to becoming an Environmental Engineer, Mr. Slade served as a Senior Technologist for OHM's Northern Region Field Analytical Services Group. His responsibilities included sampling and documentation of all environmental matrices, including containerized wastes, soil, water, and air. He is proficient in the use of field instrumentation such as LEL/O_2 and PID meters. He was also responsible for shipping paper work and management of samples into subcontract laboratories.

Experience

Time Period: July 1996 to Present **Employer:** OHM Remediation Services Corp.

- Serves as Field Engineer/Quality Control Manager for the remedial action at the Q Area Drum Storage Yard (QADSY), Norfolk Naval Base, Norfolk, Virginia. This project is being performed under OHM's Department of the Navy Multi-Contaminant RAC contract. VOCs had seeped through the ground from the leaking drums and entered the groundwater aquifer system. Mr. Slade is responsible for engineering calculations and engineering controls; procuring materials; and overseeing the quality control program, which entails ensuring that the AS/SVE system design conforms with the specifications. The pilot tests conducted in November 1996 have confirmed that the AS/SVE system will provide cost-effective extraction and treatment for the VOCs and provided data for final design of full scale system. To enhance project cost-effectiveness, the wells that were installed for the pilot test will be incorporated into the full scale design and operation.

  OHM started the construction of the permanent full-scale system in November 1997. Two systems are being constructed, each consisting of a series of air sparge and vapor extraction wells. The wells are manifolded to a common header and piped to the respective treatment system. An air compressor and blower are scheduled to be installed at a newly constructed treatment building. System startup is scheduled for April 1998. OHM will provide O&M services for a six-month period following system startup.

- Served as Field Engineer for the installation of a carbon air stripper to dissipate VOCs in groundwater for a Department of the Navy LANTDIV project at Army Adelphi Research Laboratories in Adelphi, Maryland. Under a rapid response request from Engineering Field Activity Chesapeake, OHM installed an air stripper to treat the effluent from a TCE and PCE release that was exceeding a NPDES discharge criteria. OHM prepared the 100% design from the A&E's 35% design in a three week period. OHM drop shipped a prefabricated treatment building containing the air stripper and appartenses. Mr. Slade reviewed the system design and specifications, and ensured that the system operation met quality standards.

- Served as the sample technologist for a USEPA Region II ERCS project at the Li Tungsten site in Glen Cove, New York. The project involved: excavating approximately 230 ASTs; sampling the tanks and analyzing them for disposal parameters; performing selective demolition of structurally contaminated buildings; bulking and treating stormwater, and discharging the water to the local POTW; and bulking compatible tanks and shipping them for disposal. Mr. Slade performed hazardous categorization of tanks, drums, vats, and other containers.

- Served as the sample technologist for a USEPA Region I ERCS project at the Coronet Leather Finishing site in Georgetown, Massachusetts. The project involved the excavation and disposal of approximately 800 cubic yards of lead contaminated soil; and the sampling, hazcatting, repacking, loading, and shipping of drums that were located

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inside the plant. Mr. Slade's project responsibilities included: developing sampling plans; developing the staging area for the drums to be sampled; developing the sampling protocol; sampling 200 55-gallon drums and 200 five gallon drums; and generating the necessary paperwork for the unknown agent to be categorized.

- Served as the sample technologist for a U.S. Army Corps of Engineers project at the Havertown Superfund site in Havertown, Pennsylvania. The project involves the off-site disposal of approximately 3,000 tons of hazardous waste material, and the off-site disposal of non-hazardous material (i.e., building debris). Mr. Slade's project responsibilities included: determining the amount of hazardous waste that needed to be removed; coordinating the transportation and disposal of the hazardous waste; and creating daily spreadsheets of manifests that were generated for yard waste.

- Served as a sample technologist for two delivery order projects, under OHM's contract with the Air Force Center for Environmental Excellence (AFCEE), at Plattsburgh Air Force Base in Plattsburgh, New York. The two delivery order projects involved various remedial technologies, including underground storage tank cleaning and removal, bioremediating jet fuel contaminated soil, soil vapor extraction, and groundwater remediation. Mr. Slade's project responsibilities included head space sampling, split spoon sampling, composite sampling, grab sampling, and shipping various matrices for on-site and off-site analysis.

Time Period: 1994 to 1996 **Employer:** Handex Recovery, Inc.
Position held: Sample Technologist/Hydrogeologist

Sample Technologist/Hydrogeologist — Mr. Slade was responsible for the design, installation/construction, and operation maintenance of a free product recovery groundwater treatment system at a Sun Company Terminal in Pennsylvania. The recovery system consisted of 20 monitoring wells, six recovery wells, and a remediation system, which included an air stripper and vapor and liquid phase GAC units. The groundwater was contaminated with gasoline and petroleum hydrocarbons, and approximately 125 gallons per minute was recovered. Mr. Slade's project responsibilities included reviewing the initial design and the design package (which was prepared by another contractor); preparing, reviewing, and implementing the work plan, environmental protection plan, quality control plan, sampling and analysis plan, and health and safety plan; supervising the final design of the recovery system; and preparing subcontractor bid packages. The project resulted in 95% recovery of product.

Time Period: 1991 to 1993 **Employer:** Crane Cortec
Position held: Computer Programmer/Supervisor

Computer Programmer/Second Shift Supervisor — Supervised and scheduled staff of 14 personnel who manufactured fiberglass reinforced panels. Supervised quality control, maintenance, and shipping departments. Managed transfer of Title III chemicals between departments, reviewed MSDS sheets and permits, and served as assistant safety supervisor. Other responsibilities included:

- Generated saw instructions for client specifications. Worked on IBM 487 computer aided design and drafting (CADD), with algebraic calculations. Clients included U-Haul, Ryder, Penske, and other major trucking companies in North America.

- Designed sound barrier for Ohio Department of Transportation, for a highway running through residential areas.

Manufacturing of panel's work delineation included building of panel boards and mixture of chemicals, which included mylar, resin, tedlar, coating, then processed into 60 foot over tables, which was cured out for quality control and quality assurance team. This was checked for defects and customer specifications +/- 1/8 inch. All operations were performed in accordance with OSHA, USEPA regulations, and approval of department health and safety officer. Other responsibilities included work with maintenance and repair for mechanical and electrical repair of equipment and machinery.

Time Period: 1988 to 1992 **Employer:** United States Army
Position held: First Lieutenant

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First Lieutenant— Managed a motor pool using a staff of 60 personnel. He was responsible for component and engine rebuilding. Reviewed inspection reports of all vehicles, and approved all inspections. Supervised service, recovery, and engineering departments.

Executive Officer of Company Operations and Maintenance - Trained in RAD, nuclear and biological chemicals, and explosives. Served in the capacity of Combat Engineer, for building and demolishing bridges. Served in Operation Desert Storm as a Logistics Officer, and served with other combat engineers in Saudi Arabia.

Time Period: 1987 to 1988 **Employer:** Elano Corporation
Position held: Design Engineer

Design Engineer — Designed and modified fuel systems for General Electric aircraft engines. Labeled and transferred chemicals containing hazardous waste and other materials according to EPA regulations.

Time Period: 1983 to 1987 **Employer:** Pennsylvania Naval Shipyards
Position held: Engineering Intern

Engineering Intern — Completed full four-year engineering internship at Naval Ship Engineering System Facility (NAVSSES). Performed motion studies, heat loads, and calculations on structures of newly renovated buildings for $3.5 million government contract. Assisted with pipeline installation and testing of materials for structural weakness. Responsible for vertical transportation. Verified blueprint specifications.

Academic Background

B.S., Industrial Engineering, Central State University, Ohio, 1987.
A.S., Electronics, DeVry Institute of Technology, Columbus, Ohio 1992.

Specialized Training

OSHA 40-Hour Health and Safety Training
OSHA 48-Hour HAZMAT Training
OSHA 8-Hour Refresher Training
NIOSH 48-Hour Safety and Health Course
8-Hour Radiation Worker Training
U.S. Army Corps of Engineers, Construction Quality Management Course Cert. 1997
Chemical, Biological, and Nuclear Weapons Training Course, U.S. Army Professional Development
Blister Training Course, U.S. Army Professional Development
MRU Certification

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Figure III-1

June 8, 1999

Mr. Mike Slade
OHM Remediation Services Corporation
5700 Thurston Avenue, Suite 116B
Virginia Beach, VA 23455-3302

Re: Site QC Manager – OU3, Site 7, Construction and Operation of
Air Sparge System, Cherry Point MCAS
Contract N62470-97-D-5000
Delivery Order 010

Dear Mike:

This letter will serve as your appointment as the Site Quality Control Manager on the referenced project and will also clarify your duties and authority in this position. In this position, you will be authorized to use available resources to satisfy all applicable requirements of the Program and Delivery Order Quality Control Plans.

This authorization specifically gives you the authority to direct removal and replacement or correction of nonconforming materials or work and stop work authority when continuation would be unsafe to personnel, harmful to the environment, or result in a significant degradation of quality.

You will be expected to work closely with the Project Manager, Site Supervisor and other project personnel, but you will not be directly responsible to anyone but myself for resolution of quality issues when working in the capacity of Quality Control Manager.

If you have any question in this matter, please call me at (609) 584-6840.

Sincerely,

Charles W. Hunter
Program QC Manager
LANTDIV RAC Program

EXHIBIT IV-I

APPROVED CONSULTANT & SUBCONTRACTOR LIST

COMPANY NAME & ADDRESS	DESCRIPTION OF SERVICES PROVIDED:
Hugh Sutton: **E&R Electric** **P.O. Box 3552** **2466 Pool RC.** **Kinston, NY 28502-3552** **Carl Price** **C2 Price Assoc.** **3817 Bridges Street.** **Morehead City, NC 28551** **Ph# (752) 247-3576** **Jim Hene** **Rep Inc.** **2405 Murphy Blvd.** **Gainesville, GA 30504** **Ph# (770)538-0020** **Donald Hatcher Construction, Inc.** **2040 Light wood Bridge Road** **Wallace, NC 28466** **Ph# (252) 447-6207** **Pratt Electrical** **Don Pratt** **P.O. Box 1250** **Havelock, NC 28532** **Ph# (252) 447-6207** **Bore & Core Inc.** **P.O. Box 41265** **Raleigh, NC 27629** **Ph# (252) 872-9551** **Mann Drilling Co.** **805 Chatham Street** **Newport, NC 28570** **Ph# (252) 223-5646**	TBD

EXHIBIT V-2

LIST OF PERSONNEL AUTHORIZED TO REVIEW & CERTIFY SUBMITTALS

SPECIFICATION SECTION:	SUBMITTAL TYPE:	AUTHORIZED PERSONNEL:
N/A	All	Taylor Sword

EXHIBIT VII-1

TESTING PLAN AND LOG

CONTRACT NUMBER			PROJECT TITLE AND LOCATION								CONTRACTOR	
SPECIFICTION SECTION AND PARAGRAGH NUMBER	ITEM OF WORK	TEST REQUIRED	ACCREDITED/ APPROVED LAB		SAMPLED BY	TESTED BY	LOCATION OF TEST		FREQUENCY	DATE COMPLETE	DATE FORWARDED TO CONTR. OFF.	REMARKS
			YES	NO			ON SITE	OFF SITE				

Sheet ____ of ____

EXHIBIT VIII-1
QUALITY CONTROL INSPECTION PLAN
AIR SPARGE REMDIATION SYSTEM
SITE 7, OPERABLE UNIT 03
MCAS CHERRY POINT, N.C.
Delivery Order No. 0010

Specification Section	Definable Feature of Work	Activity Number*	Control Check Verification		
			Preparatory Phase Checklist/Report No.	Initial Phase Checklist/Report No.	Follow-up Phase Checklist/Report No.
	Site Preparation • Delineate work area(s) • Obtain necessary permits & utility clearances • Establish exclusion zone & decon pad • Security • Signs **Electrical Power** • Pole mounted transformers • Service feed • Distribution/control panel **Access Road & Gravel Pad** • Slope to match existing conditions **Erosion Control Measures** • Silt fence & hay bale placement • Maintenance & on-going inspections **AS System Installation** • Set skid level & aligned • O&M Panels accessible • Piping runs (material, diameter, alignment, plumb, joints & support) **Well Installation** • Install per drawings (location, type, size & depth) • Place concrete pads (if necessary) • Well construction (casing, riser, screen & filter pack) **Distribution & Well Head Piping** • Distribution piping installed above ground per				

*Include schedule date if a CPM network is invoked.

EXHIBIT VIII-1
QUALITY CONTROL INSPECTION PLAN
AIR SPARGE REMDIATION SYSTEM
SITE 7, OPERABLE UNIT 03
MCAS CHERRY POINT, N.C.
Delivery Order No. 0010

Specification Section	Definable Feature of Work	Activity Number*	Control Check Verification		
			Preparatory Phase Checklist/Report No.	Initial Phase Checklist/Report No.	Follow-up Phase Checklist/Report No.
	drawings • Well head construction (sched. 80 PVC) • Piping supports as necessary **Electrical power, instrumentation & control** • electrical systems & equipment operationally tested **Site Restoration** • Replace impaired grass/vegetation **Start-Up Testing** • Perform calibrations, & adjustments • Develop, flow rates and pressure • Perform initial maintenance • Sample & Analysis **Operations & Maintenance** • Monitor System Performance (flow rates & pressures) • Sample & Analysis				

*Include schedule date if a CPM network is invoked.

EXHIBIT IX-1

PERSONNEL MATRIX

SPECIFICATION SECTION:	SUBMITTALS REVIEWED BY:	THREE PHASE PERFORMED BY:	TESTING PERFORMED BY:
N/A	Site QC Manager	Site QC Manager	IT/OHM as specified in Work Plan

*Include schedule date if a CPM network is invoked.

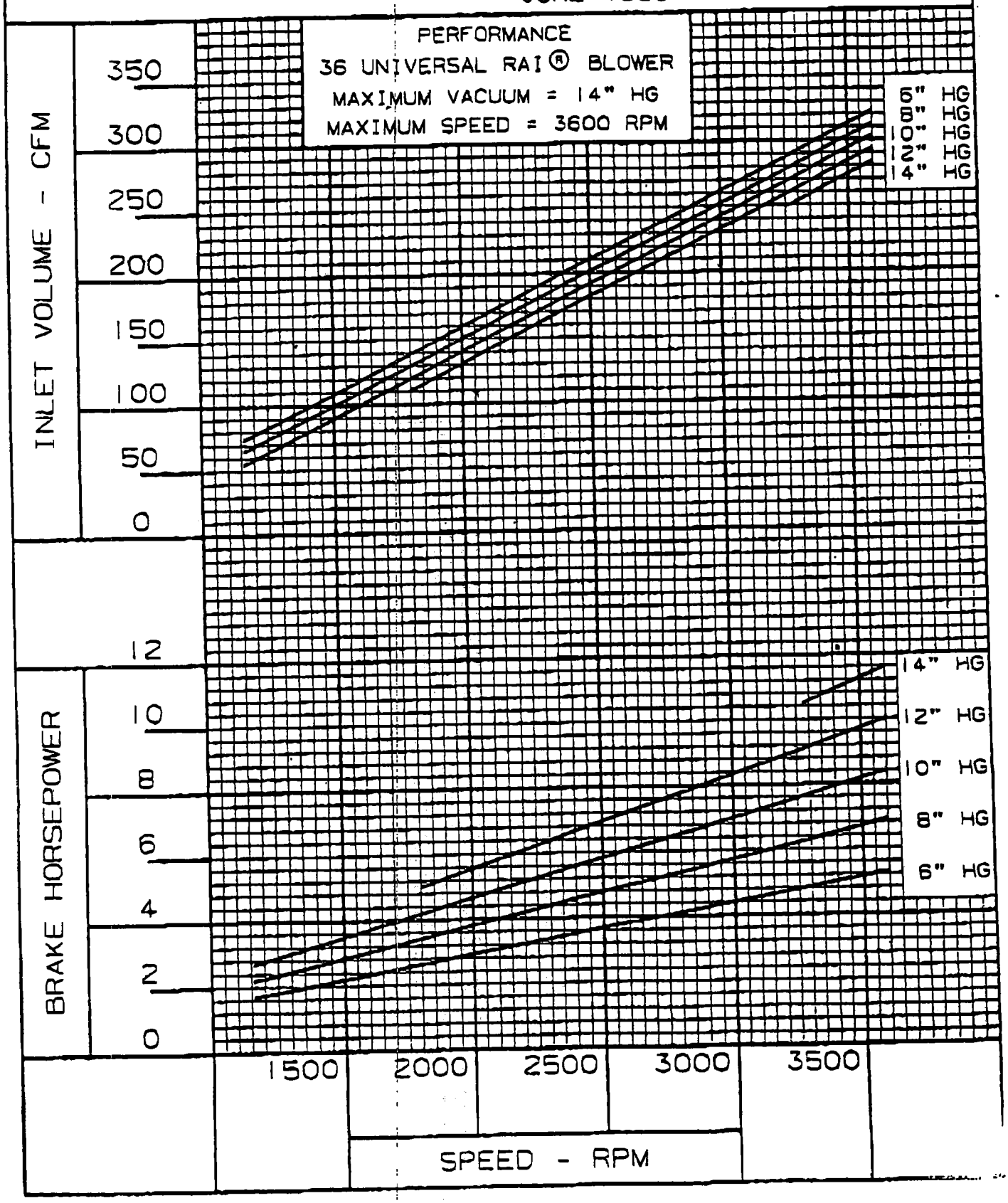
Appendix E

Manufacturer's Catalog Data

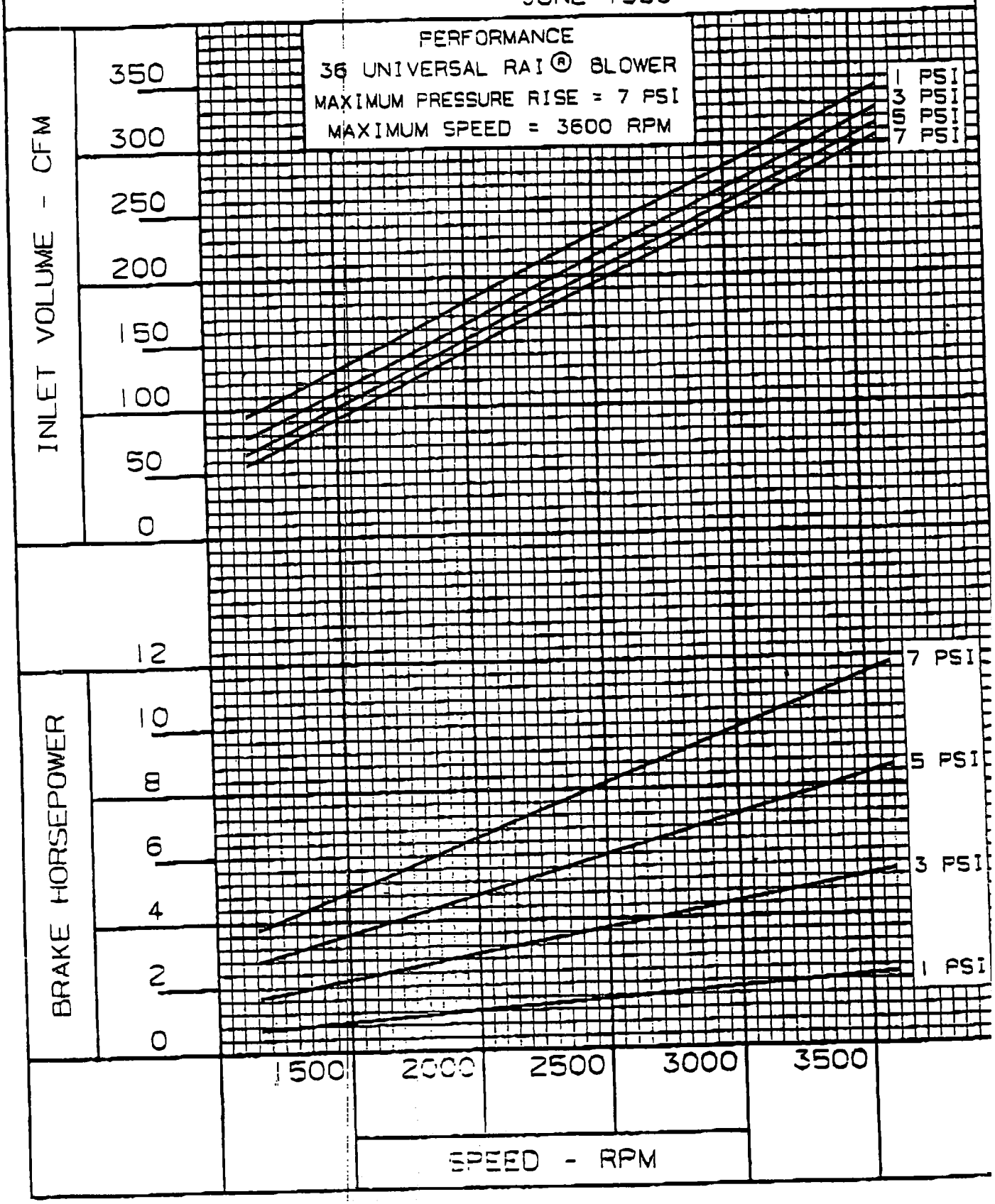
ROOTS DIVISION
DRESSER INDUSTRIES, INC.
CONNERSVILLE, IN. 47331
PRINTED IN U.S.A.

PERFORMANCE BASED ON 68°F
INLET AIR & DISCHARGE
PRESSURE - 30" HG ABS

JUNE 1990



ROOTS DIVISION
DRESSER INDUSTRIES, INC.
CONNERSVILLE, IN. 47331
PRINTED IN U.S.A.

PERFORMANCE BASED ON INLET AIR AT 14.7 PSIA & 68°F

JUNE 1990