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FINAL



**Lead-Contaminated Soil
Removal Work Plan
Montford Point Water Tower
MCB Camp Lejeune, North Carolina**

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032
Delivery Order 0151

Prepared by



**OHM Remediation
Services Corp.**
A Subsidiary of OHM Corporation

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AUGUST  1997

OHM Project No. 19668

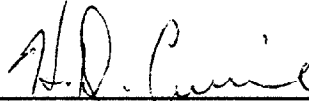
**LEAD-CONTAMINATED SOIL REMOVAL WORK PLAN
MONTFORD POINT WATER TOWER
MCB CAMP LEJEUNE, NORTH CAROLINA**

Submitted to:

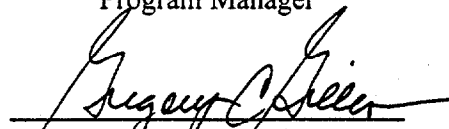
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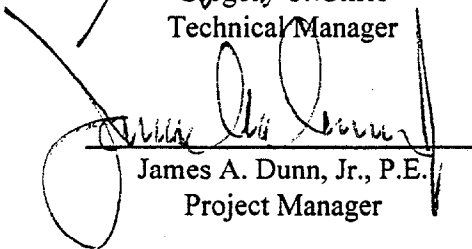
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Appendix B	Construction Quality Control Plan
Appendix C	Sampling and Analysis Plan
Appendix D	Correspondence

1.0 INTRODUCTION

This Remedial Action Work Plan (RAWP) reviews OHM Remediation Services Corp.'s (OHM) approach to implementation of the scope of work under Delivery Order No. 0151 of Navy Atlantic Division (LANTDIV) Contract N62470-93-D-3032. The elements of this work plan are based on the OHM Proposal/Cost Estimate for Lead Contaminated Soil Removal dated May 19, 1997 and the Statement of Work Design Package and Specifications dated March 4, 1997 as modified to be performed within the CERCLA program following RCRA guidelines. Several other plans have been developed for this delivery order and are to be considered as complementary components to this work plan. They include:

- Environmental Protection Plan (EPP) (included herein as Section 3.0)
- Site-Specific Health and Safety Plan (SHSP) (included herein as Appendix A)
- Construction Quality Control Plan (CQCP) (included herein as Appendix B)
- Sampling and Analysis Plan (SAP) (included herein as Appendix C)

This RAWP identifies and describes how OHM will implement the major tasks encompassing the removal of lead-contaminated soil at Montford Point Water Tower in conformance with the contract requirements. It includes the following sections:

- Section 2.0 Remedial Action Objectives
- Section 3.0 Environmental Protection Plan
- Section 4.0 Mobilization and Preparatory Work
- Section 5.0 Field Activities
- Section 6.0 Transportation and Disposal
- Section 7.0 Demobilization and Final Report
- Section 8.0 Schedule

1.1 SITE BACKGROUND

MCB Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), National Priorities List (NPL) effective October 4, 1989 (54 Federal Register 41015, October 4, 1989). Subsequent to this listing, the United States Environmental Protection Agency (USEPA) Region IV, the North Carolina Department of Environment, Health and Natural Resources (NCDEHNR) and the United States Department of the Navy (DoN) entered into a Federal Facilities Agreement (FFA) for MCB Camp Lejeune. The primary purpose of the FFA was

to ensure that environmental impacts associated with past and present activities at MCB Camp Lejeune were thoroughly investigated and appropriate CERCLA response/Resources Conservation and Recovery Act (RCRA) corrective action alternatives were developed and implemented as necessary to protect the public health and the environment.

Based on the results of the water tower pre-demolition screening, lead contaminated surface soil was identified at the Montford Point Water Tower site. Refer to Appendix D laboratory results and regulatory agency notification. As a result, the delineation and remediation of this contaminated surface soil is being conducted as an Interim Measure (IM) to minimize the potential for further release to the environment or exposure to human or ecological receptors. The IM includes identification, excavation of the lead-contaminated surface soil, and disposal of the soil in an appropriate treatment/disposal facility. Although the work as conceived in the SOW was part of the RCRA corrective action program, it will actually be performed under the auspices of the state CERCLA program.

1.2 SITE DESCRIPTION

Camp Lejeune is a training base for the U.S. Marine Corps, located in Onslow County, North Carolina. The base covers approximately 234 square miles and includes 14 miles of coast line. MCB Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base. The remedial action area at Montford Point has been recently discovered and identified as a Solid Waste Management Unit (SWMU)/Area of Concern (AOC) within Camp Lejeune.

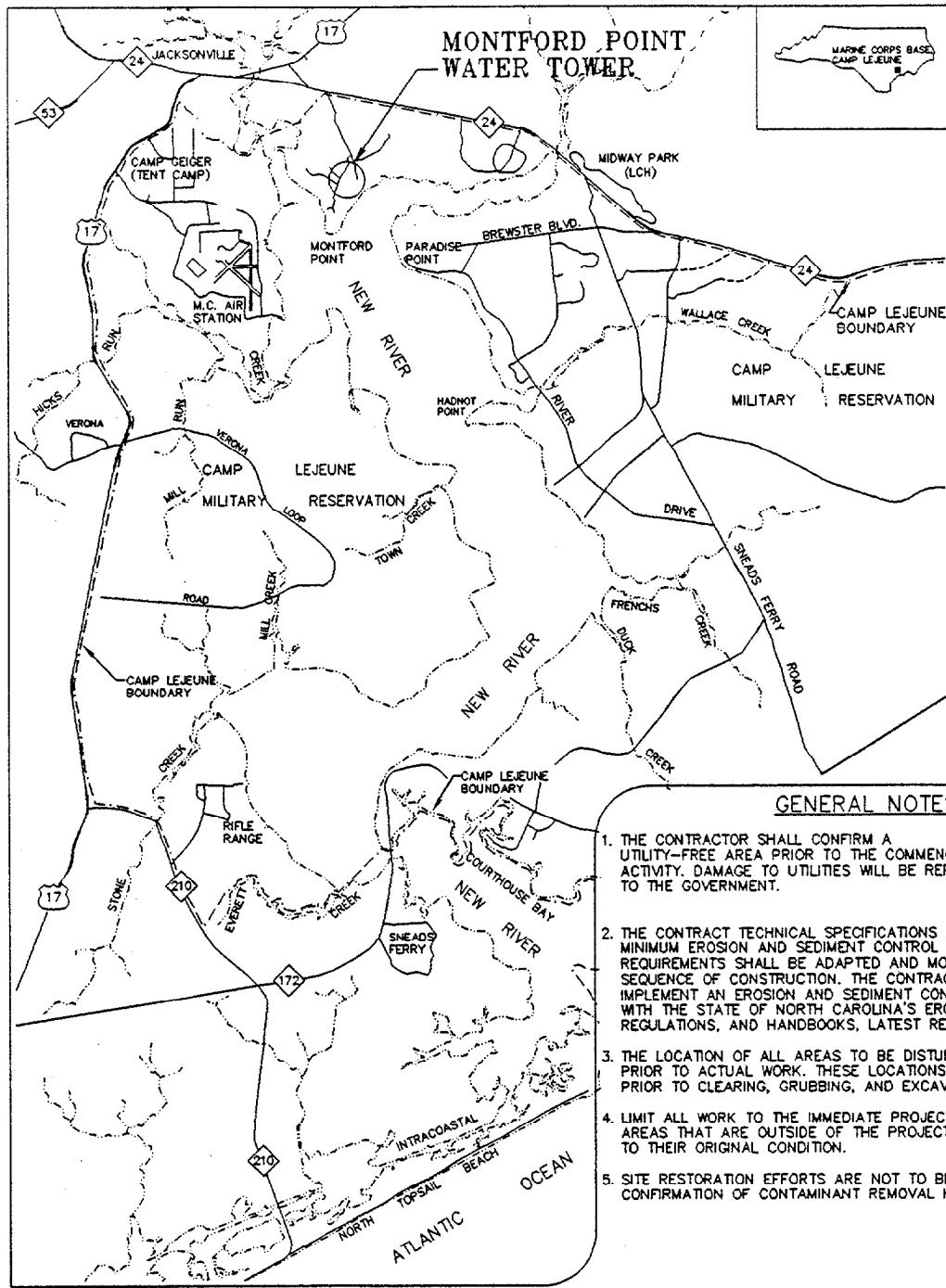
The Montford Point elevated water tower is located near SM-624 at Camp Lejeune as shown in Figures 1 and 2. The Montford Point water tower is reported to have been used to store potable water. This water tower was demolished in March 1997. Lead-contaminated soil has been found at the base of the former water tower. It is speculated that the source of the lead-contamination is lead paint from the exterior of the water tower structure. It appears likely that lead paint peeling from the tower or removed during routine maintenance activities would have fallen on the adjacent soils resulting in elevated levels of lead in this soil.

Figure 3 presents a site map of the water tower with the proposed sampling grid. This sampling will be conducted to estimate the aerial extent of soil that contains lead compounds in concentrations exceeding the Remedial Action Objectives discussed in Section 2.0.

1.3 SUMMARY OF PREVIOUS INVESTIGATIONS

In late November 1996, Rock Environmental Services conducted pre-demolition soil screening at the site. Two samples were taken and analyzed for lead using TCLP protocols. Lead was reported at 21.6 mg/L and 11.4 mg/L respectively which are above the EPA characteristic lead limit of 5.0 mg/L. These laboratory results are contained in Appendix D. As a result of this investigation, additional lead contamination delineation was recommended.

REMEDIATION OF LEAD CONTAMINATED SOIL MONTFORD POINT WATER TOWER MARINE CORPS BASE, CAMP LEJEUNE NORTH CAROLINA



GENERAL NOTES

1. THE CONTRACTOR SHALL CONFIRM A UTILITY-FREE AREA PRIOR TO THE COMMENCEMENT OF ANY FIELD ACTIVITY. DAMAGE TO UTILITIES WILL BE REPAIRED AT NO EXPENSE TO THE GOVERNMENT.
2. THE CONTRACT TECHNICAL SPECIFICATIONS ADDRESS THE MINIMUM EROSION AND SEDIMENT CONTROL REQUIREMENTS. THESE REQUIREMENTS SHALL BE ADAPTED AND MODIFIED TO BEST SUIT THE SEQUENCE OF CONSTRUCTION. THE CONTRACTOR SHALL DEVELOP AND IMPLEMENT AN EROSION AND SEDIMENT CONTROL PLAN IN ACCORDANCE WITH THE STATE OF NORTH CAROLINA'S EROSION CONTROL LAWS, REGULATIONS, AND HANDBOOKS, LATEST REVISIONS.
3. THE LOCATION OF ALL AREAS TO BE DISTURBED SHALL BE FIELD STAKED PRIOR TO ACTUAL WORK. THESE LOCATIONS SHALL BE REVIEWED BY THE NTR PRIOR TO CLEARING, GRUBBING, AND EXCAVATION ACTIVITIES.
4. LIMIT ALL WORK TO THE IMMEDIATE PROJECT AREA. RESTORE ALL DISTURBED AREAS THAT ARE OUTSIDE OF THE PROJECT LIMITS OF WORK TO THEIR ORIGINAL CONDITION.
5. SITE RESTORATION EFFORTS ARE NOT TO BE PERFORMED UNTIL CONFIRMATION OF CONTAMINANT REMOVAL HAS BEEN ACHIEVED.

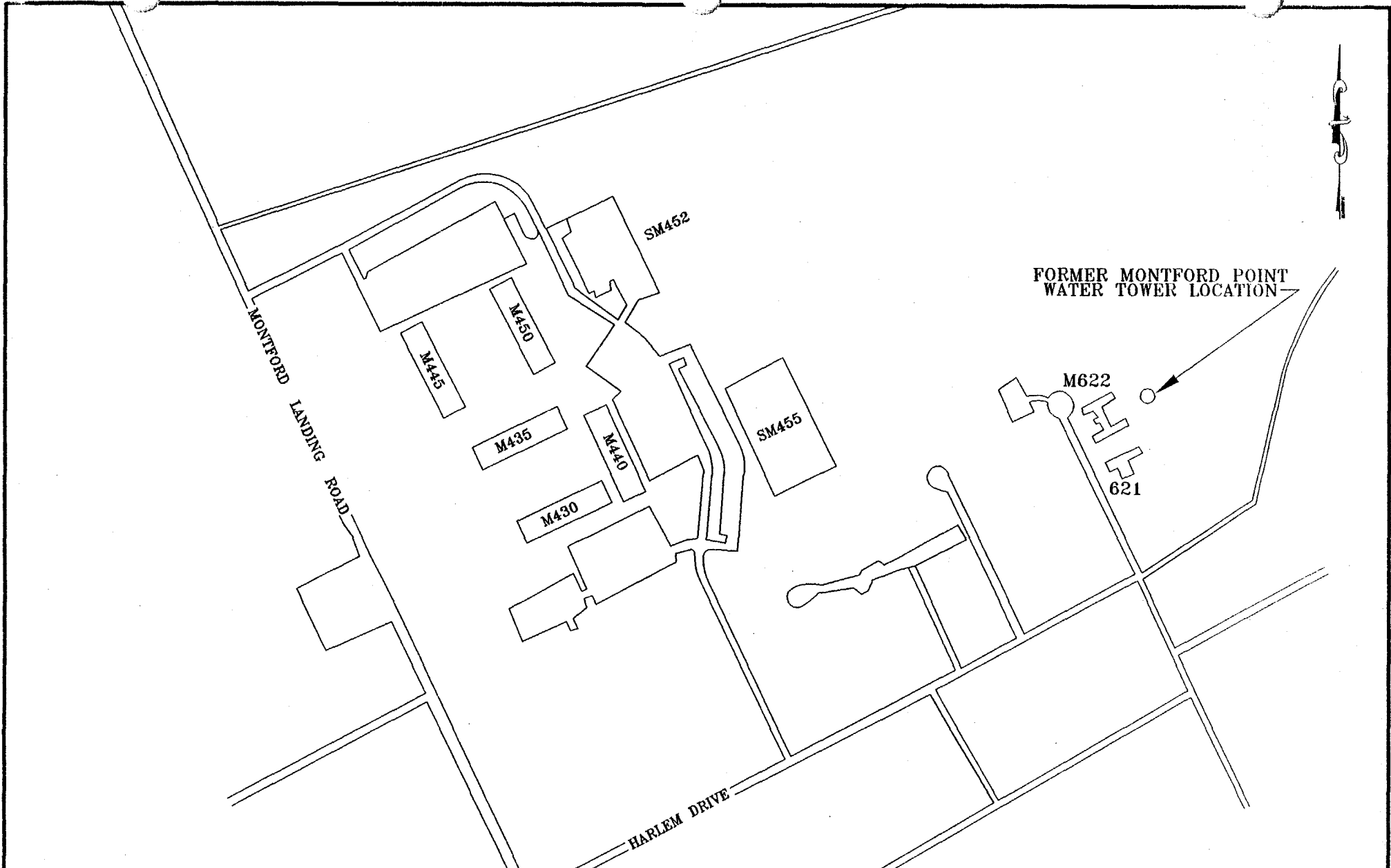
VICINITY MAP



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APPROVED BY	J. DUNN	7/25/97
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FIGURE 1
VICINITY MAP
MONTFORD POINT WATER TOWER
REMEDIATION OF LEAD
CONTAMINATED SOIL

C:\OHM3\1966E\58FIG1.DWG



C:\OHM3\19668\FIG2.DWG


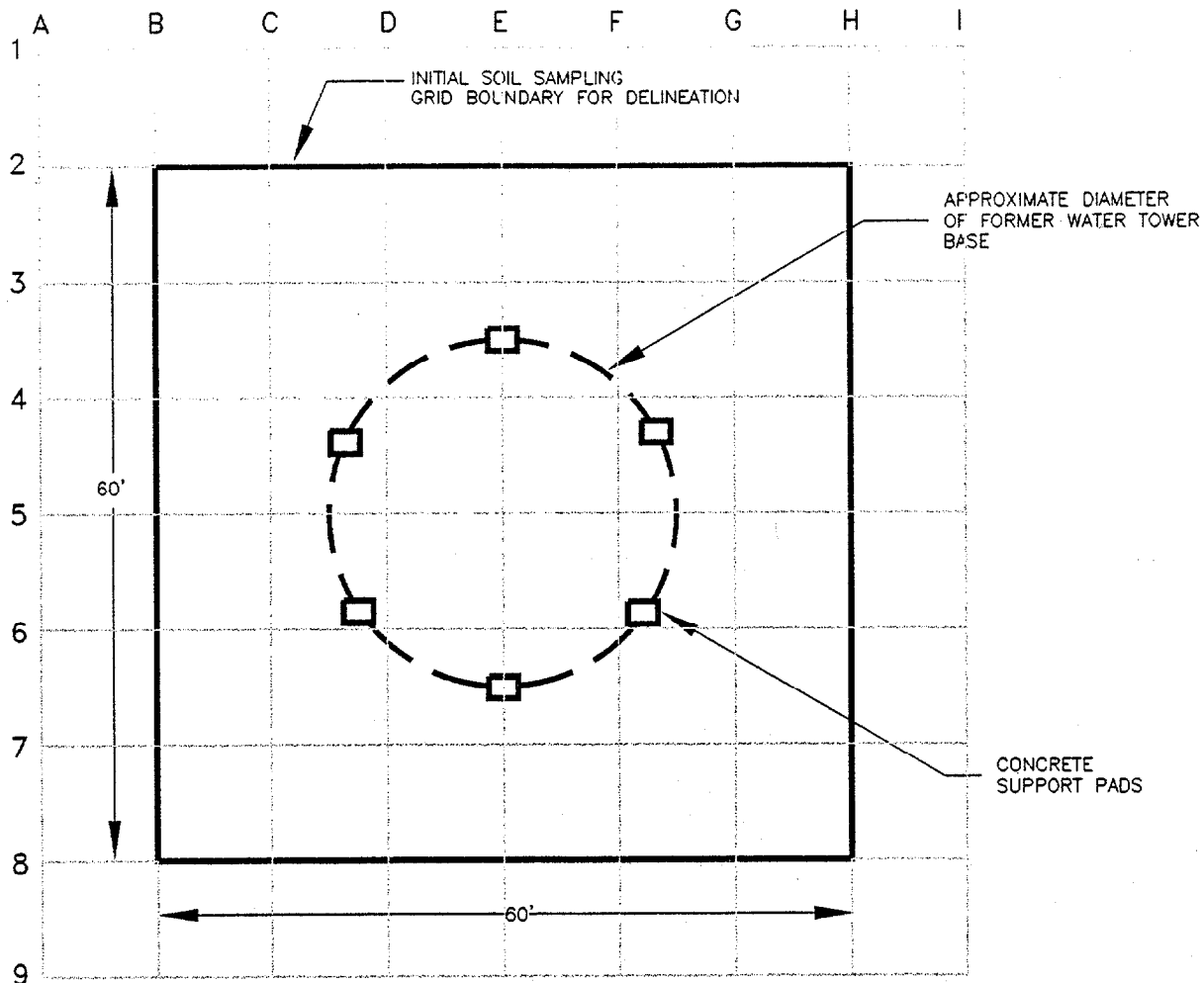
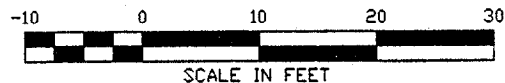
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FIGURE 2
SITE LOCATION MAP
MONTFORD POINT WATER TOWER
REMEDICATION OF LEAD
CONTAMINATED SOIL



NOTES:

1. UPON CLEARANCE OF UTILITY CONFLICTS, CONSTRUCT DECONTAMINATION PAD AND LAYOUT AREA. THE CONTRACTOR SHALL BE RESPONSIBLE TO FIELD ADJUST THE SIZE SHAPE AND DESIGN OF THE NECESSARY DECONTAMINATION AND LAYDOWN AREAS WITHIN THE AREAL EXTENT DESIGNATE TO ACCOMMODATE THIS WORK.
2. CLEAR AND GRUB AS REQUIRED. INSTALL THE NECESSARY SEDIMENT AND EROSION CONTROL FACILITIES TO ACCOMMODATE THE SCOPE OF THIS WORK.
3. PROVIDE SAFETY FENCING IN ACCORDANCE WITH THE SPECIFICATIONS.
4. COLLECT SOIL SAMPLES AT GRID POINTS SHOWN ON THIS FIGURE AS INDICATED IN THE SAMPLING AND ANALYSIS PLAN.
5. EXCAVATE THE LEAD CONTAMINATED SURFACE SOIL TO THE HORIZONTAL LIMITS AS DEFINED IN THE SAP.
6. GRID SIZE IS 10' X 10'




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FIGURE 3
SOIL SAMPLING GRID
MONTFORD POINT WATER TOWER
REMEDATION OF LEAD
CONTAMINATED SOIL

C:\OHM3\1966\368FIG.DWG

2.0 REMEDIAL ACTION OBJECTIVES

2.1 REMEDIAL ACTION OBJECTIVES FOR SOIL

The remedial objective for soil at the base of the Montford Water Tower is to remove and dispose of the lead-contaminated soils which have contaminants of concern exceeding the established remediation goals. Under this approach of removal and off-site disposal, potential risks due to contaminated soil exposure will be reduced. The action level for TCLP extract for lead in soil is 5 mg/L, 400 mg/kg total lead for dermal contact, and 270 mg/kg for leaching to the groundwater as noted in the OHM documentation Memo dated July 18, 1997. Refer to Appendix D.

Soils with TCLP lead greater than 5 mg/L or total lead greater than 270 mg/kg will be removed, treated on-site to below RCRA characteristic levels, transported off-site, and disposed of as outlined in the Transportation and Disposal (T&D) Plan in Section 6.0 of this work plan.

3.0 ENVIRONMENTAL PROTECTION PLAN

This Environmental Protection Plan (EPP) has been prepared in accordance with standard OHM policies and procedures. The EPP provides specific information relating to the scope of work under Delivery Order No. 0151 Lead-Contaminated Soil Removal, Montford Point Water Tower. The plan will provide site-specific information for:

- Land resources management
- Water resources management
- Air and noise pollution control
- Non-compliance/corrective action
- Post-excavation clean-up

The control of environmental pollution will consider air, water and land impacts, as well as noise and solid waste management.

The land resources within the property of MCB Camp Lejeune, but outside the limits of permanent work, will be preserved in their condition or restored to a condition that does not detract from the appearance of the area after completion of construction. As much as is practical, construction activities will be limited to areas defined by the plans and specifications.

3.1 HISTORICAL AND ARCHAEOLOGICAL FINDS

Although the presence of historical artifacts is not anticipated, if a historical artifact is encountered during field operations, OHM will stop work and notify the Navy Technical Representative (NTR). The NTR will be responsible for contracting federal, state, and local authorities to determine if the site may contain other important historical artifacts, and whether this site qualifies for possible placement on the National Registrar of Historical Places. Field operations will not resume until the NTR issues a written authorization to proceed.

3.2 TEMPORARY CONSTRUCTION ROADS

If required, the construction of any temporary construction roads in and around the project site will be performed in a manner as to minimize the impact to the natural environment. Water will be used for dust control, as necessary.

3.3 PROTECTION OF TREES AND SHRUBS

Prudent steps will be taken to protect trees and shrubs outside of the excavation zone as necessary. The trees and shrubs within the excavation zone will be removed by OHM. All trees and shrubs removed as a result of the construction activities will be cut into manageable pieces and moved from the project site so as not to interfere with operations. Precautions will be taken to minimize the construction activities' impact on existing vegetation and will include but not be limited to:

- Utilization of existing or temporary construction roads only
- Closely supervised equipment operators with an emphasis placed on preservation of vegetation in non-work areas
- Proper guidance of heavy equipment and truck operators by site personnel to minimize damage to adjacent vegetation not directly affected by construction activities
- Utilization of equipment appropriately designed and sized for precise excavation

3.4 RESTORATION

Upon completion of the field construction activities, disturbed areas will be graded and compacted and graded to the original grade. The ground surface will be restore to original conditions.

3.5 WATER RESOURCES PROTECTION

The site is adjacent to the New River. The New River could possibly be impacted by construction activities if proper sediment and erosion protection measures are not taken. To protect against damage, stormwater surface run-off leaving the site will be controlled by temporary erosion/sediment control techniques such as berms, silt fencing and grading. The area of bare soil exposed at any one time by construction activities will be minimized.

3.5.1 Erosion Sediment Control

Prior to disturbance of native vegetation and soils, temporary erosion/sediment control will be established on the down gradient side of each excavation. Control techniques to be utilized will involve 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 than 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. Accumulated sediment will be removed before the depth reaches 12 inches.

3.5.2 Spill Control

Measures will be taken to prevent chemicals, fuels, oils, greases, bituminous materials and contaminated materials from entering streams, rivers or lakes. Absorbents will be available to solidify any leaks outside containment and any soil contaminated with fuel spills will be immediately removed and placed into appropriate containers and sampled to determine proper disposition.

3.6 DUST AND AIR POLLUTION CONTROL

3.6.1 Air and Noise Monitoring

Personnel and ambient air monitoring will be conducted as necessary in order to determine airborne dust and contaminant levels. Ambient air monitoring will be conducted at working locations and on occasion at the perimeter of the project site. This ensures that respiratory protection is adequate to protect personnel against the contaminants that are encountered as well as ensuring that harmful levels of airborne contaminants are not leaving the site.

OHM will only perform operations of heavy equipment during daylight hours to minimize the impact of off-site noise pollution. Noise exposure to off-site residents or personnel is expected to be minimal. Hearing protection for on-site workers will still be implemented if necessary as specified in the SHSP.

3.6.2 Particulate Emission Controls

Specific measures to be taken to minimize particle emissions for major activities during site construction include the following:

Soil Excavation, Handling, Site Grading and Transportation

- Apply water to work and traffic areas as necessary to minimize dust emissions
- Cover stockpiles with synthetic sheeting to minimize wind and/or stormwater erosion
- Move and load soil for transport within the site that limits free fall of material and is least likely

to generate dust emissions

- Halt dust-generating work when on-site wind conditions exceed 35 miles per hour

Movement of Equipment

- Water traffic areas as required to minimize dust emissions
- Designate equipment traffic patterns to minimize travel distance and vehicular dust emissions
- Limit vehicle speed to minimize dust emissions

3.6.3 Burning

No burning will be performed on-site. In the event of an expected fire on-site, work will stop immediately and the MCB Camp Lejeune fire department will be notified.

3.7 POST-EXCAVATION CLEANUP

All excavation equipment will be decontaminated on a pad prior to demobilizing from the site. Decontamination will consist of scraping and pressure-washing to remove visible soil and debris from tires and undercarriage of vehicles and heavy equipment. Decontamination liquids will be containerized and samples procured and analysis prior to disposal. The site will then be turned over to the Base.

4.0 MOBILIZATION AND PREPARATORY WORK

Prior to mobilization, OHM will arrange a pre-construction meeting at MCB Camp Lejeune with LANTDIV and other responsible parties. The purpose of this meeting will be to:

- Confirm roles and responsibilities of key personnel and flow of communication for project execution
- Review the project schedule, sequence of tasks and key milestones
- Identify and discuss Base-specific issues relative to the upcoming mobilization and construction activities
- Obtain the necessary security clearances for operations personnel

OHM will submit the qualifications and licenses of subcontractors performing waste transportation and disposal. The qualifications of subcontractors including small and disadvantaged businesses proposed to perform work at the site will also be submitted. Additionally, other material/product submittals jointly identified as necessary will be submitted in accordance with the approved submittal register.

OHM will mobilize personnel and equipment as necessary from its Southern Region offices, including Covington, Georgia; and Gallatin, Tennessee. Prior to beginning work on site, a training meeting will be conducted to brief all site personnel on the Site-Specific Health and Safety Plan, construction drawings, and other relevant site-specific plans. Site hazards and conditions will be discussed and all personnel will acknowledge their understanding and compliance with the plan by signing an approved acceptance form.

Project mobilization and site setup will consist of the following main activities:

- Temporary Facilities Installation - OHM will utilize its office trailer already located at Lot 203 as an administrative area and command center. In addition a canopy/lab trailer will be set-up on-site. The lab trailer/canopy will serve as the control check point for contractor/ subcontractor personnel entering the site.
- Site Grid Layout - OHM will layout the grid for sampling to determine limits of excavation. The grid will be visibly marked using reinforcing bars and/or wood stakes. OHM will also

mark the location of other features such as construction roads and equipment lay down areas.

- **Pre-excavation Soil Characterization** - A field sampling crew will sample designated grids and ship samples off-site for analyses to determine limits of excavation as presented in the SAP.
- **Excavation Limits** – Based on the results of the initial site sampling the areas to be excavated will be delineated and visibly marked for easy recognition using paint and/or wooden stakes. Visibly marking the excavation areas allows for better determination of the work/safety zones and clearly defines the work area for the equipment operator.
- **Clearing and Grubbing** - Any trees located within the excavation zones will be cut and staged in a convenient location for pickup by the Forestry Service. Any under growth and tree limbs removed in the excavation areas will be disposed at the base landfill.
- **Erosion and Sedimentation Control** - OHM will establish controls to prevent erosion and sedimentation through the use of sediment fencing and diversion berms. In this manner, OHM will mitigate the spread of contamination to other areas and minimize run-on into the active work area. Silt fencing will be placed along the down gradient sides of each excavations. Clean soil will be used to construct a berm on the up gradient side of the excavation areas to prevent the intrusion of surface water into the excavation prior to backfill. The Environmental Protection Plan included with this RAWP provides details on environmental controls.
- **Install Construction Fences** - OHM personnel will erect safety fencing around the planned excavations. Fencing will be 4 feet high, bright orange, polyethylene, mesh fence to prevent personnel from accidentally entering the open excavation.
- **Decontamination Areas** - Personnel and equipment decontamination areas will be provided within the Contamination Reduction Zones (CRZ) upon exiting the contaminated working areas. The Site-Specific Health and Safety Plan addresses these areas in detail.
- **Site Security** - All persons entering the site will be required to sign in and out daily. OHM reserves the right to deny access to any individual not showing proper identification.
- **Health and Safety Zones** - The site will be segregated into work areas on the basis of degree of hazard and PPE requirements. In general, the fenced area excluding the open excavations will comprise the contamination reduction zone (CRZ). Personnel working within the CRZ will be required to wear the appropriate PPE as outlined in the Site-Specific Health and Safety Plan.

Excavation areas within the CRZ will be designated the exclusion zone and will be delineated by orange safety fencing. OHM health and safety personnel will provide site air monitoring and will adjust work zone boundaries as appropriate.

- Personnel Decontamination Facility - OHM will set up a personnel decontamination area at the site. The location will be near construction areas depending on the phase of remediation activities. It will be furnished with portable wash basins. All decontamination and cleaning water generated from the decontamination activities will be collected and stored prior to analysis and subsequent disposal.

5.0 FIELD ACTIVITIES

The estimated limits of in situ surface soils contaminated with lead in excess of the Remedial Action Objectives (RAOs) is approximately 60 feet x 60 feet with the former water tower in the center of the area of contamination. Additional sampling and analysis will be performed by OHM under the task of pre-excavation field sampling to fully assess the extent of contamination and confirm the limits of excavation.

5.1 PRE-EXCAVATION SOIL CHARACTERIZATION

OHM will establish a 10 feet by 10 feet grid as shown in Figure 3 with former water tower base in the center. A discrete grid sample will be collected at a depth specified in the Sampling and Analysis Plan at each grid point. Adjustments to the SAP, if needed based on field conditions, will be approved by the ROICC and NTR. Samples will be analyzed for total lead and TCLP lead using an off-site laboratory. Results will be compared with the RAOs and plotted on the sampling grid. Sampling will proceed in accordance with the SAP. This information will be used to determine the initial excavation limits. A more complete discussion of this activity is provided in the Sampling and Analysis Plan.

5.2 CLEARING AND GRUBING

Trees located within the excavation zones will be cut and staged in a convenient location for pickup by the Forestry Service. The under growth, tree limbs, roots, and other non-salable non-contaminated debris removed in the excavation areas will be disposed at the base landfill.

5.3 EXCAVATION

The approximate area expected to contain contaminated soils within the Montford Point Water Tower Site will be marked prior to beginning excavation. Underground utilities in the excavation area will be located. Hand excavation will be utilized when excavating within 5 feet of existing monitoring wells/utilities in order to not disturb or compromise their integrity. The contaminated soils in the excavation area will be removed to the pre-determined dimensions as identified from the pre-excavation contamination assessment effort. A tracked excavator equipped with a 1/2 cubic yard bucket will carefully excavate soil. Excavation depths will be manually monitored with a tape measure or equivalent measuring device to avoid any over excavation of soil.

The excavated soil will be directly loaded into roll-off containers. Off-site disposal is planned for the soils exceeding the RAOs. After excavation to the specific limits, a visual inspection will be performed on the surrounding soil. Exposed excavation areas will be sampled and samples routed to the designated off-site analytical laboratory for confirmatory analysis as discussed in the Sampling and Analysis Plan (SAP).

5.4 SOIL TREATMENT AND DISPOSAL

Trisodium phosphate at a concentration of 2.5% by weight will be added to each roll-off container of excavated soil along with an appropriate amount of water to stabilize the lead in the soil. The soil will be thoroughly mixed with the trisodium phosphate material in the roll-off containers using the backhoe. A composite sample will be collected from all the stabilized soil and sent off-site for disposal analyses as indicated in the Sampling and Analyses Plan. If analyses indicates that the TCLP lead concentration is less than 5 mg/L, the soil will be shipped (following waste profiling and approval) to a non-hazardous lined Subtitle D disposal facility.

If laboratory analyses indicates that the TCLP lead concentration is greater than 5 mg/L, further treatment will be required. The Site Supervisor will consult with OHM technical staff to determine what steps to take and obtain ROICC and NTR approval before continuing. If analyses of the treated material indicates that the TCLP lead concentration is now less than 5 mg/L, the soil will be weighed and shipped to an approved non-hazardous lined Subtitle D disposal facility.

5.5 BACKFILLING AND SITE RESTORATION

Once the contaminated materials have been removed and confirmation sampling has verified attainment of the Remedial Action Objectives, OHM will begin site restoration activities.

5.5.1 Backfill

Backfilling operations will be implemented as soon as possible after off-site analytical confirmation of clean results are received, in order to prevent collection of stormwater within open excavations. The excavated areas will be backfilled with suitable backfill material from an off-site private source and re-graded to the original contours

Fill will be spread evenly above the approved subgrade in lifts not exceeding 12 inches and compacted in horizontal layers as nearly even as possible using the track hoe.

5.5.2 Gravel

Upon completion of backfill placement, areas which had previously been graveled will be paved with gravel material meeting NCDOT Standard Specifications For Roads And Structures, Section 905. Material size will be No. 4. Gravel thickness will match existing thickness of adjacent areas. Gravel will be compacted to 95 percent of maximum density by ASTM D 698 Method D. Compaction testing is not required. Additionally, previously grassed areas prior to excavation activities, will be re-seeded.

6.0 TRANSPORTATION AND DISPOSAL

6.1 INTRODUCTION

Excavated soil will be placed in roll-off containers and stabilized on-site. It is the intention of OHM to provide the necessary chemical stabilization treatment on-site to de-characterize RCRA hazardous soils.

All trucks used for transporting material will be decontaminated prior to leaving the project site to prevent the off-site spread of contaminants. When all contaminated soils have been loaded for transportation, OHM will remove residual soils from the excavator by scraping and brushing. The excavator will then be moved to the decontamination pad for final decontamination by pressure washing.

Personnel involved with excavation will be attired in Personal Protective Equipment (PPE) as required by the site Health and Safety Plan. Used PPE will be placed in the trucks with the soil for disposal.

All waste destined for off-site treatment/disposal will be transported by licensed waste haulers. All trucks will pre-weigh at the base scales to establish their tare weight prior to being loaded with contaminated soil. After loading and prior to exiting the controlled area, a pressure washer will be used to decontaminate the truck's tires and trailer sides. The soil shall be covered with a tarp. The trailer will then be weighed at the base scales. Each load will be properly manifested for the designated hazardous waste disposal facility. Camp Lejeune EMD will be responsible for signing manifests as the generator for each off-Base shipment.

6.2 WASTE DISPOSAL APPROVAL

OHM will assign a Transportation and Disposal (T&D) Coordinator to this project acting as a single point-of-contact for all waste management activities. The individual assigned to this project will be familiar with all the applicable portions of RCRA, CERCLA, and SARA regulations--especially 40 CFR 261 (Identification and Listing of Hazardous Wastes). In addition, this individual will be familiar with the North Carolina regulations relating to hazardous and solid waste handling, treatment, storage, disposal, and transportation. This individual will review the existing analytical data as well as additional data collected by OHM and obtain pre-approval from the appropriate disposal facilities to allow direct load out of excavated soils. The T&D Coordinator will also be

responsible for preparing waste profiles to be sent to the selected disposal facilities and coordinating disposal approvals.

Based on the materials identified that will require off-site disposal, the T&D Coordinator, and the project manager and procurement personnel, have reviewed potential vendors to prequalify transportation and disposal vendors based on:

- Notice of Violation (NOV) status
- Ability to handle the wastes identified
- Cost effectiveness of the available transportation and disposal options
- Past experience
- SB and SDB contract goals

At this time OHM has identified the following qualified vendors to provide transportation and disposal of wastes from this site:

Disposal and Transportation

- Aptus Environmental
Coffeerville, Kansas
- Browning-Ferris Industries
Charlotte, North Carolina
- Chemical Waste Management
Port Authur, Texas
- LWD
Clavert City, Kentucky
- Evotech Management Services, Inc.
Belleville, Michigan
- Rollins Environmental Services
Baton Rouge, Louisiana
- R. Paquette & Company (SB)
Glenwood, Florida
- EPA Transportation Services (SDB, WBE)
Rose City, Texas
- Chemical Development Corp. (SB, WBE)
Tierra Verde, Florida
- Hilco Transport Inc. (SB, WBE)
Wilmington, North Carolina
- Robbie D. Wood
Dolomite, Alabama
- Terra First
Jacksonville, FL

All bids will be obtained based on a written solicitation and all bid responses will be in writing. All bids will be made in conjunction with OHM's procurement department. A condition of OHM's purchase order will be that the selected vendors must provide OHM with addresses, the name of a single point of contact, EPA ID numbers, permit verification, insurance verification, NOV status, and any other qualifying data necessary.

6.3 PREPARATION OF REQUIRED DOCUMENTATION

OHM will prepare (or oversee the preparation of) all paperwork associated with off-site disposal for review and signature by LANTDIV and Camp Lejeune representatives. This will include TSDF waste profiles, hazardous waste manifests, land disposal restriction (LDR) forms, labels and all other paperwork. The selected vendor(s) will be required to provide all labels, manifests, LDR forms, and other shipping paperwork. A completed example of these forms will be provided for OHM's review and approval at least one week in advance of the scheduled start of shipments. After these documents are reviewed by OHM, they will be provided to the Navy's representative for review and signature. Final copies of all labels, manifests, LDR forms and other shipping paperwork will be received by OHM's on-site personnel at least 5 days in advance of the scheduled shipment dates.

Written verification that the proposed disposal sites are permitted to accept the contaminated materials specified is required from the disposal vendors with their approvals. A written verification that all vehicles and containers were decontaminated prior to leaving the disposal site will be provided within three days of receipt of the waste materials. A written verification that wastes were actually delivered to the disposal site will be provided within seven days of receipt of waste materials. A certificate of destruction will be provided within seven days of the date of actual waste disposal and for final payment of all invoices.

6.4 WASTE PACKAGING

OHM plans to excavate and load all soils directly into roll-off containers. This will be a continuous operation and following on-site stabilization the wastes will be transported directly to the disposal facility at that time. No provision will exist for on-site soil stockpiles.

Miscellaneous non-hazardous materials will be accumulated on-site until sufficient quantities are available for shipment of a full load (80 drums or 20-30 cubic yards). OHM will conduct weekly inspections of the waste storage areas. All temporary storage will be in compliance with the applicable North Carolina regulations.

6.5 SHIPPING

The Site Supervisor will contact the selected vendor and schedule waste pick-ups in a timely manner to coordinate with the project schedule. Prior to shipment of wastes, OHM's on-site personnel, in conjunction with the T&D coordinator, will complete the attached Waste Disposal Activities Checklist. This checklist is to be completed for each waste shipment leaving the site. A copy of the

completed form will be provided to the NTR prior to waste transportation and with the Closeout Report.

OHM will maintain chronological organized files of weight tickets, manifest copies, LDR forms and other shipping paperwork for each shipment. OHM will also maintain a database of all pertinent information regarding each off-site shipment. Copies of the manifest file and database printouts will be provided to the LANTDIV and Camp Lejeune representatives upon request and at the completion of the project.

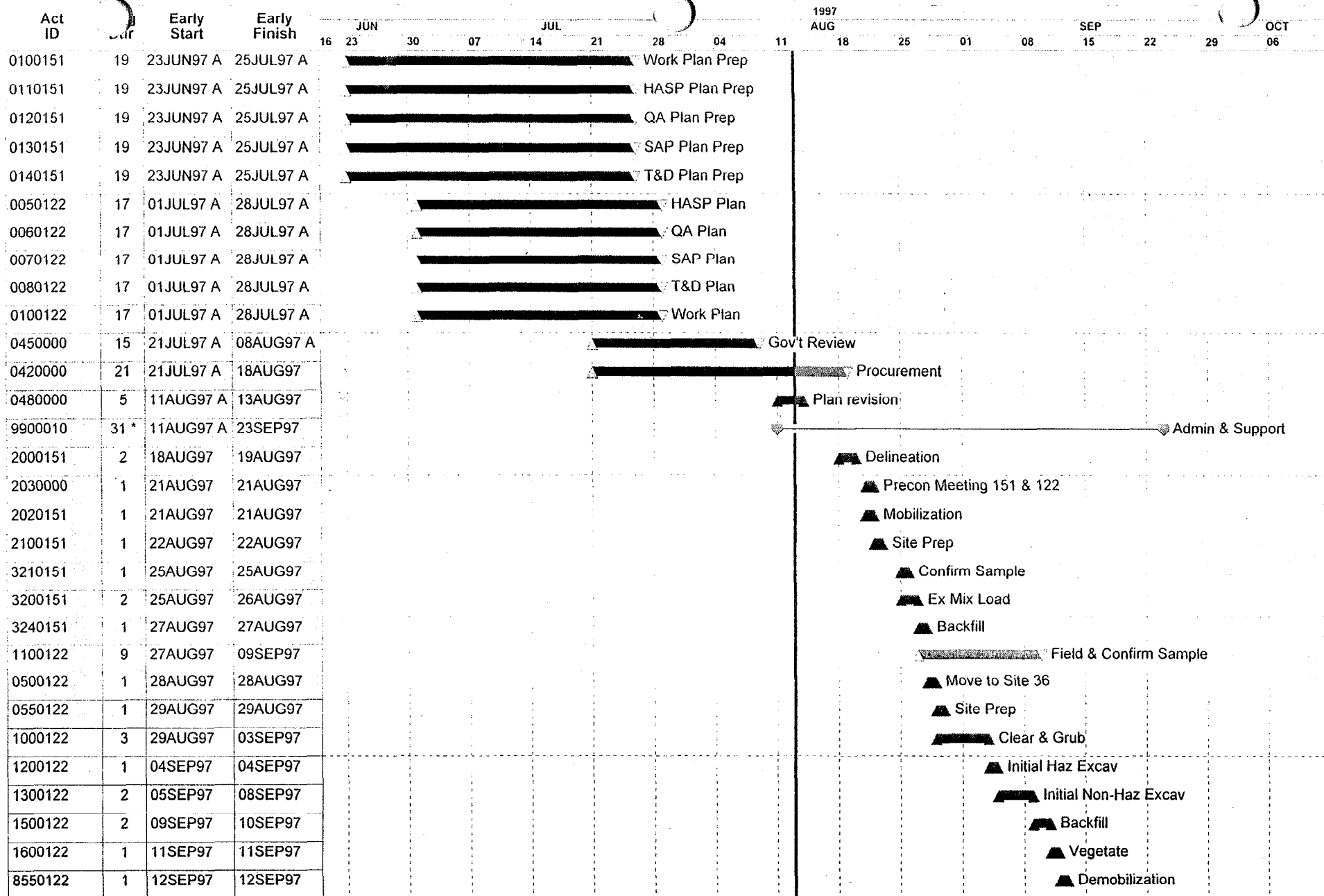
7.0 DEMOBILIZATION AND FINAL REPORTS

All equipment, support trailers and personnel will be demobilized from the project site. A Contractor Close-out Report will be completed and submitted for review and comment. The Contractor Close-out Report will include the following:

- Summary of removal action
- Quality Control Daily Reports
- On-site sample test results
- Laboratory analyses
- Quality assurance sample results
- Contaminated soil disposal documentation including manifests
- "As-built" drawings including a final survey record drawings showing limits of excavation
- Corrective actions taken (if required)

8.0 SCHEDULE

The project schedule depicts the major tasks and durations to perform the remediation of Montford Point Water Tower site.



Start date	23JUN97
Finish date	23SEP97
Data date	13AUG97
Project name	1966BAB
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OHM Remediation Services Corp.
LANTDIV D.O. 151 & 122
Project Schedule

Appendix A

Site Specific Health and Safety Plan

**Site-Specific Health and Safety Plan
for
Soil Remediation
Montford Point Water Tower
Marine Corps Base
Camp Lejeune, North Carolina**

Prepared for:

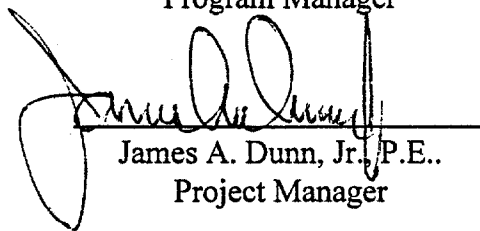
Department of the Navy
Contract No. N62470-93-D-3032
Delivery Order 0151

Prepared by:

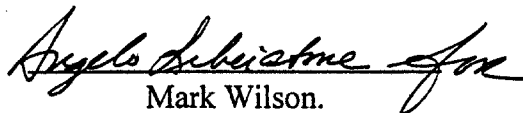
OHM Remediation Services Corp.
Norcross, Georgia



John P. Franz, P.E.
Program Manager



James A. Dunn, Jr., P.E..
Project Manager



Mark Wilson.
Southern Region Health and Safety Manager

August 1997

OHM Project No. 19668

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1.0 SCOPE OF WORK

The objective of this project is to delineate, remove, backfill with clean soil, and dispose of lead contaminated soil located at the base of the former water tower at the Montford Point Water Tower.

Two samples were taken which were found to have 21.6 and 11.6 ppm lead. It is anticipated that approximately 84 sq yards of contaminated soil will be removed to a depth of 6-12 inches.

The remediation work will consist of the following task:

- Task 1 Mobilization and site preparation
- Task 2 Obtain soil samples
- Task 3 Excavate contaminated soil/ stabilize/backfill
- Task 4 Loadout/transport contaminated soil
- Task 5 Decontaminate equipment
- Task 6 Demobilization

2.0 ORGANIZATION AND AUTHORITIES

The Project Supervisor is responsible for the safe implementation of field activities and is ultimately responsible for site safety.

The Regional Health and Safety Manager is responsible for providing guidance to the Site Safety Officer (SSO) and Project Supervisor on the implementation of the site safety plan. The SSO is responsible for implementing the site safety plan on-site and enforces the plan by performing routine site inspections. The SSO has the authority to immediately shut down site operations where unsafe conditions or practices are observed and takes the lead during site emergencies. Site personnel are responsible for following the requirements of this plan and the directions of the SSO. OHM subcontractors may either develop and implement their own site safety plan or comply with the OHM site safety plan. The following personnel are designated to perform these job functions.

- Project Manager: Jim Dunn (770) 734-8072
- Site Supervisor: Randy Smith
- Site Safety Officer: Randy Smith
- Health and Safety Manager: Mark Wilson (770) 734-8086

3.0 HAZARD EVALUATION

3.1 CHEMICAL HAZARDS

Compounds

Lead Permissible Exposure Limit = 0.05 mg/m³

Exposure to lead can be from inhalation of dusts or from skin exposure. Symptoms are nonspecific and can be hard to distinguish from minor seasonal illnesses. The symptoms are decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, digestive disorders (particularly constipation), abdominal pains, and decreased appetite.

3.2 PHYSICAL HAZARDS (Heat/Cold Stress, Noise, Fire, and Explosion)

Heat stress; manual lifting/back strain, noise, heavy equipment operations heat stress

Weather and Heat Stress

The combination of warm ambient temperature and use of protective clothing anticipated during site operations, the potential for heat stress is a concern. The potential exists for:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Heat stroke, heat cramps, and heat exhaustion are covered in detail during OHM's 40-hour OSHA 29 CFR 1910. 120 approved pre-employment course. In addition, this information is discussed during a safety "tailgate" meeting before each work day. Workers are encouraged to increase consumption of water and electrolyte-containing beverages, such as Gatorade, during warm weather. Water and electrolyte-containing beverages will be provided on-site and will be available for consumption during work breaks.

An action level for heat stress has been established at 75°F ambient temperature when site personnel are wearing chemical protective clothing during the performance of field activities. The following work/rest schedule is recommended, with personnel drinking fluids (tepid

water and/or electrolyte) at rest periods consistent with their fluid loss:

Ambient Temperature (degrees F)	Work Period (minutes)	Rest Period (minutes)
75-80F	120	15
80-85F	90	15
85-90F	60	15
90-95F	30	15
95-100F	15	15

The above work/rest schedule is only a guideline for use during field activities when personnel are wearing protective clothing. The actual work/rest schedule will be determined by conducting pulse monitoring before and after the work period and by performing daily pre/post work shift body weights. The action level for adjusting the work/rest schedule would be 110 beats per minute (bpm), obtained immediately after the work period in a seated, shaded position. When a person's pulse exceeds 110 bpm, that person is undergoing heat stress, which will require the work period to be reduced in 15 minute intervals, while maintaining the same rest period, until post work period pulse monitoring is maintained below 110 bpm. In addition, should a person's body weight change at the end of the work day by more than 1.5 percent, the work period must be reduced in 15 minute intervals, while maintaining the same rest period, until no daily body weight changes greater than 1.5 percent are observed.

Field activities, in which site personnel are required to wear chemical protective clothing at ambient temperatures higher than 95 degrees F, will be avoided, whenever feasible, by scheduling these activities during the work day to avoid peak ambient temperatures (10 a.m. - 2 p.m.). Site personnel who have experienced a heat-related illness (heat cramps, heat exhaustion) will be restricted to Level D tasks for a minimum of one day after illness occurrence and will return to tasks requiring chemical protective clothing only with the concurrence of the attending physician. Site personnel will follow OHM's Standard Operating Procedure (SOP) for heat stress prevention.

TASK SPECIFIC HAZARDS

Task 1 - Mobilization site preparation

Principle Steps Set-up work zones and support facilities, decontamination	
Potential Hazards Involved	Hazard Control Measures
Manual lifting and material handling hazards	<ul style="list-style-type: none"> - Employees will make certain the load can be safely lifted - No loads over 60 pounds will be lifted - Proper lifting techniques will be utilized - Follow OHM SOP for Personnel Lifting Safety (No. 2-3) - Follow procedures on MSDS when handling/ pouring concrete
Electrical hazards	<ul style="list-style-type: none"> - Electrical work will only be performed by approved electricians - No electrical work should be done on an energized circuit/circuit must be tested - Follow OHM SOP for Lockout/tagout (No. 6-4) - Hand tools must be grounded or double insulated - GFI must be used - Follow OHM SOP for Electrical Safety (No. 2-5)
Slips, trips, and falls	<ul style="list-style-type: none"> - Tools and debris must be picked up - Spills will be cleaned up immediately - Personnel shall not walk or climb on equipment not designed as walking surfaces - Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Underground utility hazards	<ul style="list-style-type: none"> - Locate all buried utilities and pipelines prior to
Overhead electrical utility hazards	<ul style="list-style-type: none"> - Maintain 15-foot buffer between heavy equipment and overhead electrical utilities
Portable power tool hazard	<ul style="list-style-type: none"> - All hand tools and power tools shall be in good repair - When working, overhead tools will be secured when not in use - Tools cannot be thrown or dropped from heights - Follow OHM SOP for Equipment and Hand Tools (No. 7-7)

Task 2 – Obtain Soil Samples

Principle Steps Set up hand auger; obtain sample with hand auger; prepare sample	
Potential Hazards Involved	Hazard Control Measures
Slips, trips, and falls	<ul style="list-style-type: none">- Tools and debris must be picked up- Spills will be cleaned up immediately- Personnel shall not walk or climb on equipment not designed as walking surfaces- Follow OHM SOP for Slips, Trips and Falls (No. 2-4 & 2-9)
Exposure to hazardous materials	<ul style="list-style-type: none">- Follow this SHSP, Section 3.1 and 5.2
Manual lifting and material handling hazards	<ul style="list-style-type: none">- Do not carry personnel or lift anyone except in an approved safety platform- Employees will make certain the load can be safely lifted- No loads over 60 pounds will be lifted- Proper lifting techniques will be utilized- Follow OHM SOP for Lifting Safety (No. 2-3)

Task 3 Excavate contaminated soil/stabilize/backfill

Potential Hazards	Hazard Control Measures
Struck by, Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> • Restrict entry to the work area to authorized personnel • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times
Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits (60 pounds maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large awkward loads
Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways of equipment, construction debris and other materials • Mark, identify or barricade other obstructions • Use body harness and lifeline when working 6 feet or more above the ground • Use approved ladders in accordance with OHM Health and Safety Procedures Manual
Inhalation and contact with hazardous substances	<ul style="list-style-type: none"> • 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 specified level of protection
Fire/Explosion	<ul style="list-style-type: none"> • 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 facilities • Store flammable liquids in well ventilated areas • 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
Excavation Care-in	<ul style="list-style-type: none"> • All underground installations will be located and marked • All materials must be kept 2 feet from the excavation edge • Daily inspections of the excavations will be conducted by a competent person and soil type determined • The OHM excavation permit will be used • Excavations for piping trenches and others requiring personnel entry will not be greater than 4 feet deep • Excavations with potential hazardous atmosphere must be tested O₂/LEL/toxic • Follow OHM SOP for excavation
Utility (electric/gas)	<ul style="list-style-type: none"> • Locate all buried utilities prior to excavation operations • Maintain 15-foot buffer between heavy equipment and overhead electrical utilities

Task 4 – Loadout and Transport Contaminated Soil

Potential Hazards	Hazard Control Measures
Struck by, Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> • Restrict entry to the work area to authorized personnel • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times
Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits (60 pounds maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large awkward loads
Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways of equipment, construction debris and other materials • Mark, identify or barricade other obstructions • Use body harness and lifeline when working 6 feet or more above the ground • Use approved ladders in accordance with OHM Health and Safety Procedures Manual
Inhalation and contact with hazardous substances	<ul style="list-style-type: none"> • 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 specified level of protection
Vehicle	<ul style="list-style-type: none"> • Operate in a safe and legal manner • Wear seat belts • Drive at posted and safe speeds

Task 5 Decontaminate Equipment

Potential Hazards	Hazard Control Measures
Struck by, Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> • Use 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, or splash/face shields and goggles, and steel-toe safety boots at all times
Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects
High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits (60 pounds maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large awkward loads • Do not exceed equipment load specifications • Do not suspend loads over ground personnel • Ground personnel near cleaning vats wear splash shield and apron
Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways of equipment, construction debris and other materials • Mark, identify or barricade other obstructions • Use body harness and lifeline when working 6 feet or more above the ground • Use approved ladders in accordance with OHM Health and Safety Procedures Manual
Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> • 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 splash shield and saran coveralls when soaking, handling wet materials, pressure washing • Collect and contain spent wash water for proper disposal
Burns	<ul style="list-style-type: none"> • Use proper gloves, face shield/safety goggles, shin and toe guards, and splash suits to protect workers from skin burns and injury when operating hot water/steam laser (high pressure washers)

Task 6 – Demobilization

Potential Hazards	Hazard Control Measures
Struck by, Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> • Use reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Restrict entry to the work area to authorized personnel • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times
Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits (60 pounds maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large awkward loads • Do not exceed equipment/crane load specifications when hoisting loads • Do not suspend loads over ground personnel
Electrical Shock	<ul style="list-style-type: none"> • De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs, cords, and receptacles out of water • Use approved water-proof, weather-proof type if exposure is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout/Tagout procedures in accordance with OHM Health and Safety Procedures Manual
Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways of equipment, construction debris and other materials • Mark, identify or barricade other obstructions • Use body harness and lifeline when working 6 feet or more above the ground • Use approved ladders in accordance with OHM Health and Safety Procedures Manual

3.3 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:

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.

MSDSs

There will be an MSDS located on site for each hazardous chemical known to be or used on site. All MSDSs will be located in Appendix A of the site safety plan. The site safety plan can be found in the project office trailer.

Employee Information and Training

Training employees on chemical hazards is accomplished through an 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 Attachment of the site safety plan to find listed MSDSs for chemicals anticipated to be brought to the site by OHM.

4.0 SITE CONTROL

4.1 WORK ZONES

Site operations will be segregated in three work zones: an Exclusion Zone (EZ); where potential exposures to site contaminants exists; a Contamination Reduction Zone (CRZ) where personnel and equipment decontamination operations are performed; and a Support Zone (SZ) where site support facilities are located. The boundary of the EZ/CRZ will be marked with warning signs or barrier tape and access control points will be designated to restrict access to authorized personnel. A site map depicting these work zones will be developed during site mobilization and posted. The Buddy System will be implemented on-site for those tasks performed in the EZ.

4.2 SITE COMMUNICATIONS

On-site communications will be established between site work zones and will consist of verbal communications, line of sight observations, or two-way radios. Off-site communications will be established in the support zone to summon off-site emergency services and will consist of either on-site cellular telephones or identifying the location of the nearest telephone to the site.

4.3 SAFE OPERATING PROCEDURES

OHM Health and Safety procedures apply to OHM's hazardous waste and emergency response operations. These procedures are contained in OHM's Health and Safety Procedures Manual that is reviewed with and provided to site supervisors during OSHA Supervisors Training. Questions on the applications of these procedures to site operations should be directed to the Regional Health and Safety Manager. Project-specific procedures are attached to this plan.

5.0 PERSONAL PROTECTIVE EQUIPMENT

The following Levels of Protection are designated for each task performed in site work zones, based on the hazards posed by each task. Modifications of these Levels of Protection are provided for those tasks with specific personal protective equipment requirements. An upgrade/downgrade in the designated Level of Protection may only be instituted for those tasks where more than one level of protection is specified (i.e., Mod D/C) and only after air monitoring results justify the upgrade/downgrade, based on the action levels listed in this plan. For those tasks where more than one level of protection are specified (i.e., Mod D/C) the first level of protection (Mod D) is the initial level of protection required for the task, with the second level (Level C) being either the downgrade or upgrade level of protection.

NO CHANGES TO THE DESIGNATED LEVEL OF PROTECTION BELOW SHALL BE MADE FOR THOSE TASKS WHERE ONLY ONE LEVEL OF PROTECTION IS SPECIFIED WITHOUT AN AMENDMENT TO THIS PLAN AND THE APPROVAL OF THE REGIONAL HEALTH AND SAFETY MANAGER/DIRECTOR

- Task 1: Mobilization/Site Preparation
- Level of Protection: Level D

- Task 2: Obtain soil sample
- Level of Protection: Level C with Tyvek

- Task 3: Excavate contaminated soil, stabilize and backfill
- Level of Protection: Excavate Level C with Tyvek; Backfill Level D

- Task 4: Loadout and transport contaminated soil
- Level of Protection: Level C with Tyvek Truck driver Level D

- Task 5: Decontaminate equipment
- Level of Protection: Pressuring washing Level Modified D with Sarans and Face shield Dry brushing Level Modified D with Tyvek

- Task 6: Demobilization
- Level of Protection: Level D

Personal protective equipment requirements for the above designated Levels of Protection is as

follows:

LEVEL B

Respiratory Protection: SCBA or Airline Respirator w/ 5 min. egress

Protective Clothing: Sarans

Boots/Booties: Tingleys

Gloves (inner/outer): Latex/Nitrile

Head/Face Protection: Hard Hat/Splash Shield as required by task

LEVEL C

Respiratory Protection: Full Face piece Respirator (MSA Ultra Twin)

Respirator Cartridge: GMC-H

Protective Clothing: Tyvek or Sarans

Boots/Booties: Tingleys

Gloves (inner/outer): Latex/Nitrile

Head/Face Protection: Hard Hat/Splash Shield as required by task

MODIFIED LEVEL D

Protective Clothing: Tyvek

Boots/Booties: Tingleys

Gloves (inner/outer): Latex/Nitrile

Head/Face Protection: Hard Hat

Eye Protection: Safety glasses

LEVEL D

Boots: Steel Toe/Shank Boots

Head/Face Protection: Hard Hat

Eye Protection: Safety Glasses

OHM's Respiratory Protection Health and Safety Procedures apply to the use, maintenance, and care of air-purifying and supplied air respirators. When specifying air-purifying respirators, the selection criteria for their use in Level C Protection must be met which includes: air contaminants with adequate warning properties; adequate cartridge adsorption efficiency; adequate oxygen atmosphere (20.9%) present; and non-IDLH concentrations present. Respirator cartridges will be changed daily and when personnel experience increased breathing resistance or chemical breakthrough when wearing the respirator.

Supplied-air respirators will only be used with Grade D breathing air. Airline respirator wearers will be connected to a bank of breathing air cylinders with the total length of airline hose no greater than 250 feet. The breathing air cylinder bank (six-pack) will be equipped with a pressure gauge/regulator and alarm.

Respirators will be cleaned and inspected by the wearer at least daily. Wearers are prohibited: from having facial hair that interferes with the respirator's fit; from wearing eyeglasses under the facepiece (spectacle inserts required for prescription glasses wearers); and from wearing contact lenses with respirators. Respirator wearers must be medically qualified and fit tested before being issued a respirator and annually thereafter.

6.0 DECONTAMINATION PROCEDURES

Personnel and equipment decontamination procedures will be developed, communicated to site personnel, and implemented on-site before work commences in the EZ. Standard work practices that minimize personnel and equipment contamination may include one or more of the following, where feasible: avoiding obvious areas of contamination on-site; using remote handling/sampling equipment; covering instruments/equipment; wearing disposable outer garments; and enclosing contaminant source with sheeting/overpacks.

All personnel exiting the EZ will perform personnel decontamination procedures. Contaminated disposable clothing will be bagged or drummed and disposed of accordingly. Contaminated equipment will be decontaminated using a high pressure washer, steam cleaner or other appropriate washing techniques. Wash water will be collected and disposed of accordingly. The SSO will monitor these decontamination procedures to determine their effectiveness and will take corrective measures when warranted.

The following personnel decontamination sequence will apply for standard Level B and C protection:

- | | |
|----------------------------------|----------------------------------|
| (1) Equipment Drop | (6) Remove one pr. latex gloves |
| (2) Outer Boot Wash/Removal | (7) Remove Respirator Face piece |
| (3) Outer Glove Wash/Removal | (8) Wash/Sanitize Respirator |
| (4) Remove SCBA/SAR & Egress (B) | (9) Remove Inner Gloves |
| (5) Remove Outer Coverall | (10)Field Wash Hands, Face, Neck |

7.0 AIR MONITORING

Air monitoring will be conducted to identify potential overexposure and IDLH conditions on-site and to document that the proper level of protection is worn by personnel during site operations. IDLH conditions will be monitored during initial entries and practically through the course of the project, when the potential for an IDLH condition exist. Potential overexposure conditions will be periodically monitored through the course of the project when: work begins in a uncharacterized portion of the site; additional contaminants are identified on-site; initiating tasks posing an overexposure potential; handling leaking drums or working in areas of obvious liquid contamination.

Site personnel with the greatest overexposure potential will be monitored in applying action levels for upgrading/downgrading the level of protection worn by personnel performing similar tasks. Air monitoring instruments will be calibrated and operated according to the manufacturer's instructions by the SSO. Daily background reading will be taken before site operations begin. PID Action levels are readings above background in personnel breathing zone for a sustained 10 minute period of time. LEL/O₂ Action Levels are readings taken inside confined spaces or tanks for the purpose of performing Hot Work or Confined Space Entries, with results recorded on the Hot Work/Confined Space Entry Permit. Air monitoring results will be recorded in the SSO's Logbook. The following air monitoring procedures will be implemented on-site:

Instrument: LEL/O₂ Meter

Task 2,3,4 Monitored/Frequency: Perform at start up and four times per day during all tasks
Action Levels/Required Actions: Work areas must be less than 10% LEL and equivalent to 20.9% O₂ prior to and during the course of operations in an area

Instrument: PID Meter

Task 2,3,4 Monitored/Frequency: At start up and four times during all tasks
Action Levels/Required Actions: Greater than 5 ppm Upgrade to Level C Greater than 500 ppm Upgrade to Level B.

Instrument: Miniram Particulate Monitor

Task 2,3,4 Monitored/Frequency: Perform at start up and periodic during all tasks
Action Levels/Required Actions: Greater than 0.1 mg/m³ above background Upgrade to Level C and Greater than 0.5 mg/m³ above background apply dust suppression agent

8.0 EMERGENCY RESPONSE PLAN

8.1 PRE-EMERGENCY PLANNING

Before starting site operations, the SSO will implement emergency procedures that include: identifying the location and route to emergency medical services; establishing site communications; designating emergency warning signal and evacuation routes; inventorying emergency equipment; and communicating emergency procedures to personnel.

8.2 PERSONNEL ROLES, LINES OF AUTHORITY AND COMMUNICATION

The SSO takes the lead during site emergencies until off-site emergency responders arrive on-site. In cases of major emergencies, OHM personnel will evacuate the site, contact local emergency responders, and rely on them to handle the emergency. Minor emergencies that are controllable on-site with emergency equipment located at the site will be addressed by OHM personnel with the approval of the SSO.

8.3 EMERGENCY RECOGNITION AND PREVENTION

The SSO will conduct an initial site safety briefing to review the requirements of the site safety plan with site personnel. This briefing will include discussions on the recognition, prevention and control of emergencies anticipated on-site. Daily safety meetings will be held to emphasize emergency prevention and control measures.

8.4 SAFE DISTANCE AND PLACES OF REFUGE

The on-site assembly point will be located in the SZ where site personnel are accounted for and emergency services are contacted. The SSO will evaluate the emergency situation based on the hazards posed to site personnel remaining at the on-site assembly point, then determine the need and location of further off-site evacuation and assembly points.

8.5 SITE SECURITY AND CONTROL

Access to the site will be controlled by the SSO until local emergency responders arrive. The SSO will then relinquish site security/control to the authorized emergency response organization.

8.6 EVACUATION ROUTES AND PROCEDURES

The emergency evacuation signal will be one long blast with an air horn. Evacuation routes will be designated that direct evacuation from the EZ in an upwind direction. In cases of uncontrollable emergencies such as fire, explosion, or toxic vapor release, a site evacuation shall be implemented as follows:

- Sound the emergency warning signal.
- Stop work activities and evacuate the EZ in an upwind direction.
- Assemble in the SZ and account for personnel. Dispatch a response team equipped with appropriate PPE (minimum Level B protection) and rescue unaccounted personnel.
- Contact off-site emergency response services.

8.7 EMERGENCY DECONTAMINATION PROCEDURES

Personnel will be decontaminated to the extent feasible (gross decon or deluge shower) but life saving and first aid procedures take priority over personnel decontamination efforts. Standard personnel decontamination procedures apply for those injuries deemed non-life threatening by the SSO.

8.8 EMERGENCY MEDICAL TREATMENT AND FIRST AID

In the absence of reasonably accessible medical services, an SSO trained in first aid by the American Red Cross or the equivalent will be available on-site to render first aid. An industrial first aid kit available on-site, with its contents approved by OHM's consulting physician. The contents of the first aid kit will be checked by the SSO weekly, with expendable items replaced when used.

8.9 EMERGENCY ACTIONS

If actual or suspected serious injury occurs on-site implement the following emergency actions:

- Remove the exposed/injured person(s) from immediate danger.

- Render first aid if necessary. Decontaminate injured after critical first-aid has been administered.
- Obtain paramedic services or ambulance transport to local hospital. This procedure shall be followed even if there is no visible injury.
- Other personnel in the work area shall be evacuated and assembled at the SZ until the SSO determines that it is safe to resume work.

8.10 RESPONSE FOLLOW-UP

The SSO must complete an incident investigation form for site emergencies within 24 hours of the incident and submit/fax it to their Division Manager. Incidents involving potential Lost Time Accident (LTA) injuries, overexposure incidents, or emergencies causing site evacuations must be reported within 24 hours after incident occurrence to:

Angelo Liberatore
Regional Health and Safety Manager
Phone: 770/453-7671 (work)
770/476-0112 (home)
Fax: 770/729-3905

The SSO will identify the cause(s) of the incident and take action to prevent reoccurrence. The SSO will also evaluate the effectiveness of the site's emergency response procedures and institute corrective actions when warranted.

8.11 EMERGENCY EQUIPMENT ON-SITE

The following emergency equipment are located on-site:

- Fire Extinguishers @ OHM Vehicle
- Industrial First Aid Kit @ OHM Vehicle
- Portable Eye wash/Shower @ OHM Vehicle

8.12 EMERGENCY CONTACTS

The following emergency contacts will be identified during project mobilization and conspicuously posted in the SZ.

	Name	Phone Number
Hospital:	<u>USMC Base Hospital (on Base)</u>	<u>(910) 451-1840</u>
	<u>Onslow County Hospital (off Base)</u>	<u>(910) 577-2240</u>
Fire Dept.:	<u>911 (on Base)</u>	
Police Dept.:	<u>911 (on Base) (910) 451-3855 (off base)</u>	

Location and Route to Hospital: See attached map

Insert route to hospital below:

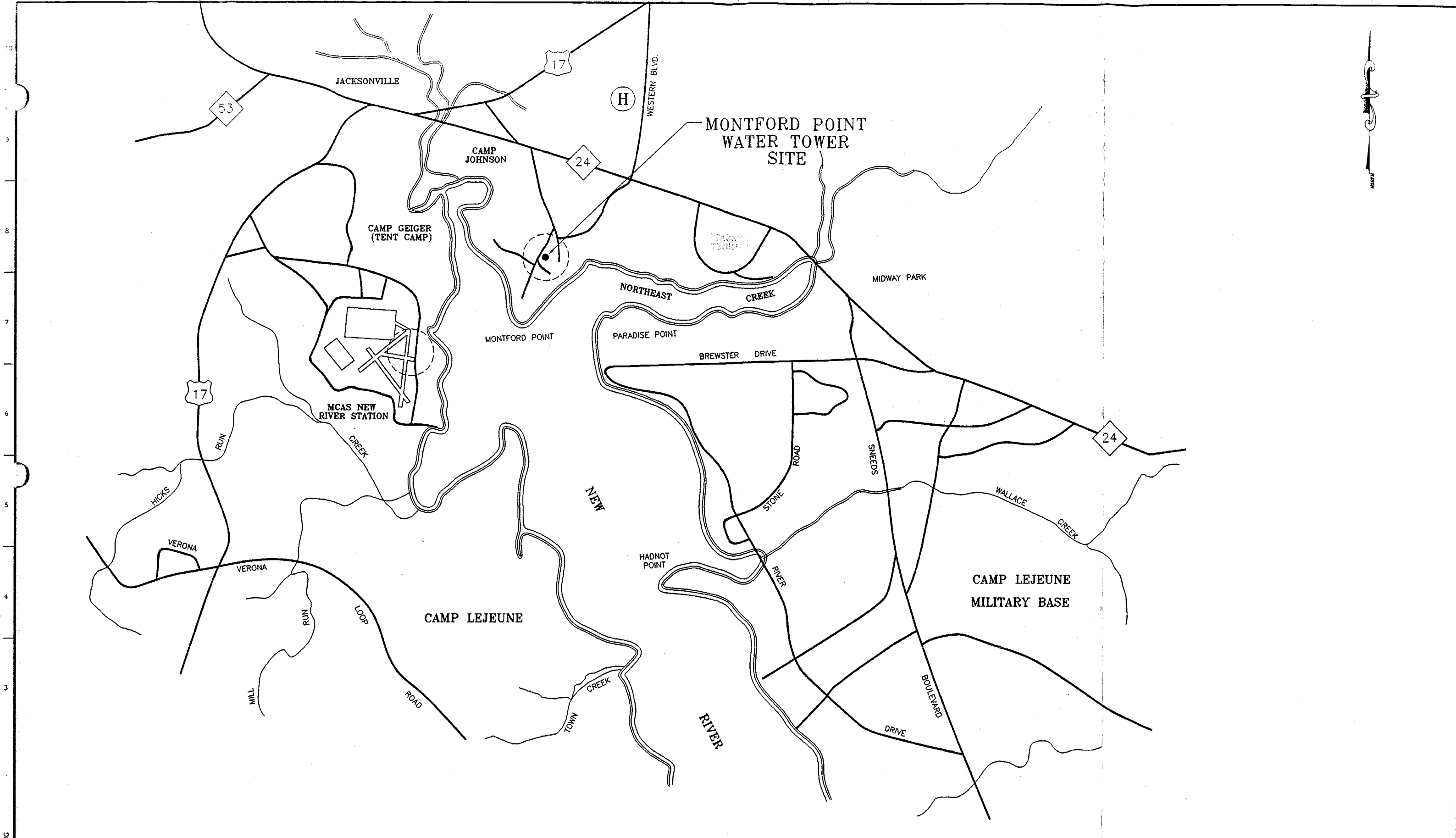
On Base

1. Proceed north on Holcomb Boulevard and turn left.
2. Base hospital is approximately ½ mile ahead on right
3. Follow signs to the emergency room entrance

Off Base

1. Proceed north on Holcomb Boulevard and exit MCB Camp Lejeune through the main gate.
2. Follow Highway 24 West (approximately 2.5 miles) to Western Boulevard and turn right (north)
3. Continue on Western Boulevard (approximately 1.5 miles) to the fifth stoplight and the hospital is on the left side of the street
4. Follow signs to the emergency room entrance

A map depicting the route to the Onslow County Memorial Hospital and the Base Naval Hospital will be posted in each trailer.



OHM Remediation Services Corp.
 Norcross, Georgia
 A Subsidiary of OHM Corporation

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

AT FULL SCALE (IF NOT 2"=SCALE ACCORDINGLY)		REVISIONS			
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
	1				

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND

ATLANTIC DIVISION

NAVAL STATION NORFOLK, VIRGINIA

CONTRACT DELIVERY ORDER NO.

OHM PROJECT No. 19688 MARINE CORPS BASE, CAMP LEJEUNE, N.C.

DRAWING NUMBER: _____

SHEET NUMBER: _____ of _____

DATE: 5/16/97

U:\OHM\319688\517.WG

9.0 SITE SAFETY PLAN CERTIFICATIONS

This site safety plan complies with the appropriate sections of 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response". Only site personnel meeting the training and medical surveillance requirements of 29 CFR 1910.120 are authorized to perform hazardous waste operations or emergency response at this site. This Site Safety Plan has been approved by Mark Wilson on 8/8/97.

Appendix A

Material Safety Data Sheets

Anti-fog
Bleach
Breathing air
Diesel fuel
Fire extinguishers
Gasoline
Gear lube
Grease
Hydraulic oil

Hydrogen cyanide (calibration gas)
Hydrogen sulfide (calibration gas)
Isobutylene (calibration gas)
Isopropyl alcohol
Liquid detergent
Methane (calibration gas)
Motor oil
Pentane (calibration gas)
Starting fluid
WD-40

MATERIAL SAFETY DATA SHEET

BAUSCH & LOMB, INCORPORATED
PERSONAL PRODUCTS DIVISION

Page 1 of 5

Effective Date: August 30, 1995

Supersedes: NA

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: SIGHT SAVERS brand ANTI-FOG LIQUID
 Product Code: 24, 25, 68, 69, 8565, 8569, 8570, 143060
 Chemical Family: NA

For Information: 1-800-553-5340
 For Emergency: 1-800-553-5340

Manufacturer: Bausch & Lomb, Inc.
 Personal Products Division
 P. O. Box 450
 1400 N. Goodman St.
 Rochester, New York 14692

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT:	CAS #	PERCENTAGE (W/V)	EXPOSURE STANDARDS/GUIDELINES*				
			OSHA		ACGIH		
			TWA	STEL	TWA	STEL	UNITS
Isopropyl alcohol	67-63-0	12	400	500	400	500	ppm
Dipropylene glycol methyl ether	34590-94-8	2	100	150	100	150	ppm

Other components considered as non-hazardous ingredients

NE = Not Established
 STEL = Short Term Exposure Limit
 OSHA = Occupational Safety & Health Administration

NA = Not Applicable
 TWA = Time Weighted Average
 ACGIH = American Conference of Governmental Industrial Hygienists

Section 3: HAZARDS IDENTIFICATION

PRECAUTIONS TO CONSIDER: This product is intended to be used to clean lenses in personal items such as eyewear, face shields, etc. This product is not intended to be ingested nor administered through any other routes of exposure. If you are sensitive to any ingredient in this product, do not use.

EYE CONTACT: This product is intended to be used per label instructions. Avoid eye contact. In the event of accidental eye contact flush with water for 15 minutes and obtain medical assistance.

SKIN CONTACT: This product is intended to be used per label instructions. Discontinue use if skin irritation develops.

INGESTION: In the event of ingestion of this product or any other untoward events, contact a Poison Control Center or other emergency service and obtain the appropriate medical attention. Accidental ingestion of Sight Savers Anti-fog liquid may cause gastric and intestinal irritation. Ingestion of larger quantities may cause nausea, vomiting, headache, dizziness, abdominal pain or related gastrointestinal disturbance. Give fluids and seek medical care.

INHALATION: Normal use of this product will not present an inhalation hazard. An acute exposure to high concentrations, as from a large spill, may result in upper respiratory tract irritation and central nervous system depression. Move to fresh air and seek medical attention.

CARCINOGENICITY: None of the ingredients contained in this product are listed under IARC, NTP or 29 CFR 1910 subpart Z (as a suspect or known carcinogen).

Section 4: FIRST AID MEASURES

SKIN, INGESTION, INHALATION: Skin irritation is not expected. Should irritation develop discontinue use. This product is not intended to be ingested or taken internally. In the event of ingestion of contents or any untoward events, contact a Poison Control Center or other emergency service and obtain the appropriate medical attention. Refer to the statements in sections 3 and 11.

Section 5: FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES: This product is flammable.

FLASH POINT: 88° F Method: closed cup

FLAMMABLE LIMITS: Lower Flammable Limit: NA Upper Flammable Limit: NA

AUTO IGNITION TEMPERATURE: NA

HAZARDOUS DECOMPOSITION/ COMBUSTION PRODUCTS: Carbon dioxide and carbon monoxide.

Section 5: FIRE FIGHTING MEASURES - CONTINUED

FIRE FIGHTING INSTRUCTIONS: As with all fires, evacuate personnel to safe area. Normal fire fighting procedures may be used.
EXTINGUISHING MEDIA: Use foam, CO₂, dry chemical, or water fog.

Section 6: ACCIDENTAL RELEASE MEASURES

SPILL: Remove sources of ignition and absorb with vermiculite or other absorbent. Use respiratory protection and gloves.
DISPOSAL: Dispose of in accordance with all applicable Federal, State, and local environmental regulations. This product does not meet the definition of hazardous waste per 40 CFR, Part 261.11

Section 7: HANDLING AND STORAGE

HANDLING/STORAGE CONDITIONS: This product is stable and non-reactive. Keep away from heat, sparks and flame.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

The following information assumes and pertains to situations where an event (such as warehouse storage or an industrial accident) occurs with large quantities of this product.

ENGINEERING CONTROLS: Not Applicable

RESPIRATORY PROTECTION:

Ventilation: General room ventilation
Respirator: A respirator with organic vapor cartridges should be used for spill cleanup.

SKIN AND EYE PROTECTION:

Eye protection should be worn to protect against splash hazards and gloves should be used to prevent prolonged skin contact during spill cleanup.

ADDITIONAL PROTECTIVE CLOTHING & EQUIPMENT:

Not Applicable

HYGIENIC WORK PRACTICES:

No special work practices are required.

Section 9 PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT APPEARANCE: Purple liquid. Refer to product labeling for description.
ODOR: Slight odor of rubbing alcohol.
PHYSICAL STATE: Liquid

CHEMICAL PROPERTIES:

BOILING POINT:	212 ° F	MELTING POINT:	NA
VAPOR PRESSURE:	30 mm. @ 77 ° F	VAPOR DENSITY:	NA
SOLUBILITY IN WATER:	Soluble	SPECIFIC GRAVITY:	1.0
VISCOSITY:	Same as water	EVAPORATION RATE:	<1 (i.e. Butyl Acetate = 1)
pH:	7	% VOLATILE:	100%
MOLECULAR WEIGHT:	NA	FREEZING POINT:	0 ° C or 32 ° F

Section 10: STABILITY AND REACTIVITY

GENERAL STABILITY CLASSIFICATION: This product is stable and non-reactive.
INCOMPATIBLE MATERIALS/ CONDITIONS TO AVOID: Prevent contact with strong acids and bases, as with water.
HAZARDOUS DECOMPOSITION: None

Section 11: TOXICOLOGICAL INFORMATION

TOXICITY: Under normal use of this product (per label instructions) there is low toxicity potential associated with this product.

<u>COMPONENT</u>	<u>PERCENTAGE (W/W)</u>	<u>TOXICOLOGICAL DATA</u>
Isopropyl alcohol	12	LCLo 16,000 ppm/4 hours
Dipropylene glycol methyl ether	2	LD ₅₀ (dog) 7500 mg/kg

Section 12: ECOLOGICAL INFORMATION

Ecological effects have not been determined at this time.

Section 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable Federal, State, and local environmental regulations. This product does not meet the definition of hazardous waste per 40 CFR, Part 261.11

Section 14: TRANSPORT INFORMATION

There is no unreasonable risk (health, safety or property) that this product would pose when transported in commerce. Hazard class definitions (49 CFR, Part 173) are not applicable to this product.

Section 15: REGULATORY INFORMATION

TSCA: NA

CERCLA: NA

SARA TITLE III:

- SECTION 302 (Extremely Hazardous Substances): NA
- SECTION 311/312 (Hazard Categories): NA
- SECTION 313 (Toxic Chemicals): NA

TSCA = Toxic Substance Control Act

CERCLA = Comprehensive Response Compensation, and Liability Act

Sara Title III = Superfund Amendment and Reauthorization Act

SECTION 16: OTHER INFORMATION

The information contained herein is provided upon request without warranty of any kind. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Users should make independent determinations of the suitability and completeness of information from other sources to assure proper use and disposal of these materials and the safety and health of employees and customers. Bausch and Lomb Incorporated recommends that use of this product is in accordance with product labeling and appropriate safety practices and handling procedures.

MATERIAL SAFETY DATA SHEET

BAUSCH & LOMB, INCORPORATED
PERSONAL PRODUCTS DIVISION

Page 1 of 5

Effective Date: August 30, 1995

Supersedes: NA

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: SIGHT SAVERS brand ANTI-FOG LIQUID WITHOUT SILICONE

Product Code: 68GM, 69GM, 8565GM, 8569GM, 8570GM, 143060GM

For Information: 1-800-553-5340

Chemical Family: NA

For Emergency: 1-800-553-5340

Manufacturer: Bausch & Lomb, Inc.
 Personal Products Division
 P. O. Box 450
 1400 N. Goodman St.
 Rochester, New York 14692

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT:	CAS #	PERCENTAGE (W/V)	EXPOSURE STANDARDS/GUIDELINES*				
			OSHA		ACGIH		
			TWA	STEL	TWA	STEL	UNITS
Isopropyl alcohol	67-63-0	12	400	500	400	500	ppm
Dipropylene glycol methyl ether	34590-94-8	2	100	150	100	150	ppm

Other components considered as non-hazardous

NE = Not Established
 STEL = Short Term Exposure Limit
 OSHA - Occupational Safety & Health Administration

NA = Not Applicable
 TWA = Time Weighted Average
 ACGIH = American Conference of Governmental Industrial Hygienists

Section 3: HAZARDS IDENTIFICATION

PRECAUTIONS TO CONSIDER: This product is intended to be used to clean lenses in personal items such as eyewear, face shields, etc. This product is not intended to be ingested nor administered through any other routes of exposure. If you are sensitive to any ingredient in this product, do not use.

EYE CONTACT: This product is intended to be used per label instructions. Avoid eye contact. In the event of accidental eye contact flush with water for 15 minutes and obtain medical assistance.

SKIN CONTACT: This product is intended to be used per label instructions. Discontinue use if skin irritation develops.

INGESTION: In the event of ingestion of this product or any other untoward events, contact a Poison Control Center or other emergency service and obtain the appropriate medical attention. Accidental ingestion of Sight Savers Anti-fog Liquid may cause gastric and intestinal irritation. Ingestion of larger quantities may cause nausea, vomiting, headache, dizziness, abdominal pain or related gastrointestinal disturbance. Give fluids and seek medical care.

INHALATION: Normal use of this product will not present an inhalation hazard. An acute exposure to high concentrations, as from a spill, may result in upper respiratory tract irritation and central nervous system depression. Move to fresh air and seek medical care.

CARCINOGENICITY: None of the ingredients contained in this product are listed under IARC, NTP or 29 CFR 1910 subpart Z (as a suspect or known carcinogen).

Section 4: FIRST AID MEASURES

SKIN, INGESTION, INHALATION: Skin irritation is not expected. However, should irritation develop discontinue use. This product is not intended to be ingested or taken internally. In the event of ingestion of contents or any untoward events, contact a Poison Control Center or other emergency service and obtain the appropriate medical attention. Refer to the statements in sections 3 and 11.

Section 5: FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES: This product is flammable.

FLASH POINT: 88° F Method: closed cup

FLAMMABLE LIMITS: Lower Flammable Limit: NA Upper Flammable Limit: NA

AUTO IGNITION TEMPERATURE: NA

HAZARDOUS DECOMPOSITION/ COMBUSTION PRODUCTS: Carbon dioxide and carbon monoxide.

Section 5: FIRE FIGHTING MEASURES - CONTINUED

FIRE FIGHTING INSTRUCTIONS: As with all fires, evacuate personnel to safe area. Normal fire fighting procedures may be used.
EXTINGUISHING MEDIA: Use foam, CO₂, dry chemical, or water fog.

Section 6: ACCIDENTAL RELEASE MEASURES

SPILL: Remove sources of ignition and absorb with vermiculite or other absorbent. Use respiratory protection and gloves.
DISPOSAL: Dispose of in accordance with all applicable Federal, State, and local environmental regulations. This product does not meet the definition of hazardous waste per 40 CFR, Part 261.11

Section 7: HANDLING AND STORAGE

HANDLING/STORAGE CONDITIONS: This product is stable and non-reactive. Keep away from heat, sparks and flame.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

The following information assumes and pertains to situations where an event (such as warehouse storage or an industrial accident) occurs with large quantities of this product.

ENGINEERING CONTROLS: Not Applicable

RESPIRATORY PROTECTION:

Ventilation: General room ventilation
Respirator: A respirator with organic vapor cartridges should be used for spill cleanup.

SKIN AND EYE

PROTECTION: Eye protection should worn to protect against splash hazards and gloves should be used to prevent prolonged skin contact during spill cleanup.

ADDITIONAL PROTECTIVE CLOTHING & EQUIPMENT:

Not Applicable

HYGIENIC WORK

PRACTICES: No special work practices are required.

Section 9 PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT APPEARANCE: Clear liquid. Refer to product labeling for description.
ODOR: Slight odor of rubbing alcohol.
PHYSICAL STATE: Liquid.

CHEMICAL PROPERTIES:

BOILING POINT:	212 ° F	MELTING POINT:	NA
VAPOR PRESSURE:	30 mm @ 77 ° F	VAPOR DENSITY:	NA
SOLUBILITY IN WATER:	Soluble	SPECIFIC GRAVITY:	1.0
VISCOSITY:	Same as water	EVAPORATION RATE:	<1 (i.e. Butyl Acetate = 1)
pH:	7	% VOLATILE:	100%
MOLECULAR WEIGHT:	NA	FREEZING POINT:	0 ° C or 32 ° F

Section 10: STABILITY AND REACTIVITY

GENERAL STABILITY CLASSIFICATION: This product is stable and non-reactive.

**INCOMPATIBLE MATERIALS/
CONDITIONS TO AVOID:** Prevent contact with strong acids and bases, as with water.

HAZARDOUS DECOMPOSITION: None

Section 11: TOXICOLOGICAL INFORMATION

TOXICITY: Under normal use of this product (per label instructions) there is low toxicity potential associated with this product.

<u>COMPONENT</u>	<u>PERCENTAGE (W/W)</u>	<u>TOXICOLOGICAL DATA</u>
Isopropyl alcohol	12	LCLo 16,000 ppm/4 hours
Dipropylene glycol methyl ether	2	LD ₅₀ (dog) 7500 mg/kg

Section 12: ECOLOGICAL INFORMATION

Ecological effects have not been determined at this time.

Section 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable Federal, State, and local environmental regulations. This product does not meet the definition of hazardous waste per 40 CFR, Part 261.11

Section 14: TRANSPORT INFORMATION

There is no unreasonable risk (health, safety or property) that this product would pose when transported in commerce. Hazard class definitions (49 CFR, Part 173) are not applicable to this product.

Section 15: REGULATORY INFORMATION

TSCA: NA

CERCLA: NA

SARA TITLE III:

- SECTION 302 (Extremely Hazardous Substances): NA
- SECTION 311/312 (Hazard Categories): NA
- SECTION 313 (Toxic Chemicals): NA

TSCA = Toxic Substance Control Act

CERCLA = Comprehensive Response Compensation, and Liability Act

Sara Title III = Superfund Amendment and Reauthorization Act

SECTION 16: OTHER INFORMATION

The information contained herein is provided upon request without warranty of any kind. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Users should make independent determinations of the suitability and completeness of information from other sources to assure proper use and disposal of these materials and the safety and health of employees and customers. Bausch and Lomb Incorporated recommends that use of this product is in accordance with product labeling and appropriate safety practices and handling procedures.



The Clorox Company
 7200 Johnson Drive
 Pleasanton, California 94588
 Tel. (510) 847-6100

Material Safety Data Sheet

I Product: CLOROX BLEACH - FOR INSTITUTIONAL USE																
Description: CLEAR, LIGHT YELLOW LIQUID WITH CHLORINE ODOR																
Other Designations	Manufacturer															
EPA Reg. No. 5813-1 Sodium hypochlorite solution Liquid chlorine bleach Clorox Liquid Bleach Clorox Germicidal Bleach	The Clorox Company 1221 Broadway Oakland, CA 94612															
Emergency Telephone No.																
For Medical Emergencies, call Rocky Mountain Poison Center: 1-800-446-1014 For Transportation Emergencies, call: Chemtrec: 1 800-424-9300																
II Health Hazard Data	III Hazardous Ingredients															
<p>* Causes substantial but temporary eye injury. May irritate skin. May cause nausea and vomiting if ingested. Exposure to vapor or mist may irritate nose, throat and lungs. The following medical conditions may be aggravated by exposure to high concentrations of vapor or mist; heart conditions or chronic respiratory problems such as asthma, chronic bronchitis or obstructive lung disease. Under normal consumer use conditions the likelihood of any adverse health effects are low.</p> <p>FIRST AID: <u>EYE CONTACT:</u> Immediately flush eyes with plenty of water. If irritation persists, see a doctor. <u>SKIN CONTACT:</u> Remove contaminated clothing. Wash area with water. <u>INGESTION:</u> Drink a glassful of water and call a physician. <u>INHALATION:</u> If breathing problems develop remove to fresh air.</p>	<table border="1"> <thead> <tr> <th>Ingredients</th> <th>Concentration</th> <th>Worker Exposure Limit</th> </tr> </thead> <tbody> <tr> <td>Sodium hypochlorite CAS # 7681-52-9</td> <td>5.25%</td> <td>not established</td> </tr> </tbody> </table> <p>None of the ingredients in this product are on the IARC, NTP or OSHA carcinogen list. Occasional clinical reports suggest a low potential for sensitization upon exaggerated exposure to sodium hypochlorite if skin damage (e.g. irritation) occurs during exposure. Routine clinical tests conducted on intact skin with Clorox Liquid Bleach found no sensitization in the test subjects.</p>	Ingredients	Concentration	Worker Exposure Limit	Sodium hypochlorite CAS # 7681-52-9	5.25%	not established									
Ingredients	Concentration	Worker Exposure Limit														
Sodium hypochlorite CAS # 7681-52-9	5.25%	not established														
IV Special Protective and Precautions	V Transportation and Regulatory Data															
<p><u>Hygienic Practices:</u> Wear safety glasses. With repeated or prolonged use, wear gloves.</p> <p><u>Engineering Controls:</u> Use general ventilation to minimize exposure to vapor or mist.</p> <p><u>Work Practices:</u> Avoid eye and skin contact and inhalation of vapor or mist.</p> <p>Keep out of the reach of children.</p>	<p><u>U.S. DOT Hazard Class:</u> Not restricted</p> <p><u>U.S. DOT Proper Shipping Name:</u> Hypochlorite solution with not more than 7% available chlorine. Not Restricted per 49CFR172.101(e)(12)(iv).</p> <p><u>EPA CERCLA/SARA TITLE III Superfund Amendment and Reauthorization Act:</u></p> <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="3">CERCLA/304</th> </tr> <tr> <th>RQ (lbs)</th> <th>311/312</th> <th>313</th> </tr> </thead> <tbody> <tr> <td>Sodium hypochlorite</td> <td>100</td> <td>—</td> <td>—</td> </tr> <tr> <td>Sodium hydroxide</td> <td>1000</td> <td>Yes</td> <td>—</td> </tr> </tbody> </table>		CERCLA/304			RQ (lbs)	311/312	313	Sodium hypochlorite	100	—	—	Sodium hydroxide	1000	Yes	—
	CERCLA/304															
	RQ (lbs)	311/312	313													
Sodium hypochlorite	100	—	—													
Sodium hydroxide	1000	Yes	—													
VI Spill or Leak Procedures	VII Reactivity Data															
<p><u>Small Spills (<5 gallons)</u></p> <ol style="list-style-type: none"> Absorb, containerize, and landfill in accordance with local regulations. Wash down residual to sanitary sewer.* <p><u>Large Spills (>5 gallons)</u></p> <ol style="list-style-type: none"> Absorb, containerize, and landfill in accordance with local regulations; wash down residual to sanitary sewer.* - OR - (2) Pump material to waste drum(s) and dispose in accordance with local regulations; wash down residual to sanitary sewer.* 	<p>Stable under normal use and storage conditions. Strong oxidizing agent. Reacts with other household chemicals such as toilet bowl cleaners, rust removers, vinegar, acids or ammonia containing products to produce hazardous gases, such as chlorine and other chlorinated species. Prolonged contact with metal may cause pitting or discoloration.</p>															
VIII Fire and Explosion Data	IX Physical Data															
<p>Flammable or explosive. In a fire, cool containers to prevent rupture and release of sodium chlorate.</p>	<p>Boiling point 212°F/100°C decomposes)</p> <p>Specific Gravity (H₂O=1) 1.085</p> <p>Solubility in Water complete</p> <p>pH 11.4</p>															



The Clorox Company
 7200 Johnson Drive
 Pleasanton, California 94568
 Tel. (510) 847-8100

Material Safety Data Sheet

I Product: REGULAR CLOROX BLEACH								
Description: CLEAR, LIGHT YELLOW LIQUID WITH CHLORINE ODOR								
Other Designations	Manufacturer	Emergency Telephone No.						
Sodium hypochlorite solution Liquid chlorine bleach Clorox Liquid Bleach	The Clorox Company 1221 Broadway Oakland, CA 94612	Notify your Supervisor Rocky Mountain Poison Center (800) 448-1014 For Transportation Emergencies Chemtrec (800) 424-9300						
II Health Hazard Data		III Hazardous Ingredients						
<p>* Causes substantial but temporary eye injury. May irritate skin. May cause nausea and vomiting if ingested. Exposure to vapor or mist may irritate nose, throat and lungs. The following medical conditions may be aggravated by exposure to high concentrations of vapor or mist: heart conditions or chronic respiratory problems such as asthma, chronic bronchitis or obstructive lung disease. Under normal consumer use conditions the likelihood of any adverse health effects are low.</p> <p>FIRST AID: <u>EYE CONTACT:</u> Immediately flush eyes with plenty of water. If irritation persists, see a doctor. <u>SKIN CONTACT:</u> Remove contaminated clothing. Wash area with water. <u>INGESTION:</u> Drink a glassful of water and call a physician. <u>INHALATION:</u> If breathing problems develop remove to fresh air.</p>		<table border="1"> <thead> <tr> <th>Ingredients</th> <th>Concentration</th> <th>Worker Exposure Limit</th> </tr> </thead> <tbody> <tr> <td>Sodium hypochlorite CAS # 7681-52-9</td> <td>5.25%</td> <td>not established</td> </tr> </tbody> </table> <p>None of the ingredients in this product are on the IARC, NTP or OSHA carcinogen list. Occasional clinical reports suggest a low potential for sensitization upon exaggerated exposure to sodium hypochlorite if skin damage (e.g. irritation) occurs during exposure. Routine clinical tests conducted on intact skin with Clorox Liquid Bleach found no sensitization in the test subjects.</p>	Ingredients	Concentration	Worker Exposure Limit	Sodium hypochlorite CAS # 7681-52-9	5.25%	not established
Ingredients	Concentration	Worker Exposure Limit						
Sodium hypochlorite CAS # 7681-52-9	5.25%	not established						
IV Special Protection and Precautions		V Transportation and Regulatory Data						
<p><u>Hygienic Practices:</u> Wear safety glasses. With repeated or prolonged use, wear gloves.</p> <p><u>Engineering Controls:</u> Use general ventilation to minimize exposure to vapor or mist.</p> <p><u>Work Practices:</u> Avoid eye and skin contact and inhalation of vapor or mist.</p> <p><u>Keep out of the reach of children.</u></p>		<p><u>U.S. DOT Hazard Class:</u> Not restricted</p> <p><u>U.S. DOT Proper Shipping Name:</u> Hypochlorite solution with not more than 7% available chlorine. Not Restricted per 49CFR172.101(c)(12)(m).</p> <p><u>Section 313 (Title III Superfund Amendment and Reauthorization Act):</u> As a consumer product, this product is exempt from supplier notification requirements under Section 313 Title III of the Superfund Amendment and Reauthorization Act of 1986 (reference 40 CFR Part 372).</p>						
VI Spill or Leak Procedures		VII Reactivity Data						
<p><u>Small Spills</u> (<5 gallons) (1) Absorb, containerize, and landfill in accordance with local regulations. (2) Wash down residual to sanitary sewer.*</p> <p><u>Large Spills</u> (>5 gallons) (1) Absorb, containerize, and landfill in accordance with local regulations; wash down residual to sanitary sewer.* - OR - (2) Pump material to waste drum(s) and dispose in accordance with local regulations; wash down residual to sanitary sewer.*</p> <p>* Contact the sanitary treatment facility in advance to assure ability to process washed-down material.</p>		<p>Stable under normal use and storage conditions. Strong oxidizing agent. Reacts with other household chemicals such as toilet bowl cleaners, rust removers, vinegar, acids or ammonia containing products to produce hazardous gases, such as chlorine and other chlorinated species. Prolonged contact with metal may cause pitting or discoloration.</p>						
VIII Fire and Explosion Data		IX Physical Data						
<p>Not flammable or explosive. In a fire, cool containers to prevent rupture and release of sodium chlorate.</p>		<p>Boiling point 212°F/100°C decomposes</p> <p>Specific Gravity (H₂O=1) 1.085</p> <p>Solubility in Water complete</p> <p>pH 11.4</p>						



AGA Gas Inc.
 5225 Cakroze Blvd.
 P.O. Box 34737
 Cleveland, Ohio 44101-4737

Telephone
 (216) 542-6600

MATERIAL No. 10
 SAFETY
 DATA SHEET

PRODUCT NAME Compressed Air	CAS # N/A
TRADE NAME AND SYNONYMS Compressed Air; Air; Compressed Air, Breathing Quality	DOT ID No. UN 1002
CHEMICAL NAME AND SYNONYMS See last page.	DOT Hazard Class Nonflammable gas
ISSUE DATE AND REVISIONS 25 November 1985	Formula See last page. Chemical Family N/A

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT None listed (ACGIH, 1985-86)
SYMPTOMS OF EXPOSURE Air is nontoxic and necessary to support life. Inhalation of air in a high pressure environment such as underwater diving, caissons or hyperbaric chambers can result in symptoms similar to overexposure to pure oxygen. These include tingling of fingers and toes, abnormal sensations, impaired coordination and confusion. Decompression sickness pains or "bends" are possible following rapid decompression.
TOXICOLOGICAL PROPERTIES High pressure effects (greater than two atmospheres of oxygen) are on the central nervous system. Improper decompression results in the accumulation of nitrogen in the blood.
RECOMMENDED FIRST AID TREATMENT Facilities or practices at which air is breathed in a high pressure environment should be prepared to deal with the illnesses associated with decompression (bends or caisson disease). Decompression equipment may be required.

Information contained in this material safety data sheet is offered without charge for use by technically qualified personnel at their discretion and risk. All statements, technical information and recommendations contained herein are based on tests and data which we believe to be reliable, but the accuracy or completeness thereof is not guaranteed and no warranty of any kind is made with respect thereto. This information is not intended as a license to operate under or a recommendation to practice or infringe any patent of this Company or others covering any process, composition or matter of use. Since the Company shall have no control of the use of the product described herein, the Company assumes no liability for loss or damage incurred from the proper or improper use of such product.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

PHYSICAL DATA

BOILING POINT -317.3°F (-194.3°C)	LIQUID DENSITY AT BOILING POINT 54.56 lb/ft ³ (874 kg/m ³)
VAPOR PRESSURE @ 70°F (21.1°C): Above the critical temp. of -221.1°F (-140.6°C)	GAS DENSITY AT 70°F 1 atm .0749 lb/ft ³ (1.200 kg/m ³)
SOLUBILITY IN WATER Very slightly	FREEZING POINT N/A
EVAPORATION RATE N/A	SPECIFIC GRAVITY (AIR=1) 1.0
APPEARANCE AND ODOR Colorless, odorless gas	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMABLE LIMITS - BY VOLUME LEL N/A UEL N/A	
EXTINGUISHING MEDIA Nonflammable gas	ELECTRICAL CLASSIFICATION Nonhazardous		
SPECIAL FIRE FIGHTING PROCEDURES N/A			

UNUSUAL FIRE AND EXPLOSION HAZARDS

Compressed air at high pressures will accelerate the burning of materials to a greater rate than they burn at atmospheric pressure.

REACTIVITY DATA

STABILITY Unstable	CONDITIONS TO AVOID	
Stable	X	N/A
INCOMPATIBILITY (Materials to avoid) None		
HAZARDOUS DECOMPOSITION PRODUCTS None		
HAZARDOUS POLYMERIZATION May Occur	CONDITIONS TO AVOID	
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

N/A

WASTE DISPOSAL METHOD

N/A

RESPIRATORY PROTECTION - Specify type:			
N/A			
VENTILATION	LOCAL EXHAUST	N/A	SPECIAL
	MECHANICAL (Gen)	N/A	OTHER
PROTECTIVE CLOVES			
Any material			
EYE PROTECTION			
Safety goggles or glasses			
OTHER PROTECTIVE EQUIPMENT			
Safety shoes			

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION	
DOT Shipping Name: Air, compressed	DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas	I.D. No.: UN 1002
SPECIAL HANDLING RECOMMENDATIONS	
<p>Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.</p> <p>For additional handling recommendations, consult the Compressed Gas Association's Pamphlets P-1, G-7 and G-7.1.</p>	
SPECIAL STORAGE RECOMMENDATIONS	
<p>Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.</p> <p>For additional storage recommendations, consult the Compressed Gas Association's Pamphlets P-1, G-7, and G-7.1.</p>	
SPECIAL PACKAGING RECOMMENDATIONS	
<p>Dry air is noncorrosive and may be used with all materials of construction. Moisture causes metal oxides which are formed with air to be hydrated so that they increase in volume and lose their protective role (rust formation)... Concentrations of SO₂, Cl₂, salt, etc. in the moisture enhances the rusting of metals in air.</p>	
OTHER RECOMMENDATIONS OR PRECAUTIONS	
<p>Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).</p>	

CHEMICAL FORMULA: (Continued)

Atmospheric air which is compressed is composed of the following concentrations of gases:

<u>Gas</u>	<u>Molar %</u>
Nitrogen	78.09
Oxygen	20.94
Argon	0.93
Carbon Dioxide	0.033*
Neon	18.18×10^{-4}
Helium	5.239×10^{-4}
Krypton	1.139×10^{-4}
Hydrogen	0.5×10^{-4}
Xenon	0.086×10^{-4}
Radon	6×10^{-18}
Water vapor	Varying concentrations

*Concentrations may have slight variations.

Compressed air is also produced by reconstitution using only oxygen and nitrogen. This product contains 79 molar percent nitrogen and 21 molar percent oxygen plus trace amounts of other atmospheric gases which are present in the oxygen and nitrogen.



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Sheet No. 470
Diesel Fuel Oil No. 2-D

Issued: 10/81 Revision: A, 11/90

Section 1. Material Identification

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Diesel Fuel Oil No. 2-D Description: Diesel fuel is obtained from the middle distillate in petroleum separation; a distillate oil of low sulfur content. It is composed chiefly of unbranched paraffins. Diesel fuel is available in various grades, one of which is synonymous with fuel oil No. 2-D. This diesel fuel oil requires a minimum Cetane No. (efficiency rating for diesel fuel comparable to octane number ratings for gasoline) of 40 (ASTM D613). Used as a fuel for trucks, ships, and other automotive engines; as mosquito control (coating on breeding waters); and for drilling muds.
Other Designations: CAS No. 68334-30-5, diesel fuel.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*TM for a suppliers list.

R	1	
I	-	
S	2	
K	2	
		HMIS
		H 0
		F 2
		R 0
		PPG*
		* Sec. 8

Cautions: Diesel fuel oil No. 2-D is a skin irritant and central nervous depressant with high mist concentrations. It is an environmental hazard and moderate fire risk.

Section 2. Ingredients and Occupational Exposure Limits

Diesel fuel oil No. 2-D*

1989 OSHA PEL	1990-91 ACGIH TLV	1988 NIOSH REL	1985-86 Toxicity Data†
None established	Mineral Oil Mist TWA: 5 mg/m ³ † STEL: 10 mg/m ³	None established	Rat, oral, LD ₅₀ : 9 g/kg produces gastrointestinal (hypermotility, diarrhea) effects

* Diesel fuel No. 2-D tends to be low in aromatics and high in paraffinics. This fuel oil is complex mixture of: 1) >95% paraffinic, olefinic, naphthenic, and aromatic hydrocarbons, 2) sulfur (<0.5%), and 3) benzene (<100 ppm). [A low benzene level reduces carcinogenic risk. Fuel oils can be exempted under the benzene standard (29 CFR 1910.1028)]. Although low in the fuel itself, benzene concentrations are likely to be much higher in processing areas.

† As sampled by nonvapor-collecting method.

‡ Monitor NIOSH, RTECS (HZ1800000), for future toxicity data.

Section 3. Physical Data

Boiling Point Range: 340 to 675 °F (171 to 358 °C) **Specific Gravity:** <0.86
Viscosity: 1.9 to 4.1 centistoke at 104 °F (40 °C) **Water Solubility:** Insoluble
Appearance and Odor: Brown, slightly viscous liquid.

Section 4. Fire and Explosion Data

Flash Point: 125 °F (52 °C) min. **Autoignition Temperature:** >500 °F (932 °C) **LEL:** 0.6% v/v **UEL:** 7.5% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or foam to fight fire. Use a water spray to cool fire exposed containers. Do not use a forced water spray directly on burning oil since this will scatter the fire. Use a smothering technique for extinguishing fire.

Unusual Fire or Explosion Hazards: Diesel fuel oil No. 2-D is a OSHA Class II combustible liquid. Its volatility is similar to that of gas oil. Vapors may travel to a source of ignition and flash back.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective clothing. If feasible, remove containers from fire. Be aware of runoff from fire control methods. Do not release to sewers or waterways due to pollution and fire or explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Diesel fuel oil No. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: It is incompatible with strong oxidizing agents; heating greatly increases the fire hazard.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of diesel fuel oil No. 2-D can produce various hydrocarbons and hydrocarbon derivatives, and other partial oxidation products such as carbon dioxide, carbon monoxide, and sulfur dioxide.

Section 6. Health Hazard Data

Carcinogenicity: Although the IARC has not assigned an overall evaluation to diesel fuels as a group, it has evaluated occupational exposures in diesel engine exhaust as an IARC probable human carcinogen (Group 2A). It has evaluated distillate (light) diesel oils as not classifiable as human carcinogens (Group 3).

Summary of Risks: Although diesel fuel's toxicologic effects should resemble kerosene's, they are somewhat more pronounced due to additives such as sulfurized esters. Excessive inhalation of aerosol or mist can cause respiratory tract irritation, headache, dizziness, nausea, vomiting, and loss of coordination, depending on concentration and exposure time. When removed from exposure area, affected persons usually recover completely. If vomiting occurs after ingestion and if oil is aspirated into the lungs, hemorrhaging and pulmonary edema, progressing to renal infarction and chemical pneumonitis, may result. A comparative ratio of oral to aspirated lethal doses may be 1 pt vs. 5 ml. Aspiration may also result in transient CNS depression or excitement. Secondary effects may include hypoxia (insufficient oxygen in body cells), infection, pneumatoxemia, and chronic lung dysfunction. Inhalation may result in euphoria, cardiac dysrhythmias, respiratory arrest, and CNS toxicity. Prolonged or repeated skin contact may irritate hair follicles and block sebaceous glands, producing a rash of acne pimples and spots, usually on the face and legs.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Target Organs: Central nervous system, skin, and mucous membranes.

Primary Entry Routes: Inhalation, ingestion.

Acute Effects: Systemic effects from ingestion include gastrointestinal irritation, vomiting, diarrhea, and in severe cases central nervous system depression, progressing to coma or death. Inhalation of aerosols or mists may result in increased rate of respiration, tachycardia (excessively rapid heartbeat), and cyanosis (dark purplish discoloration of the skin and mucous membranes caused by deficient blood oxygenation).

Chronic Effects: Repeated contact with the skin causes dermatitis.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin: Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. If large areas of the body have been exposed or if irritation persists, get medical help immediately. Wash affected area with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard.

First Aid: Contact a physician immediately. Position to avoid aspiration.

For first aid, get appropriate in-plant, paramedic, or community medical support.

Notes to Physicians: Gastric lavage is contraindicated due to aspiration hazard. Preferred antidotes are charcoal and milk. In cases of severe aspiration pneumonitis, consider monitoring arterial blood gases to ensure adequate ventilation. Observe the patient for 6 hr. If vital signs become normal or symptoms develop, obtain a chest x-ray.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate area for large spills, remove all heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Clean up spills promptly to reduce fire or vapor hazards. Use a noncombustible absorbent material to pick up small spills or residues. For large spills, dike far ahead to contain. Pick up liquid for reclamation or disposal. Do not release to sewers or waterways due to health and fire and/or explosion hazard. Follow applicable OSHA regulations (29 CFR 1910.100). Diesel fuel oil No. 2-D spills may be environmental hazards. Report large spills.

Spill/Leak: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Designations

A Hazardous Waste (40 CFR 261.21): Ignitable waste

CLA Hazardous Substance (40 CFR 302.4): Not listed

A Extremely Hazardous Substance (40 CFR 355): Not listed

A Toxic Chemical (40 CFR 372.65): Not listed

A Designations

Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

Section 8. Special Protection Data

Eyes: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, use a NIOSH-approved respirator with a mist filter and organic vapor cartridge. For emergency or nonroutine operations (cleaning spills, or vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Hand Protection: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations that promote worker safety and productivity. Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰⁾

Emergency Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Personal Hygiene: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, or using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Use and storage conditions should be suitable for a OSHA Class II combustible liquid. Store in closed containers in a well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. To prevent static discharge, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Use nonsparking tools and explosion-proof electrical equipment. No smoking in storage or use areas.

Engineering Controls: Avoid vapor or mist inhalation and prolonged skin contact. Wear protective rubber gloves and chemical safety glasses. Skin contact with liquid or high mist concentration may occur. Additional suitable protective clothing may be required depending on working conditions. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Practice good personal hygiene and housekeeping procedures. Do not wear oil contaminated clothing. At least weekly laundering of work clothes is recommended. Do not put oily rags in pockets. When working with this material, wear gloves or use barrier cream.

Regulatory Information Data (49 CFR 172.101)

Product Name: Fuel oil

Hazard Class: Combustible liquid

UN ID: NA1993

Label: None

Packaging Exceptions: 173.118a

Packaging Requirements: None

Codebook References: 1, 5, 7, 12, 73, 84, 101, 103, 125, 127, 132, 133, 136, 143, 145

Prepared by: MJ Allison, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: AC Dartington, MD; Edited by: JR Stuart, MS

ANSUL

ANSUL FIRE PROTECTION
WARRISETTE, WI 54143-2542

MATERIAL SAFETY DATA SHEET

FORAY

QUICK IDENTIFIER in Plant Common Name:

Manufacturer's Name:	ANSUL FIRE PROTECTION, WORMALD U.S., INC.	Emergency Telephone No.:	(715) 735-7411
Address:	One Stanton Street, Marinette, WI 54143-2542	Other Information Same As:	Card:
Prepared By:	Safety and Health Department	Date Prepared:	June 1, 1989

SECTION 1 — IDENTITY

Common Name: (used on label) (Trade Name and Synonyms)	FORAY Dry Chemical Extinguishing Agent	CAS No.:	N/A
Chemical Name:	N/A This is a Mixture	Chemical Family:	Mixture
Formula:	N/A		

SECTION 2 — INGREDIENTS

PART A — HAZARDOUS INGREDIENTS				
Principal Hazardous Component(s) (chemical and common name(s)):	%	CAS No.	ACGIH TLV	Acute Toxicity Data
Muscovite Talc	Less than 5	12001-26-2	20 mppct*	NDA
Magnesium Aluminum Silicate	Less than 10	8031-18-3	10 mg/M3	NDA
*Million particles per cubic foot				
PART B — OTHER INGREDIENTS				
Other Component(s) (chemical and common name(s)):	%	CAS No.		Acute Toxicity Data
Monocammonium Phosphate	Greater than 75	7722-75-1		NDA
Ammonium Sulfate	Greater than 10	7783-20-2		NDA
Methyl Hydrogen Polysiloxane	Less than 1	63148-57-2		NDA
Yellow Pigment	Less than 0.1	5468-75-7		NDA

SECTION 3 — PHYSICAL AND CHEMICAL CHARACTERISTICS (Fire and Explosion Data)

Boiling Point:	N/A	Specific Gravity (H ₂ O = 1):	N/A	Vapor Pressure (mm Hg):	N/A
Percent Volatile by Volume (%):	N/A	Vapor Density (Air = 1):	N/A	Evaporation Rate (H ₂ O = 1):	N/A
Solubility in Water:	Slight	Reactivity in Water:	Unreactive		
Appearance and Color:	Yellow colored powder, no characteristic odor				
Flash Point:	None	Flammable Limits in Air % by Volume:	N/A	Extinguisher Media:	N/A
Special Fire Fighting Procedures:	NONE — THIS IS AN EXTINGUISHING AGENT				
Unusual Fire and Explosion Hazards:	None				

SECTION 4 — PHYSICAL HAZARDS

Stability:	Unstable <input type="checkbox"/> Stable <input checked="" type="checkbox"/>	Conditions to Avoid:	N/A
Incompatibility (Materials to Avoid):	Strong alkalis, Mg		
Hazardous Decomposition Products:	NH ₃ and/or PO _x may be evolved		

SECTION 5 — HEALTH HAZARDS

Threshold Limit Value:	OSHA nuisance dust limit of 15 mg/M ³ or ACGIH nuisance dust value of 10 mg/M ³ for the eight hour time-weighted average.		
Routes of Entry: Eye Contact:	Mildly irritating for a short period of time.		
Skin Contact:	May be mildly irritating.		
Inhalation:	Treat as a mineral dust irritant to the respiratory tract.		
Ingestion:	Not an expected route of entry.		
Signs and Symptoms:	Acute Overexposure: Transient cough, shortness of breath. Chronic Overexposure: Chronic fibrosis of the lung, pneumoconiosis.		
Medical Conditions Generally Aggravated by Exposure:	Reactive airway		
Chemical Listed as Carcinogen or Potential:	National Toxicology Program: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	IARC Monographs: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	OSHA: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

SECTION 6 — EMERGENCY AND FIRST AID PROCEDURES

Eye Contact:	Flush with large amounts of water; if irritation persists, seek Medical attention.
Skin Contact:	Wash with soap and water; if irritation persists, seek Medical attention.
Inhalation:	Remove victim to fresh air. Seek Medical attention if discomfort continues.
Ingestion:	If patient is conscious, give large amounts of water and induce vomiting. Seek Medical help.

SECTION 7 — SPECIAL PROTECTION INFORMATION

Respiratory Protection Locality Type:	Dust mask where dustiness is prevalent, or TLV exceeded. Mechanical filter respirator if exposure is prolonged.		
Ventilation:	Local Exhaust	Discretionary	Mechanical (General): Recommended
Protective Gloves:	N/A	Eye Protection:	Recommended as mechanical barrier for prolonged exposure.
Other Protective Clothing or Equipment:	If irritation occurs, long sleeves and impervious gloves should be worn.		

SECTION 8 — SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage:	Should be stored in original container or Ansul fire extinguisher.
Other Precautions:	Do not mix agents.
Steps to be Taken in Case Material is Released or Spilled:	Sweep up.
Waste Disposal Methods:	Dispose of in compliance with local, state, and federal regulations.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM RATINGS

HAZARD INDEX:	
4 Severe Hazard	<u>1</u> HEALTH
3 Serious Hazard	<u>0</u> FLAMMABILITY
2 Moderate Hazard	<u>0</u> REACTIVITY
1 Slight Hazard	
0 Minimal Hazard	

N/A = Not Applicable NOA = No Data Available



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1145 Catalyn Street
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Sheet No. 467
Automotive Gasoline, Lead-free

Issued: 10/81 Revision: A, 9/91

Section 1. Material Identification

35

Automotive Gasoline, Lead-free, Description: A mixture of volatile hydrocarbons composed mainly of branched-chain paraffins, cycloparaffins, olefins, naphthenes, and aromatics. In general, gasoline is produced from petroleum, shale oil, Athabasca tar sands, and coal. Motor gasolines are made chiefly by cracking processes, which convert heavier petroleum fractions into more volatile fractions by thermal or catalytic decomposition. Widely used as fuel in internal combustion engines of the spark-ignited, reciprocating type. Automotive gasoline has an octane number of approximately 90. A high content of aromatic hydrocarbons and a consequent high toxicity are also associated with a high octane rating. Some gasolines sold in the US contain a minor proportion of tetraethyllead, which is added in concentrations not exceeding 3 ml per gallon to prevent engine "knock." However, methyl-tert-butyl ether (MTBE) has almost completely replaced tetraethyllead.

R 1
I 2
S 2*
K 4
* Skin absorption



HMS
H 2
F 3
R 1
PPG†
† Sec. 8

Other Designations: CAS No. 8006-61-9, benzin, gasoline, gasolene, motor spirits, natural gasoline, petrol.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*TM for a suppliers list.

Cautions: Inhalation of automotive gasoline vapors can cause intense burning in throat and lungs, central nervous system (CNS) depression, and possible fatal pulmonary edema. Gasoline is a dangerous fire and explosion hazard when exposed to heat and flames.

Section 2. Ingredients and Occupational Exposure Limits

Automotive gasoline, lead-free*

1990 OSHA PELs	1990-91 ACGIH TLVs
8-hr TWA: 300 ppm, 900 mg/m ³	TWA: 300 ppm, 890 mg/m ³
15-min STEL: 500 ppm, 1500 mg/m ³	STEL: 500 ppm, 1480 mg/m ³
	1990 NIOSH REL
	None established

1985-86 Toxicity Data*
Man, inhalation, TC₅₀: 900 ppm/1 hr; toxic effects include sense organs and special senses (conjunctiva irritation), behavioral (hallucinations, distorted perceptions), lungs, thorax, or respiration (cough)
Human, eye: 140 ppm/8 hr; toxic effects include mild irritation
Rat, inhalation, LC₅₀: 300 g/m³/5 min

* A typical modern gasoline composition is 80% paraffins, 14% aromatics, and 6% olefins. The mean benzene content is approximately 1%. Other additives include sulfur, phosphorus, and MTBE.

† See NIOSH, RTECS (LX3300000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: Initially, 102 °F (39 °C); after 10% distilled, 140 °F (60 °C); after 50% distilled, 230 °F (110 °C); after 90% distilled, 338 °F (170 °C); final boiling point, 399 °F (204 °C)
Density/Specific Gravity: 0.72 to 0.76 at 60 °F (15.6 °C)
Water Solubility: Insoluble
Vapor Density (air = 1): 3.0 to 4.0

Appearance and Odor: A clear (gasoline may be colored with dye), mobile liquid with a characteristic odor recognizable at about 10 ppm in air.

Section 4. Fire and Explosion Data

Flash Point: -45 °F (-43 °C) Autoignition Temperature: 536 to 853 °F (280 to 456 °C) LEL: 1.3% v/v UEL: 6.0% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or alcohol foam as extinguishing media. Use of water may be ineffective to extinguish fire, but use water spray to knock down vapors and to cool fire-exposed drums and tanks to prevent pressure rupture. Do not use a solid stream of water since it may spread the fuel.

Unusual Fire or Explosion Hazards: Automobile gasoline is an OSHA Class IB flammable liquid and a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow to an ignition source and flash back. Automobile gasoline can also react violently with oxidizing agents.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode, and full protective clothing. When the fire is extinguished, use nonsparking tools for cleanup. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Automotive gasoline is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Automotive gasoline can react with oxidizing materials such as peroxides, nitric acid, and perchlorates.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of automotive gasoline can produce oxides of carbon and partially oxidized hydrocarbons.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC list gasoline as a possible human carcinogen (Group 2B). Although the IARC has assigned an overall evaluation to gasoline, it has not assigned an overall evaluation to specific substances within this group (inadequate human evidence).

Primary of Risks: Gasoline vapors are considered moderately poisonous. Vapor inhalation can cause central nervous system (CNS) depression and mucous membrane and respiratory tract irritation. Brief inhalations of high concentrations can cause a fatal pulmonary edema. Reported responses to gasoline vapor concentrations are: 160 to 270 ppm causes eye and throat irritation in several hours; 500 to 900 ppm causes eye, nose, and throat irritation, and dizziness in 1 hr; and 2000 ppm produces mild anesthesia in 30 min. Higher concentrations are intoxicating in 4 to 10 minutes. If large areas of skin are exposed to gasoline, toxic amounts may be absorbed. Repeated or prolonged skin exposure causes dermatitis. Certain individuals may develop hypersensitivity. Ingestion can cause CNS depression. Pulmonary aspiration after ingestion can cause severe pneumonitis. In adults, ingestion of 20 to 50 g gasoline may produce severe symptoms of poisoning.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Target Organs: Skin, eye, respiratory and central nervous systems.

Primary Entry Routes: Inhalation, ingestion, skin contact.

Acute Effects: Acute inhalation produces intense nose, throat, and lung irritation; headaches; blurred vision; conjunctivitis; flushing of the face; mental confusion; staggering gait; slurred speech; and unconsciousness, sometimes with convulsions. Ingestion causes inebriation (drunkenness), vomiting, dizziness, fever, drowsiness, confusion, and cyanosis (a blue to dark purplish coloration of skin and mucous membrane caused by lack of oxygen). Aspiration causes choking, cough, shortness of breath, increased rate of respiration, excessively rapid heartbeat, fever, bronchitis, and pneumonitis. Other symptoms following acute exposure include acute hemorrhage of the pancreas, fatty degeneration of the liver and kidneys, and passive congestion of spleen.

Chronic Effects: Chronic inhalation results in appetite loss, nausea, weight loss, insomnia, and unusual sensitivity (hyperesthesia) of the distal extremities followed by motor weakness, muscular degeneration, and diminished tendon reflexes and coordination. Repeated skin exposure can cause blistering, drying, and lesions.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin: Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard.

Give conscious victim a mixture of 2 tablespoons of activated charcoal mixed in 8 oz of water to drink. Consult a physician immediately.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Use nonsparking tools. Take up small spills with sand or other noncombustible adsorbent. Dike storage areas to control leaks and spills. Follow applicable OSHA regulations (29 CFR 1910.120).

Aquatic Toxicity: Bluegill, freshwater, LC₅₀ 8 ppm/96 hr.

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

HAZARD DESIGNATIONS

OSHA Hazardous Waste (40 CFR 261.21): Characteristic of ignitability

CERCLA Hazardous Substance (40 CFR 302.4): Not listed

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA DESIGNATIONS

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. There are no specific NIOSH recommendations. However, for vapor concentrations not immediately dangerous to life or health, use chemical cartridge respirator equipped with organic vapor cartridge(s), or a supplied-air respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Materials such as neoprene or polyvinyl alcohol provide excellent/good resistance for protective clothing. Note: Resistance of specific materials can vary from product to product.

Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰³⁾

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in closed containers in a cool, dry, well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. Avoid direct sunlight. Storage must meet requirements of OSHA Class IB liquid. Outside or detached storage preferred.

Engineering Controls: Avoid vapor inhalation and skin or eye contact. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Indoor use of this material requires explosion-proof exhaust ventilation to remove vapors. Only use gasoline as a fuel source due to its volatility and flammable/explosive nature. Practice good personal hygiene and housekeeping procedures. Wear work clothing daily.

Transportation Data (49 CFR 172.101, 102)

DOT Shipping Name: Gasoline (including casing-head and natural)

DOT Hazard Class: Flammable liquid

ID No.: UN1203

DOT Label: Flammable liquid

DOT Packaging Exceptions: 173.118

DOT Packaging Requirements: 173.119

IMO Shipping Name: Gasoline

IMO Hazard Class: 3.1

ID No.: UN1203

IMO Label: Flammable liquid

IMDG Packaging Group: II

MSDS Citation References: 26, 73, 89, 100, 101, 103, 124, 125, 127, 132, 133, 136, 138, 140, 143, 146, 153, 159

Prepared by: M A Lson, BS; Industrial Hygiene Review: DJ Wilson, CTH; Medical Review: W Silverman, MD; Edited by: JR Stuart, MS

WITCO MATERIAL SAFETY DATA SHEET

AMALIE MULTI-PURPOSE LS GEAR LUBRICANT

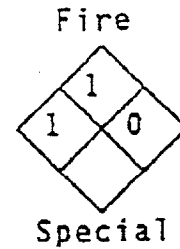
PAGE 1

Product Code: 473 6752

NFPA HAZARD RATING

- 4 - Extreme
- 3 - High
- 2 - Moderate
- 1 - Slight
- 0 - Insignificant

Toxicity



Reactivity

DIVISION AND LOCATION---SECTION I

Division: AMALIE REFINING COMPANYLocation: BRADFORD, PENNSYLVANIA

ONE AMALIE WAY, BRADFORD, PA, 16701

Emergency Telephone Number: (814) 368-6111Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:

petroleum hydrocarbon plus additives

Formula: not applicableHazardous Decomposition Products:

carbon monoxide and carbon dioxide from burning.

oxides of phosphorous from burning

oxides of sulfur

Incompatibility (Keep away from):

strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.

Toxic and Hazardous Ingredients:

none

Form: liquidOdor: pungent, sulfur typeAppearance: viscous liquidColor: green to brownSpecific Gravity (water=1): .89Boiling Point: greater than 330°C (625°F)Melting Point: -18°C (0°F)Solubility in Water (by weight %): 0 at 20°CVolatile (by weight %): 0Evaporation Rate: 0Vapor Pressure (mm Hg at 20°C): 0Vapor Density (air=1): not volatilepH (as is): not applicableStability: Product is stable under normal conditionsViscosity SUS at 100°F: Less than 100

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

ALIE MULTI-PURPOSE LS GEAR LUBRICANT

PAGE 2

Product Code: 473 6752

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:

Do not use water except as fog.

Unusual Fire and Explosion Hazards:

none

Flashpoint: (Method Used) Cleveland open cup greater than 190°C (375°F)Flammable limits %: not applicableExtinguishing agents:Drychemical or Waterfog or CO₂ or Foam

Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m³ for mineral oil mist (OSHA and ACGIH).Chronic effects of overexposure:

Prolonged or repeated skin contact may cause dermatitis (skin irritation)

Acute toxicological properties:

no data available

Emergency First Aid Procedures:Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.Inhalation: Remove victim to fresh air. Call a physician.If Swallowed: Call a physician immediately. DO NOT induce vomiting. (Vomiting may cause aspiration into lungs resulting in chemical pneumonia.)

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local, mechanical, special):

Local if necessary to maintain allowable PEL(permissible exposure limit) or TLV(threshold limit value)

Respiratory Protection (Specify type):

Use NIOSH/MSHA certified respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.

Protective Gloves:

neoprene type

Eye Protection:

chemical safety goggles

Other Protective Equipment:

none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

AMALIE MULTI-PURPOSE LS GEAR LUBRICANT

PAGE 3

Product Code: 473 6752

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:

Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:

Dispose of in accordance with all applicable federal, state and local regulations.

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:

Do not handle or store at temperatures over

Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated

Reportable Quantity: not applicable

Freight Classification: Petroleum Lubricating Oil

Special Transportation Notes:

none

COMMENTS

* STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).

Hydrocarbon oils CAS. NO. 8020-83-5

The additive mixtures in this product have been declared a trade secret by the additive manufacturers.

Prepared by: Robert Kellam

Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety

Original Date: 05/20/81 Sent to: _____

Revision Date: 07/19/94 _____

Supersedes: 04/01/93 _____

Date Sent: _____

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

ALIE MULTI-PURPOSE LS GEAR LUBRICANT

PAGE 4

Product Code: 473 6752

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

WITCO MATERIAL SAFETY DATA SHEET

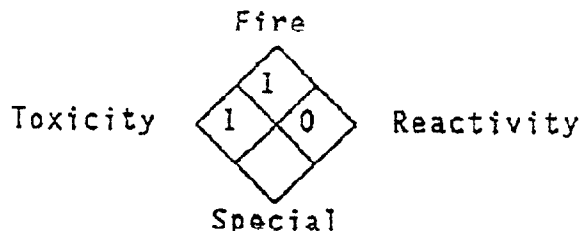
Kendall C-915 Grease

PAGE 1

Product Code: J63 7834

NFPA HAZARD RATING

- 4 - Extreme
- 3 - High
- 2 - Moderate
- 1 - Slight
- 0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: KENDALL REFINING COMPANYLocation: BRADFORD, PENNSYLVANIA

77 N. KENDALL AVE., BRADFORD, PA, 16701

Emergency Telephone Number: (814) 368-6111Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:

petroleum hydrocarbon and calcium stearate

Formula: not applicableHazardous Decomposition Products:

carbon monoxide and carbon dioxide from burning.

Incompatibility (Keep away from):

strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.

Toxic and Hazardous Ingredients:

none

Form: semi-solidOdor: mineral oilAppearance: greaseColor: blackSpecific Gravity (water=1): .94Boiling Point: greater than 260°C (500°F)Melting Point: not applicableSolubility in Water (by weight %): negligibleVolatile (by weight %): negligibleEvaporation Rate: negligibleVapor Pressure (mm Hg at 20°C): negligibleVapor Density (air=1): not applicablepH (as is): not applicableStability: Product is stable under normal conditionsViscosity SUS at 100°F: Greater than or = to 100

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:

Do not use water except as fog.

Unusual Fire and Explosion Hazards:

none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

Kendall C-915 Grease

PAGE 2

Product Code: J63 7834

(Section III continued)

Flashpoint: (Method Used) ASTM D92 greater than 210°C (410°F)Flammable limits %: not applicableExtinguishing agents:Drychemical or Waterfog or CO₂ or Foam or Sand/Earth

Water may cause frothing.

Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):

not applicable

Chronic effects of overexposure:

Extended skin contact may cause dermatitis to some individuals.

Acute toxicological properties:

no data available

Emergency First Aid Procedures:Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.Inhalation: Remove victim to fresh air. Call a physician.If Swallowed: Contact a physician immediately.

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local, mechanical, special):

none required

Respiratory Protection (Specify type):

none required

Protective Gloves:

rubber

Eye Protection:

chemical safety goggles

Other Protective Equipment:

none

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:

Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:

Dispose of in accordance with all applicable federal, state and local regulations.

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

Kendall C-915 Grease

PAGE 3

Product Code: J63 7834

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:

Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not RegulatedReportable Quantity: not applicableFreight Classification: Petroleum Lubricating GreaseSpecial Transportation Notes:

COMMENTS

* STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
Partial contents are withheld as trade secret information.

Prepared by: Robert KellamTitle: Group Supervisor, Lubricants Testing, Maintenance, and SafetyOriginal Date: 06/18/82 Sent to: _____Revision Date: 08/09/94 _____Supersedes: 04/01/93 _____Date Sent: _____

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

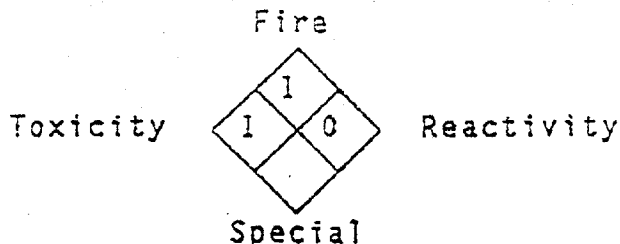
WITCO MATERIAL SAFETY DATA SHEET

KENDALL FOUR SEASONS HYDRAULIC FLUID
AW-22,32,46,58,100 and 150

PAGE 1

NFPA HAZARD RATING

4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: KENDALL REFINING COMPANY

Location: BRADFORD, PENNSYLVANIA

77 N. KENDALL AVE., BRADFORD, PA, 16701

Emergency Telephone Number: (814) 368-6111

Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:

petroleum hydrocarbon

Formula: not applicable

Hazardous Decomposition Products:

carbon monoxide and carbon dioxide from burning.
oxides of phosphorous from burning
oxides of sulfur

Incompatibility (Keep away from):

strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.

Toxic and Hazardous Ingredients:

none

Form: liquid

Odor: bland

Appearance: liquid

Color: amber

Specific Gravity (water=1): .87 to .88

Boiling Point: greater than 330°C (625°F)

Melting Point: less than -18°C (0°F)

Solubility in Water--(by weight %): 0 at 20°C

Volatile (by weight %): 0

Evaporation Rate: 0

Vapor Pressure (mm Hg at 20°C): 0

Vapor Density (air=1): not volatile

pH (as is): not applicable

Stability: Product is stable under normal conditions

Viscosity SUS at 100°F: Greater than or = to 100

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

KENDALL FOUR SEASONS HYDRAULIC FLUID

PAGE 2

AW-22,32,46,68,100 and 150

FIRE AND EXPLOSION DATA---SECTION IIISpecial Fire Fighting Procedures:

Do not use water except as fog.

Unusual Fire and Explosion Hazards:

none

Flashpoint: (Method Used) Cleveland open cup greater than 200°C (390°F)Flammable limits %: not applicableExtinguishing agents:Drychemical or Waterfog or CO₂ or Foam

Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IVPermissible concentrations (air):

see COMMENTS section

Chronic effects of overexposure:

no data available

Acute toxicological properties:

no data available

Emergency First Aid Procedures:Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.Inhalation: Remove victim to fresh air. Call a physician.If Swallowed: Contact a physician immediately.SPECIAL PROTECTION INFORMATION---SECTION VVentilation Type Required (Local, mechanical, special):

see COMMENTS section

Respiratory Protection (Specify type): -

Use NIOSH/MSHA certified respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.

Protective Gloves:

neoprene type

Eye Protection:

chemical safety goggles

Other Protective Equipment:

none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

KENDALL FOUR SEASONS HYDRAULIC FLUID
AW-22,32,46,68,100 and 150

PAGE 3

HANDLING OF SPILLS OR LEAKS---SECTION VIProcedures for Clean-Up:

Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:

Dispose of in accordance with all applicable federal, state and local regulations.

SPECIAL PRECAUTIONS---SECTION VIIPrecautions to be taken in handling and storage:

Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated

Reportable Quantity: not applicable

Freight Classification: Petroleum Lubricating Oil

Special Transportation Notes:

none

ENVIRONMENTAL/SAFETY REGULATIONS---SECTION IXSection 313 (Title III Superfund Amendment and Reauthorization Act):

This product does not contain any chemical in sufficient quantity to be subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

COMMENTS

If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m³ for mineral oil mist (OSHA and ACGIH).

* STATE REGULATORY INFORMATION:

Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).

Hydrocarbon oils CAS. NO. 8020-83-5

The additive mixtures in this product have been declared a trade secret by the additive manufacturers.

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

KENDALL FOUR SEASONS HYDRAULIC FLUID

PAGE 4

-22,32,46,68,100 and 150

(COMMENTS continued)

Prepared by: Robert KellamTitle: Group Supervisor, Lubricants Testing, Maintenance, and SafetyOriginal Date: 05/24/89 Sent to: _____Revision Date: 08/09/94 _____Supersedes: 04/01/93 _____Date Sent: _____

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.



LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

PRODUCT NAME Isobutylene		
TELEPHONE (415) 977-8500 EMERGENCY RESPONSE INFORMATION ON PAGE 2		
LIQUID AIR CORPORATION ALPHAGAZ DIVISION One California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS Isobutylene	CAS NUMBER 115-11-7
	CHEMICAL NAME AND SYNONYMS Isobutene, Isobutylene, 2-Methylpropane	
ISSUE DATE OCTOBER 1, 1985 AND REVISIONS CORPORATE SAFETY DEPT.	FORMULA (iso) C ₄ H ₈	MOLECULAR WEIGHT 56.03 CHEMICAL FAMILY Monolefin

See last page.

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT Isobutylene is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg. (ACGIH, 1984-85)

SYMPTOMS OF EXPOSURE

Inhalation: Moderate concentrations so as to exclude an adequate supply of oxygen to the lungs causes dizziness, drowsiness and eventual unconsciousness. It also has a very mild anesthetic effect which might cause lack of co-ordination or lessened mental alertness.

Skin and Eye Contact: It is mildly irritating to mucous membranes. Due to its rapid rate of evaporation, it can cause tissue freezing or frostbite on dermal contact.

TOXICOLOGICAL PROPERTIES

It has a very mild anesthetic effect; however, the major property is the exclusion of an adequate supply of oxygen to the lungs.

Frostbite effects are a change in color of the skin to gray or white possibly followed by blistering.

Listed as Carcinogen
or Potential Carcinogen

National Toxicology
Program

Yes
No

I.A.R.C.
Monographs

Yes
No

OSHA Yes
No

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO ISOBUTYLENE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Medical assistance should be sought immediately.

Dermal Contact or Frostbite: Remove contaminated clothing and flush affected areas

(Continued on last page)

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Isobutylene is flammable over a wide range in air.

PHYSICAL DATA

BOILING POINT 19.18°F (-7.12°C)	LIQUID DENSITY AT BOILING POINT 39.09 lb/ft ³ (626.2 kg/m ³)
VAPOR PRESSURE @ 70°F (21.1°C) = 38.43 psia (265 kPa)	GAS DENSITY AT 70°F 1 atm .148 lb/ft ³ (2.37 kg/m ³)
SOLUBILITY IN WATER Insoluble	FREEZING POINT -220.63°F (-140.35°C)
APPEARANCE AND ODOR Colorless gas with an unpleasant odor similar to that which is emitted when burning anthracite coal. Specific gravity @70°F (Air = 1.0) is 1.98.	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) -105°F (-76°C) Closed cup	AUTO IGNITION TEMPERATURE 869°F (465°C)	FLAMMABLE LIMITS % BY VOLUME LEL: 1.8 UEL: 9.6
EXTINGUISHING MEDIA Water, carbon dioxide, dry chemical	ELECTRICAL CLASSIFICATION Class 1, Group not specified	
GENERAL FIRE FIGHTING PROCEDURES If possible, stop the flow of isobutylene. Use water spray to cool surrounding containers.		
UNUSUAL FIRE AND EXPLOSION HAZARDS Isobutylene is heavier than air and may travel a considerable distance to a source of ignition. Should flame be extinguished and flow of gas continue, increase ventilation to prevent flammable mixture formation in low areas or pockets.		

REACTIVITY DATA

STABILITY Unstable	CONDITIONS TO AVOID	
Stable	X	
INCOMPATIBILITY (Materials to avoid) Oxidizers		
HAZARDOUS DECOMPOSITION PRODUCTS None		
HAZARDOUS POLYMERIZATION May Occur	CONDITIONS TO AVOID	
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact the closest Liquid Air Corporation location.

WASTE DISPOSAL METHOD
Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to Liquid Air Corporation for proper disposal. For

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air-line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION	LOCAL EXHAUST to prevent accumulation above the LEL.	SPECIAL
Hood with forced ventilation	MECHANICAL (Gen.) In accordance with electrical codes.	OTHER
PROTECTIVE GLOVES Plastic or rubber		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower, eyewash "fountain"		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION	
DOT Shipping Name: Liquefied petroleum gas	DOT Hazard Class: Flammable gas
DOT Shipping Label: Flammable gas	I.D. No.: UN 1075
SPECIAL HANDLING RECOMMENDATIONS	
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<250 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.	
For additional handling recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.	
SPECIAL STORAGE RECOMMENDATIONS	
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.	
For additional storage recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.	
SPECIAL PACKAGING RECOMMENDATIONS	
Isobutylene is noncorrosive and may be used with any common structural material.	
OTHER RECOMMENDATIONS OR PRECAUTIONS	
Earth-ground and bond all lines and equipment associated with the isobutylene system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).	



LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

RECOMMENDED FIRST AID TREATMENT: (Continued)

with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

TIME WEIGHTED AVERAGE EXPOSURE LIMIT (Continued)

TWA (OSHA, 1985) for LPG (Liquefied Petroleum Gas) is 1,000 molar PPM.



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(518) 377-3854

Isopropyl Alcohol MSDS No. 324
*Note: 2 pages
Date of Preparation: 9/85 Revision: A, 10/93

Section 1 - Chemical Product and Company Identification

42

Product/Chemical Name: Isopropyl Alcohol
Chemical Formula: (CH₃)₂CHOH
CAS No.: 67-63-0
Synonyms: Dimethyl carbinol, 2-hydroxypropane, IPA, Ischol, Lutosol, isopropanol, Petrohol, 2-propanol, sec-propyl alcohol, rubbing alcohol, Spectar.
Derivation: Treating propylene with sulfuric acid and then hydrolyzing or direct hydration of propylene using superheated steam. Most commonly available as rubbing alcohol (70% IPA).
General Use: As a solvent for gums, shellac, and essential oils, chemical intermediate, dehydrating agent, vehicle for germicidal compounds, de-icing agent for liquid fuels; for denaturing ethyl alcohol, preserving pathological specimens; in extraction of alkaloids, quick-drying inks and oils, and an ingredient of skin lotions, cosmetics, window cleaner, liquid soaps, and pharmaceuticals.
Vendors: Consult the latest *Chemical Week Buyers' Guide*, (73)

Section 2 - Composition / Information on Ingredients

Isopropyl alcohol, 100% vol. Most commonly sold as 70% isopropyl alcohol (rubbing alcohol).

OSHA PELs	NIOSH REL	DFG (Germany) MAK
8-hr TWA: 400 ppm (980 mg/m ³)	10-hr TWA: 400 ppm (980 mg/m ³)	TWA: 400 ppm (980 mg/m ³)
STEL: 500 ppm (1225 mg/m ³) *	STEL: 500 ppm (1225 mg/m ³)	Category II: Substances with systemic effects
ACGIH TLVs	IDLH Level	Half-life: < 2 hr
TWA: 400 ppm (983 mg/m ³)	12,000 ppm	Peak Exposure Limit: 800 ppm, 30 min. average value, 4/shift
STEL: 500 ppm (1230 mg/m ³)		

* Vacated 1989 Final Rule Limits

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Isopropyl alcohol is a highly flammable, volatile liquid. It is considered more toxic than ethyl alcohol, but less toxic than methyl alcohol. Inhalation can cause irritation of the eyes and respiratory tract and central nervous system depression at high concentrations. Repeated skin contact may cause dermatitis. Systemic toxicity appears to occur mostly in cases of heavy ingestion or inhalation. There is recent evidence that skin absorption may be more likely to cause systemic effects than previously thought.

Potential Health Effects

Primary Entry Routes: Inhalation, ingestion, skin contact/absorption.
Target Organs: Eyes, skin, respiratory system.
Acute Effects

Inhalation: Vapor inhalation is irritating to the respiratory tract and can cause central nervous system depression at high concentrations. Volunteers exposed to 400 ppm for 3 to 5 min experienced mild eye and respiratory irritation. At 800 ppm, irritation was not severe, but most people found the air uncomfortable to breathe.
Eye: Exposure to the vapor or direct contact with the liquid causes irritation and possible corneal burns.
Skin: Some irritation may occur after prolonged exposure.
Ingestion: Accidental ingestions have provided the most information on isopropyl alcohol toxicity. Symptoms include nausea and vomiting, headache, facial flushing, dizziness, lowered blood pressure, mental depression, hallucinations and distorted perceptions, difficulty breathing, respiratory depression, stupor, unconsciousness, and coma. Kidney insufficiency including oliguria (reduced urine excretion), anuria (absent urine excretion), nitrogen retention, and edema (fluid build-up in tissues) may occur. One post-mortem examination in a case of heavy ingestion showed extensive hemorrhagic tracheobronchitis, bronchopneumonia, and hemorrhagic pulmonary edema. Death can occur in 24 to 36 h post-ingestion due to respiratory paralysis.
Carcinogenicity: NTP and OSHA do not list isopropyl alcohol as a carcinogen. The IARC has studied IPA and has classified it as Class-3 (unclassifiable, inadequate human and animal evidence). There appears to be an association between the manufacture (strong acid process, rather than the alcohol itself) of isopropanol and parasinus cancer, but this may be due to the diisopropyl sulfate or isopropyl oil by-products.
Medical Conditions Aggravated by Long-Term Exposure: Dermatitis or respiratory or kidney disorders.
Chronic Effects: Repeated skin contact can cause drying of skin and delayed hypersensitivity reactions in some individuals.

Wilson Risk Scale
R 1
I 2
S 3*
K 3
*Skin absorption
HMIS
H 1
F 3
R 0
ppp*
*Sec 3

Others: Isopropyl alcohol is oxidized in the body to acetone where it is excreted by the lungs or kidneys. Some acetone may be further metabolized to acetate, formate, and finally carbon dioxide. Probable oral lethal dose is 140 mL.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: Do not allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin Contact: Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. Vomiting may be contraindicated because of the rapid onset of central nervous system depression. Gastric lavage is preferred.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Diagnostic test: acetone in urine.

Section 5 - Fire Fighting Measures

Flash Point: 53 °F (12 °C)

Flash Point Method: CC

Burning Rate: 2.3 mm/min.

Autoignition Temperature: 750°F (399°C)

LEL: 2 % v/v

UEL: 12.7 % v/v at 200 °F

Flammability Classification: Class 1B Flammable Liquid

Extinguishing Media: Carbon dioxide, dry chemical, water spray (solid streams can spread fire), alcohol-resistant foam, or fog.

Unusual Fire or Explosion Hazards: Container may explode in heat of fire. Vapors may travel to an ignition source and flash back. Isopropyl alcohol poses an explosion hazard indoors, outdoors, and in sewers.

Hazardous Combustion Products: Carbon oxides and acrid smoke.

Fire-Fighting Instructions: If possible without risk, move container from fire area. Apply cooling water to container side until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. *Do not* release runoff from fire control methods to sewers or waterways.

Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection.



Section 6 - Accidental Release Measures

Spill/Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. Cleanup personnel should protect against vapor inhalation and skin/eye contact. Water spray may reduce vapor, but may not prevent ignition in closed spaces.

Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers.

Large Spills

Containment: For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use non-sparking tools to open containers.

Storage Requirements: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec 10).

Install electrical equipment of Class I, Group D.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all equipment used with and around IPA.

Ventilation: Provide general or local exhaust ventilation systems to maintain airborne levels below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source. (103)

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin, kidneys, and respiratory system. Be extra cautious when using IPA concurrently with carbon tetrachloride because animal studies have shown it enhances carbon tetrachloride's toxicity.

Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Nitrile rubber (breakthrough time > 3 hr), Neoprene and Teflon (breakthrough time > 4 hr) are suitable materials for PPE. Do not use PVA, PVC or natural rubber (breakthrough time < 1 hr). Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator Regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use any powered, air-purifying respirator with organic vapor cartridges or any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). For < 10,000 ppm, use any supplied-air respirator (SAR) operated in continuous-flow mode. For < 12,000 ppm, use any air-purifying, full facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister or any SCBA or SAR with a full facepiece. For emergency or entrance into unknown concentrations, use any SCBA or SAR (with auxiliary SCBA) with a full facepiece and operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove isopropyl alcohol from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using isopropyl alcohol, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Appearance and Odor: Colorless with a slight odor and bitter taste.

Odor Threshold: 22 ppm*

Vapor Pressure: 44 mm Hg at 25 °F (7 °C)

Saturated Vapor Density (Air = 1.2 kg/m³, 0.075 lb/ft³):

1.274 kg/m³ or 0.080 lb/ft³

Formula Weight: 60.09

Density (H₂O=1, at 4 °C): 0.78505 at 68 °F (20 °C)

Water Solubility: > 10 %

Ionization Potential: 10.10 eV

Other Solubilities: Soluble in alcohol, ether, chloroform, and benzene. Insoluble in salt solutions.

Boiling Point: 180.5 °F (82.5 °C)

Freezing Point: -129.1 °F (-89.5 °C)

Viscosity: 2.1 cP at 77 °F (25 °C)

Refraction Index: 1.375 at 68 °F (20 °C)

Surface Tension: 20.8 dyne/cm at 77 °F (25 °C)

Critical Temperature: 455 °F (235 °C)

Critical Pressure: 47 atm

Octanol/Water Partition Coefficient: log K_{ow} = 0.05

* References range from 1 to as high as 610 ppm.

Section 10 - Stability and Reactivity

Stability: Isopropyl alcohol is stable at room temperature in closed containers under normal storage and handling conditions.

Polymerization: Hazardous polymerization does not occur.

Chemical Incompatibilities: Include acetaldehyde, chlorine, ethylene oxide, acids and isocyanates, hydrogen + palladium, nitroform, oleum, phosgene, potassium *t*-butoxide, oxygen (forms unstable peroxides), nitromethane, barium perchlorate, tetrafluoroborate, chromium trioxide, sodium dichromate + sulfuric acid, aluminum, aluminum triisopropoxide, and oxidizers. Will attack some forms of plastic, rubber, and coatings.

Conditions to Avoid: Exposure to heat, ignition sources, and incompatibles.

Hazardous Decomposition Products: Thermal oxidative decomposition of isopropyl alcohol can produce carbon oxides and acid smoke.

Section 11 - Toxicological Information

Toxicity Data:

Eye Effects:

Rabbit, eye: 100 mg caused severe irritation.

Skin Effects:

Rabbit, skin: 500 mg caused mild irritation.

Reproductive:

Rat, inhalation: 3500 ppm/7 hr given from 1 to 19 days of pregnancy caused fetotoxicity.

Acute Oral Effects:

Human, oral, TD_{Lo}: 223 mg/kg caused hallucinations, distorted perceptions, lowered blood pressure, and a change in pulse rate.

Human, oral, LD_{Lo}: 3570 mg/kg caused coma, respiratory depression, nausea, and vomiting.

Rat, oral, LD₅₀: 5045 mg/kg caused a change in righting reflex, and somnolence (general depressed activity).

* See NIOSH, RTECS (NT3050000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: Guppies (*Poecilia reticulata*) LC₅₀ = 7,060 ppm/7 days; fathead minnow (*Pimephales promelas*) LC₅₀ = 11,330 mg/L/1 hr. BOD = 133 %/5 days.

Environmental Degradation: On soil, EPA will volatilize or leach into groundwater. Biodegradation is possible but rates are not found in available literature. It will volatilize (est. half-life = 5.4 days) or biodegrade in water. It is not expected to concentrate in fish. In the air, it reacts with photochemically produced hydroxyl radicals with a half-life of one to several hrs. Because it is soluble, removal by rain, snow or other precipitation is possible.

Section 13 - Disposal Considerations

Disposal: Microbial degradation is possible by oxidizing isopropyl alcohol to acetone by members of the genus *Desulfovibrio*. Spray waste into incinerator (permit-approved facilities only) equipped with an afterburner and scrubber. Isopropyl alcohol can be settled out of water spills by salting with sodium chloride. Note: Salt may harm aquatic life, so weigh the benefits against possible harm before application. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Container Cleaning and Disposal: Triple rinse containers.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Isopropanol or isopropyl alcohol

Shipping Symbols: -

Hazard Class: 3

ID No.: UN1219

Packing Group: II

Label: Flammable Liquid

Special Provisions (172.102): T1

Packaging Authorizations

a) Exceptions: 173.150

b) Non-bulk Packaging: 173.202

c) Bulk Packaging: 173.242

Quantity Limitations

a) Passenger, Aircraft, or Railroad: 5 L

b) Cargo Aircraft Only: 60 L

Vessel Stowage Requirements

a) Vessel Stowage: B

b) Other: -

Section 15 - Regulatory Information

EPA Regulations:

Listed as a RCRA Hazardous Waste Number (40 CFR 261.21)

RCRA Hazardous Waste Classification (40 CFR 261.21): Characteristic of Ignitability

1 (Unlisted Hazardous Waste, Characteristic of Ignitability) as a CERCLA Hazardous Substance (40 CFR 302.4) per

RCRA, Sec. 3001

CERCLA Reportable Quantity (RQ), 100 lb (45.4 kg)

SARA 311/312 Codes: 1, 2, 3

Listed as a SARA Toxic Chemical (40 CFR 372.65); only persons who manufacture by the strong acid process are subject; no supplier notification.

SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed

OSHA Regulations:

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)

Section 16 - Other Information

References: 73, 103, 124, 126, 127, 132, 136, 139, 148, 153, 159, 164, 167, 168, 176, 187

Prepared By _____ M Gannon, BA

Industrial Hygiene Review _____ PA Roy, MPH, CIH

Medical Review _____ T Thoburn, MD, MPH

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

MATERIAL SAFETY DATA SHEET

NOTE: This Material Safety Data Sheet (MSDS) is prepared for industrial/commercial use situations. The preparation of this MSDS may be required by law but this is not an assertion that this product presents a risk in the normal consumer use situation.

**1. PRODUCT IDENTIFICATION**

PRODUCT (AS LABELED): Dove[®] Dishwashing Liquid

GENERAL USE: A consumer hand dishwashing liquid

MANUFACTURER'S NAME: LEVER BROTHERS COMPANY
ADDRESS: 390 Park Avenue
 New York, NY 10022

BUSINESS PHONE: 212-688-6000

DATE OF PREPARATION 8/01/95
MSDS#: C024, Replaces version dated 2/2/95

2. COMPOSITION and INFORMATION ON INGREDIENTS

INGREDIENTS: The cleaning agents in Dove are biodegradable. Dove contains no phosphorous.

EXPOSURE LIMITS IN AIR*

CHEMICAL NAME:	CAS#	ACGIH		OSHA	
		TLV mg/m ³	STEL mg/m ³	PEL mg/m ³	SEEL mg/m ³
Ammonium alkyl benzene sulfonate	1931-61-9	NA	NA	NA	NA
Ammonium alcohol ethoxysulfate	NA	NA	NA	NA	NA
Lauryl-Myristic monoethanolamide	NA	NA	NA	NA	NA
Sodium aryl sulfonate	NA	NA	NA	NA	NA
Ethanol	64-17-5	1000ppm	NA	1000ppm	3300ppm

NA - Not Applicable
 *See Section 12. for DEFINITION OF TERMS

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: EMERGENCY OVERVIEW: This product is a liquid detergent with a perfumed odor. It presents a low risk other than a possible slip hazard in the event of a spill.

POTENTIAL HEALTH EFFECTS:

CONTACT WITH SKIN: No irritation with brief contact. Possible irritation from prolonged or repeated industrial contact.

CONTACT WITH EYES: May cause mild irritation and discomfort.

INGESTION: May cause gastrointestinal irritation with nausea, vomiting, and delayed diarrhea.

INHALATION: While inhalation of a product mist is unlikely, such exposure may cause transient upper respiratory irritation.

CHRONIC HEALTH EFFECTS: None expected.

CONSUMER PRODUCT PRECAUTIONARY STATEMENT: Not for use in automatic dishwashers. Do not mix with chlorine bleach or other household cleaning products. KEEP OUT OF REACH OF CHILDREN.

4. FIRST-AID MEASURES

SKIN EXPOSURE: Rinse with water.

EYE EXPOSURE: Flush with water for 15 minutes.

INGESTION: Do not induce vomiting. Drink a glass of milk or water.

INHALATION: Move individual to fresh air.

Note: If symptoms persist, seek medical attention.

5. FIRE-FIGHTING MEASURES

FLASH POINT: No flash to 200 F..

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %): Not applicable.

FIRE EXTINGUISHING MATERIALS: Not applicable.

Water Spray: Yes
Dry Chemical: Yes

Carbon Dioxide: Yes
Halon: Yes

Foam: Yes

UNUSUAL FIRE AND EXPLOSION HAZARDS: Product is not combustible. Use appropriate fire extinguishing agent for the packaging material.

SPECIAL FIRE FIGHTING PROCEDURES: None.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Disposal is to be performed in compliance with applicable laws. Small or household quantities may be disposed of in refuse or sewer. Product contains biodegradable ingredients. Contains no phosphorous. For large (industrial) releases, prevent spill from entering a waterway. Absorbent materials may be used.

7. HANDLING and STORAGE

WORK PRACTICE AND HYGIENE PRACTICES: Use personal protective equipment appropriate for the task.

STORING AND HANDLING PRACTICES: None required with normal use.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Use personal protective equipment when contact is likely.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Mechanical ventilation not normally required during normal operation.

EYE PROTECTION: Wear safety glasses.

HAND PROTECTION: Wear rubber gloves for prolonged contact.

BODY PROTECTION: None required.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: Not applicable.

SPECIFIC GRAVITY: 1.032 - 1.048

SOLUBILITY IN WATER: soluble.

VAPOR PRESSURE, mm Hg @ 20 C: (approximately) 18

APPEARANCE AND COLOR: This liquid is a pleasant smelling, slippery, opaque white solution.

EVAPORATION RATE (water = 1): 1

MELTING POINT OR RANGE: < 0 C

BOILING POINT: > 100 C

pH (1% solution): 8.0 - 8.9 (as is)

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: None.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Do not mix with chlorine bleach.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Do not use in automatic dishwasher.

11. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:

Not applicable.

HAZARD CLASS NUMBER and DESCRIPTION:

Not applicable.

UN IDENTIFICATION NUMBER:

Not applicable.

PACKING GROUP:

Not applicable.

DOT LABEL(S) REQUIRED:

Not applicable.

EMERGENCY RESPONSE GUIDE NUMBER: Not applicable.

MARINE POLLUTANT:

Not applicable.

CANADIAN TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS NOT CLASSIFIED AS "DANGEROUS GOODS".

12. OTHER INFORMATION

PREPARED
BY:

LEVER BROTHERS COMPANY
NEW YORK, NY 10022

The information contained in this MSDS is based on data which is believed to be accurate. While Lever Brothers Company believes that the data contained herein comply with 29 CFR 1910.1200, they are not to be taken as a warranty or representation for which Lever Brothers Company assumes legal responsibility. They are offered solely for your consideration and verification. This MSDS is not prepared for consumer use situations.



Genium Publishing Corporation

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Material Safety Data Sheets Collection:

Sheet No. 440
Methane

Issued: 7/80

Revision: A, 8/89

Section 1. Material Identification

29

Methane Description: Widely distributed in nature, methane comprises 0.00022% by volume of the earth's atmosphere. American natural gas is mostly methane (85%). At temperatures greater than 2012 °F (1100 °C), pure carbon combines with pure hydrogen to form methane. Above 2732 °F (1500 °C), the amount of methane produced increases with temperature. Obtained from sodium acetate and sodium hydroxide or from aluminum carbide and water. Commercially prepared from natural gas or by fermentation of cellulose and sewage sludge. Constituent of illuminating and cooking gas. Used in the manufacture of hydrogen, hydrogen cyanide, ammonia, acetylene, formaldehyde, and many other organics.

R 1
I -
S -
K 4



NFPA

Other Designations: Fire damp; marsh gas; methyl hydride; CH₄; CAS No. 0074-82-8.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.

HMIS

H 1

F 4

R 0

PPG*

* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Methane, ca 100%*

OSHA PEL

None established

ACGIH TLV, 1988-89

None established

NIOSH REL

None established

Toxicity Data†

Not listed

* Check with your supplier to determine the exact composition of the purchased methane. Possible contaminants are ethane (C₂H₆), propane (C₃H₈), butane (C₄H₁₀), higher molecular weight alkanes, carbon dioxide (CO₂), nitrogen (N₂), and oxygen (O₂).

† Monitor NIOSH, RTECS (PA1490000), for future toxicity data.

Section 3. Physical Data

Boiling Point: -259 °F (161.6 °C)

Water Solubility: Slight*

Vapor Density (Air = 1): 0.544 at 32 °F (0 °C)

Melting Point: -296.5 °F (-182.5 °C)

Molecular Weight: 16 g/mol

Appearance and Odor: A colorless, odorless, tasteless, extremely flammable gas. Commercial methane's trace amounts of a suitable mercaptan compound give it natural gas's familiar rotten egg smell.

*Soluble in alcohol and ether.

Section 4. Fire and Explosion Data

Flash Point: -213 °F (-136.11 °C)

Autoignition Temperature: 999 °F (537 °C)

LEL: 5% v/v*

UEL: 15% v/v*

Extinguishing Media: Methane's extreme flammability, extensive explosibility range, and very low flash point represent dangerous fire and explosion risks. *Treat any fire situation involving rapidly escaping and burning methane gas as an emergency.* Extinguish methane fires by shutting off the source of the gas. Use water sprays to cool fire-exposed containers and to protect the personnel attempting to seal the source of the escaping gas.

Unusual Fire or Explosion Hazards: Methane gas is very flammable with an extensive explosibility range. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipelines. Never extinguish the burning gas without first locating and sealing its source. Otherwise, the still leaking gas could explosively re-ignite without warning and cause more damage than if it burned itself out.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

* The loudest methane-air explosions occur when 1 volume of methane is mixed with 10 volumes of air (or 2 volumes of oxygen). **Warning:** Air with more than 14% by volume methane burns *noiselessly*. Methane burns with a pale, faintly luminous, not always easily detected flame.

Section 5. Reactivity Data

Stability/Polymerization: Methane is stable at room temperature in closed, pressurized containers during routine operations. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Genium reference 84 reports that methane can react violently with bromine pentafluoride, chlorine, chlorine dioxide, nitrogen trifluoride, liquid oxygen, and oxygen difluoride.

Conditions to Avoid: Never expose methane to ignition sources such as open flame, lighted cigarettes or pipes, uninsulated heating element or electrical or mechanical sparks. Prevent any accidental or uncontrollably rapid release of methane gas from high-pressure cylinders, tank cars, or pipelines.

Hazardous Products of Decomposition: Thermal oxidative degradation of methane can produce carbon dioxide and toxic carbon monoxide (CO).

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists methane as a carcinogen. **Summary of Risks:** As a simple asphyxiant, methane does not cause significant physiological responses, but it can displace the minimum required atmospheric oxygen level. Significant displacement results in an oxygen-deficient atmosphere with no adequate warning properties. Asphyxiation can occur especially in confined, poorly ventilated, undisturbed spaces infrequently entered by workers. Frostbite (cryogenic damage) can result from contact with liquid methane's extremely low temperature. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** None reported. **Primary Entry:** Inhalation. **Acute Effects:** The initial symptoms of simple asphyxiant gases's effects are rapid respiration and air hunger, diminished mental alertness, and impaired muscular coordination. Continuing lack of oxygen causes faulty judgement, depression of all sensations, rapid fatigue, emotional instability, nausea, vomiting, prostration, unconsciousness, and finally, convulsions, coma, and death. **Chronic Effects:** None reported.

FIRST AID

Skin: (Liquid methane): Promptly flush the affected area with lots of tepid/lukewarm water to reduce freezing of tissues. Never apply direct heat to frostbitten areas. Loosely apply dry, bulky dressings to protect the area from further injury. Get treatment from qualified medical personnel. **Inhalation:** Rescuers must consider their own safety when entering confined, poorly ventilated, oxygen-deficient areas. Self-contained breathing equipment must be readily available. Rescuers must use nonsparking tools and equipment; e.g., floodlights lowered into any incident area must be electrically grounded and bonded, shatter-resistant, and sparkproof. After first aid, get appropriate in-plant, paramedic, or community medical attention and support for inhalation exposures in oxygen-deficient atmospheres. Seek prompt medical assistance for further observation and treatment.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Design and practice a methane spill control and countermeasure plan (SCCP). When a leak occurs, notify safety personnel, eliminate heat and ignition sources, evacuate unnecessary personnel, provide maximum explosion proof ventilation, and implement the SCCP. Use only nonsparking tools and equipment. Locate and seal the source of the leaking gas. Use water sprays to protect the personnel attempting this shutoff. Large methane releases can result in spectacular explosions. If attempts to shut off the leaking gas are unsuccessful, evacuate the likely explosion area. **Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Remove leaking or defective cylinders to a safe, outside, posted, discharge location. Let the methane gas discharge at a moderate rate. When it is empty, return the cylinder to the supplier after it is properly tagged, labelled, or stenciled MT (empty) or defective.

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

EPA Designations

RCRA Hazardous Waste (40 CFR 261.33): Not listed

CERCLA Hazardous Substance (40 CFR 302.4): Not listed

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

SARA Toxic Chemical (40 CFR 372.65): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). **Gloves:** To prevent skin contact, workers handling liquid methane should wear appropriate insulating gloves, safety glasses, and splash aprons, as required by the particular work conditions. **Respirator:** Wear a NIOSH-approved respirator if necessary. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres; use self-contained breathing equipment there. **Ventilation:** Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the 5% v/v LEL (Sec. 4). Local exhaust ventilation is preferred since it prevents methane dispersion into the work area by eliminating it at its source (Genium ref. 103). Give special attention to proper ventilation of enclosed areas. **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, washing facilities, fire extinguishers, and oxygen bottles for emergency first-aid. **Contaminated Equipment:** Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Launder contaminated clothing before wearing. Remove this material from your shoes and equipment. **Other:** If appropriate, consider installing automatic sensing equipment that warns workers of oxygen-deficient atmospheres or of potentially explosive air-gas mixtures. All engineering systems in any methane gas storage, handling, or processing area must be explosion-proof so they have no spark potential or hot spots. Pressurized systems must use only approved valves, manifolds, flanges, and flame arrestors. **Comments:** Methane gas presents dangerous fire, explosion, and reactivity risks. Regularly inspect and service all the piping systems which transport methane gas in production and storage areas. Before use, thoroughly test methane lines with nitrogen gas for leaking, especially in enclosed areas.

Section 9. Special Precautions and Comments

Storage Requirements: Store methane in closed, pressurized cylinders, tank cars, pipelines, or other containers in a cool, dry, well ventilated, fireproof area away from heat and ignition sources and incompatible chemicals (Sec. 5). Protect these containers from physical damage and heat. Shield them from direct sunlight. **Special Handling/Storage:** Electrically ground and bond all containers, tanks, cylinders, tank cars and pipelines used in methane shipping, receiving, or transferring operations. Never smoke in any work area where the possibility of exposure to methane gas (fire hazard) exists. Recommended storage containers include steel.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Methane

IMO Shipping Name: Methane, compressed

DOT Hazard Class: Flammable gas

IMO Hazard Class: 2.1

DOT ID No.: UN1971

IMO Label: Flammable gas

DOT Label: Flammable gas

DOT Packaging Requirements: 49 CFR 173.302

DOT Packaging Exceptions: 49 CFR 173.306

MSDS Collection References: 1, 6, 7, 84-94, 100, 116, 117, 119, 120, 122

Prepared by: PJ Igce, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: MJ Hardies, MD

WITCO MATERIAL SAFETY DATA SHEET

KENDALL NON-DETERGENT MOTOR OIL, ALL SAE GRADES

PAGE 2

FIRE AND EXPLOSION DATA---SECTION IIISpecial Fire Fighting Procedures:

Do not use water except as fog.

Unusual Fire and Explosion Hazards:

none

Flashpoint: (Method Used) Cleveland open cup greater than 190°C (380°F)Flammable limits %: not applicableExtinguishing agents:Drychemical or Waterfog or CO₂ or Foam

Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IVPermissible concentrations (air):If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m³ for mineral oil mist (OSHA and ACGIH).Chronic effects of overexposure:

Prolonged or repeated skin contact may cause dermatitis (skin irritation)

Acute toxicological properties:

no data available

Emergency First Aid Procedures:Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.Inhalation: Remove victim to fresh air. Call a physician.If Swallowed: Contact a physician immediately.SPECIAL PROTECTION INFORMATION---SECTION VVentilation Type Required (Local, mechanical, special):

Local if necessary to maintain allowable PEL(permissible exposure limit) or TLV(threshold limit value)

Respiratory Protection (Specify type):

Use NIOSH/MSHA certified respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.

Protective Gloves:

neoprene type

Eye Protection:

chemical safety goggles

Other Protective Equipment:

none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEETKENDALL NON-DETERGENT MOTOR OIL, ALL SAE GRADES

PAGE 3

HANDLING OF SPILLS OR LEAKS---SECTION VIProcedures for Clean-Up:

Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:

Dispose of in accordance with all applicable federal, state and local regulations.

SPECIAL PRECAUTIONS---SECTION VIIPrecautions to be taken in handling and storage:

Do not handle or store at temperatures over

Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated

Reportable Quantity: not applicable

Freight Classification: Petroleum Lubricating Oil

Special Transportation Notes:

none

ENVIRONMENTAL/SAFETY REGULATIONS---SECTION IXSection 313 (Title III Superfund Amendment and Reauthorization Act):

This product does not contain any chemical in sufficient quantity to be subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

COMMENTS

* STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
The additive mixtures in this product have been declared a trade secret by the additive manufacturers.

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

KENDALL NON-DETERGENT MOTOR OIL, ALL SAE GRADES

PAGE 4

(COMMENTS continued)

Prepared by: Robert Kellam

Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety

Original Date: 05/18/81 Sent to: _____

Revision Date: 08/09/94

Supersedes : 04/01/93

Date Sent :

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.



LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

PRODUCT NAME Pentane		
TELEPHONE (415) 977-8500 EMERGENCY RESPONSE INFORMATION ON PAGE 2		
LIQUID AIR CORPORATION ALPHAGAZ DIVISION California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS Pentane; n-Pentane	CAS NUMBER 109-66-0
	CHEMICAL NAME AND SYNONYMS Pentane; n-Pentane	NFPA 704 NUMBER (HFR) 0 4 0
ISSUE DATE AUGUST 1, 1987 AND REVISIONS CORPORATE SAFETY DEPT.	FORMULA C ₅ H ₁₂	MOLECULAR WEIGHT 72.15 CHEMICAL FAMILY Alkane

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT 600 Molar PPM; STEL = 750 Molar PPM (ACGIH 1986-87). OSHA (1985)TWA = 1,000 Molar PPM.										
SYMPTOMS OF EXPOSURE Vapors may cause mild irritation of the eyes, skin or lungs. Inhalation: High concentrations of pentane so as to exclude an adequate supply of oxygen to the lungs causes dizziness, deeper breathing due to air hunger, possible nausea and eventual unconsciousness. Contact with rapidly evaporating liquid can cause cryogenic "burns" or frostbite.										
TOXICOLOGICAL PROPERTIES Pentane is inactive biologically and essentially nontoxic; therefore, the major property is the exclusion of an adequate supply of oxygen to the lungs. Frostbite effects are a change in color of the skin to gray or white, possibly followed by blistering. Pentane is not listed in the IARC, NTP or by OSHA as a carcinogen or a potential carcinogen.										
<table border="0"> <tr> <td>Listed as Carcinogen or Potential Carcinogen</td> <td>National Toxicology Program</td> <td>Yes <input type="checkbox"/></td> <td>No <input checked="" type="checkbox"/></td> <td>I.A.R.C. Monographs</td> <td>Yes <input type="checkbox"/></td> <td>No <input checked="" type="checkbox"/></td> <td>OSHA</td> <td>Yes <input type="checkbox"/></td> <td>No <input checked="" type="checkbox"/></td> </tr> </table>	Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	I.A.R.C. Monographs	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	OSHA	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	I.A.R.C. Monographs	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	OSHA	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	
RECOMMENDED FIRST AID TREATMENT PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO PENTANE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive. Dermal contact or frostbite: Remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.										

Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Liquid Air Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or consequences of its use. Since Liquid Air Corporation has no control over the use of the product, it assumes no liability for damage or loss of product resulting from improper use or application of the product. Data Sheets may be changed from time to time. Be sure to consult the latest edition.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Pentane is flammable in air.

PHYSICAL DATA

BOILING POINT 97°F (36°C)	LIQUID DENSITY AT BOILING POINT @ 60°F (15.5°C) = 39.3 lb/ft ³ (629.4 kg/m ³)
VAPOR PRESSURE @ 100°F (37.8°C) = 15 psia (103 kPa)	GAS DENSITY AT 70°F 1 atm @ 60°F (15.5°C) = .2015 lb/ft ³ (3.228 kg/m ³)
SOLUBILITY IN WATER Negligible	FREEZING POINT -201.5°F (-129.7°C)
APPEARANCE AND COLOR Colorless liquid and vapor with mild paraffinic odor. Specific gravity (air=1) = 2.48	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) <-40° F & C (C.C.)	AUTO IGNITION TEMPERATURE Unknown	FLAMMABLE LIMITS % BY VOLUME LEL = 1.4 UEL = 8.3
EXTINGUISHING MEDIA Water (foam), dry chemical, carbon dioxide	ELECTRICAL CLASSIFICATION Class 1, Group not specified	
SPECIAL FIRE FIGHTING PROCEDURES If possible, stop flow of pentane. Use water spray to cool surrounding containers.		
UNUSUAL FIRE AND EXPLOSION HAZARDS None		

REACTIVITY DATA

STABILITY Unstable	CONDITIONS TO AVOID	
Stable	X	N/A
INCOMPATIBILITY (Materials to avoid) Oxygen, other oxidizers		
HAZARDOUS DECOMPOSITION PRODUCTS None		
HAZARDOUS POLYMERIZATION May Occur	CONDITIONS TO AVOID	
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest Liquid Air location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest Liquid Air location or call the emergency telephone number listed herein.

EMERGENCY RESPONSE INFORMATION

IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 231-1366
OR CALL CHEMTREC AT (800) 368-3000

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION	LOCAL EXHAUST To prevent accumulation above the TWA.	SPECIAL N/A
Hood with forced ventilation	MECHANICAL (Gen.) In accordance with electrical codes	OTHER N/A
PROTECTIVE GLOVES Plastic or rubber		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower, eyewash "fountain"		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION	
DOT Shipping Name: Pentane	DOT Hazard Class: Flammable liquid
DOT Shipping Label: Flammable liquid	DOT I.D. No.: UN 1265

SPECIAL HANDLING RECOMMENDATIONS
 Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<50 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Do not tamper with (valve) safety device. Close valve after each use and when empty.

For additional handling recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
 Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no source of ignition in the storage or use area.

For additional storage recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS
 Pentane is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS
 Earth-ground and bond all lines and equipment associated with the Pentane system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with its (written) consent is a violation of Federal Law (49CFR).

Always secure cylinders in an upright position before transporting them. NEVER transport cylinders in trunks of vehicles, (Continued on last page)

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, storage, handling, and use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations.



LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued) enclosed vans, truck cabs or in passenger compartments. Transport cylinders secured in open flatbed or in open pick-up type vehicles.

III. HAZARDOUS INGREDIENTS

(includes IARC, NTP, OSHA and ACGIH listed carcinogens greater than 0.1%)

MATERIAL	%	CAS #	EXPOSURE LIMIT	SOURCE
Ethyl ether	40-70	60-29-7	400 ppm TWA	(3)
			500 ppm STEL	(3)
n-heptane	25-60	142-82-5	400 ppm TWA	(3)
			500 ppm STEL	(3)
Methylcyclohexane	25-60	108-87-2	400 ppm TWA	(3)
Carbon dioxide	5-10	124-38-9	10000 ppm TWA	(1)
			5000 ppm TWA	(2)
			30000 ppm STEL	(3)

NON-HAZARDOUS INGREDIENTS > 1%

None

None of the other ingredients is listed as a carcinogen or potential carcinogen by OSHA, NTP or IARC.

The source for exposure limits listed above are:

- (1) OSHA Permissible Exposure Limit (effective 9/89)
- (2) ACGIH Threshold Limit Value (1988-89 Edition)
- (3) Both the OSHA PEL and ACGIH TLV
- (4) Recommended by the Manufacturer

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT

Tag Open Cup: Not determined
Pensky-Martens Closed Cup: -49°F

AEROSOL FLAME EXTENSION

Greater than 18 inches

FLASHBACK

Yes



AEROSOL FIRE PROTECTION LEVEL
Level 3 Aerosol (NFPA 30B)

FLAMMABLE LIMITS IN AIR, % BY VOLUME
LOWER: 1.85
UPPER: 36.5

AUTOIGNITION TEMPERATURE
180°C

EXTINGUISHING MEDIA
Foam, alcohol foam, carbon dioxide, and dry chemical. Water may be unsuitable except as cooling medium.

SPECIAL FIRE FIGHTING PROCEDURES
Use self-contained breathing apparatus. Toxic fumes may be emitted.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Extremely flammable contents, pressurized containers. Vapors are heavier than air and may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from product handling point.

V. HEALTH HAZARD DATA

EFFECTS OF SINGLE OVEREXPOSURE

SWALLOWING May cause signs and symptoms of systemic intoxication, with incoordination, blurred vision, headache, analgesia, unconsciousness and respiratory failure due to depression of the central nervous system. Due to high volatility, may rapidly distend the stomach, causing discomfort and may make breathing difficult. May also cause pneumonitis if aspirated.

SKIN ABSORPTION Significant absorption not expected.

INHALATION Acts as a narcotic or general anesthetic. May cause irritation of the respiratory tract with cough and also signs and symptoms of intoxication, with incoordination, blurred vision, headache, analgesia, unconsciousness, cardiac irregularities, and respiratory failure due to depression of the central nervous system. Breathing high vapor concentrations may cause heart rate irregularities, possibly fatal, particularly in persons with heart disease.

SKIN CONTACT May cause mild irritation, experienced as local redness.



No. 12

Material Safety Data Sheet
PRESTONE[®] Engine Starting Fluid

EYE CONTACT

Exposure to liquid or high concentrations of vapor may cause irritation, experienced as redness, excess tearing, and possible swelling of the conjunctiva.

EFFECTS OF REPEATED OVEREXPOSURE

Repeated skin exposure can cause cracking and drying. Repeated inhalation may cause loss of appetite, exhaustion, headaches, drowsiness, dizziness, cardiac arrhythmia, central nervous system excitability, and psychic disturbances.

OTHER EFFECTS OF OVEREXPOSURE

May cause albuminuria and polycythemia.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE

Because of its irritating and defatting properties, this material may aggravate an existing dermatitis. Existing cardiac conditions may be aggravated if inhaled in high concentrations and may be fatal as a result of serious arrhythmia and cardiac decompensation.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARDS

None currently known.

EMERGENCY AND FIRST AID PROCEDURES

SWALLOWING

Give at least 2 glasses of milk or water if the patient is conscious. Do not induce vomiting. Call a physician immediately.

SKIN

Wash with soap and water.

INHALATION

Remove to fresh air. Give artificial respiration if not breathing. CPR may be required if cardiac arrest occurs. Oxygen may be given if necessary. Call a physician.

EYES

Immediately flush eyes with plenty of water for least 15 minutes. Seek medical attention, preferably an ophthalmologist.

NOTES TO PHYSICIAN

May produce arrhythmia, especially in a person with an irritable myocardium. Because of possible arrhythmogenic effects, sympathomimetics should be used with caution. Avoid the use of epinephrine.



There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition. Artificial ventilation may be required if coma is deep and breathing shallow.

VI. REACTIVITY DATA

- STABILITY** Stable.
- HAZARDOUS POLYMERIZATION**
Will not occur.
- CONDITIONS TO AVOID** Heat, sparks and open flames.
- INCOMPATIBILITY (Materials to Avoid)**
Strong oxidizing agents.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
Extremely flammable. Will burn to form carbon dioxide, carbon monoxide. May form oxides of nitrogen.

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED
Wear appropriate personal protective equipment and remove all sources of ignition. Contain spill using absorbent material and collect material for disposal in a container suitable for flammable waste. See Section IV, "Unusual Fire and Explosion Hazards."

WASTE DISPOSAL METHOD
Waste material is a RCRA hazardous waste due to ignitability if discarded in its purchased form. Incineration, treatment or landfilling should be carried out in accordance with applicable RCRA Federal, State, and Local regulations.



VIII. SPECIAL PROTECTION INFORMATION

(for manufacturing and bulk spill cleanup)

RESPIRATORY PROTECTION

Use NIOSH/MSHA approved chemical cartridge respirator for operations which may result in employee exposure above the Permissible Exposure Limit (PEL).

VENTILATION

Use local exhaust ventilation for operations which may result in employee exposure above the PEL.

PROTECTIVE GLOVES

None required under normal use. PVA (polyvinyl alcohol) gloves are recommended for operations which may result in repeated skin contact.

EYE PROTECTION

Safety glasses are considered adequate for normal use.

OTHER PROTECTIVE EQUIPMENT

None required

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

- **DANGER:** Extremely flammable. Do not store near heat, sparks or open flame.
- Do not inhale vapors; use in well ventilated area.
- Avoid eye and prolonged skin contact.
- Do not drink or swallow contents.
- Contents under pressure; do not store at temperatures above 120°F.

OTHER PRECAUTIONS

Observe all requirements of plant, company or government regulations.

KEEP OUT OF REACH OF CHILDREN.



Material Safety Data Sheet
PRESTONE® Engine Starting Fluid

X. DEPARTMENT OF TRANSPORTATION

HAZARDOUS MATERIALS	Engine Starting Fluid
HAZARD CLASSIFICATION	Flammable Gas
IDENTIFICATION NUMBER	UN1960
LABEL(S) REQUIRED	Flammable Gas

XI. ENVIRONMENTAL DATA

EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW INFORMATION

This product contains the following chemicals subject to SARA TITLE III, Section 313 reporting:

Chemical Name	CAS#	Weight %
None		

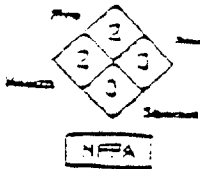
This MSDS is directed to professional users and bulk handlers of the product. Consumer products are labeled in accordance with Federal Hazardous Substances Act regulations.

While First Brands Corporation believes that the data contained herein are factual and the opinions expressed are those of qualified experts regarding the results of the tests conducted, the data are not to be taken as a warranty or representation for which First Brands Corporation assumes legal responsibility. They are offered solely for your consideration, investigation and verification. Any use of these data and information must be determined by the user to be in accordance with applicable federal, state and local laws and regulations.

If more information is needed, please contact:

R. L. Lewis
 First Brands Corporation
 88 Long Hill Street
 East Hartford, CT 06108
 (203)728-6181

Ms. 18



MATERIAL SAFETY DATA SHEET

I. PRODUCT IDENTIFICATION

Manufacturer: WD-40 Company Address: 1061 Cudahy Place (S2710) P.O. Box 80607 San Diego, California 92138-8021	Telephone: Emergency Only: 1 (800) 424-9300 (CHEMTREC) Information: (619) 275-1400 Chemical Name: Organic Mixture Trade Name: WD-40 Bulk Liquid
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II. HAZARDOUS INGREDIENTS

Chemical Name	CAS Number	%	Exposure Limit ACGIH/OSHA
Aliphatic Petroleum Distillates	8052-41-3	70	100 ppm (PEL)
Petroleum Base Oil	64742-85-0	> 20	5 mg/M ³ (TWA)
Non-hazardous Ingredients		< 10	

III. PHYSICAL DATA

Boiling Point:	300°F (minimum)	Evaporation Rate:	Not determined
Vapor Density (air = 1):	Greater than 1	Vapor Pressure:	Not determined
Solubility in Water:	Insoluble	Appearance:	Cloudy light amber
Specific Gravity (H ₂ O = 1):	0.80 @ 70°F	Odor:	Characteristic odor
Percent Volatile (volume):	74%	VOC:	576 grams per liter

IV. FIRE AND EXPLOSION

Flash Point:	Tag Open Cup 110°F (minimum)
Flammable Limits:	(solvent portion) [Lel] 1.0% [Uel] 6.0%
Extinguishing Media:	CO ₂ , Dry Chemical, Foam
Special Fire Fighting Procedures:	None
Unusual Fire and Explosion Hazards:	None

V. HEALTH HAZARD / ROUTE(S) OF ENTRY

Threshold Limit Value	
Aliphatic Petroleum Distillates (Stoddard solvent) lowest TLV (ACGIH 100 ppm.)	
Symptoms of Overexposure	
Inhalation (Breathing):	May cause anesthesia, headache, dizziness, nausea and upper respiratory irritation.
Skin Contact:	May cause drying of skin and/or irritation.
Eye Contact:	May cause irritation, tearing and redness.
Ingestion (Swallowed):	May cause irritation, nausea, vomiting and diarrhea.
First Aid Emergency Procedures	
Ingestion (Swallowed):	Do not induce vomiting, seek medical attention.
Eye Contact:	Immediately flush eyes with large amounts of water for 15 minutes.
Skin Contact:	Wash with soap and water.
Inhalation (Breathing):	Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.
DANGER!	
Aspiration Hazard:	If swallowed can enter lungs and may cause chemical pneumonia. Do not induce vomiting. Call Physician immediately.
Suspected Cancer Agent:	
Yes _____ No <u>X</u>	The components in this mixture have been found to be noncarcinogenic by NTP, IARC and OSHA.

335
BULK No. 1

VI. REACTIVITY DATA

Stability:	Stable <u>X</u>	Unstable _____
Conditions to avoid:	NA	
Incompatibility:	Strong oxidizing materials	
Hazardous decomposition products:	Thermal decomposition may yield carbon monoxide and/or carbon dioxide.	
Hazardous polymerizations:	May occur _____	Will not occur <u>X</u>

VII. SPILL OR LEAK PROCEDURES

Spill Response Procedures
Absorb small quantities with sand, earth, sawdust. Large quantities pump into tank.

Waste Disposal Method
Incinerate liquid, bury saturated absorbent in land fill. Dispose of in accordance with local, state and federal regulations.

VIII. SPECIAL HANDLING INFORMATION

Ventilation:	Sufficient to keep solvent vapor less than TLV.
Respiratory Protection:	Advised when concentrations exceed TLV.
Protective Gloves:	Advised to prevent possible skin irritation.
Eye Protection:	Approved eye protection to safeguard against potential eye contact, irritation or injury.
Other Protective Equipment:	None required.

IX. SPECIAL PRECAUTIONS

Keep from open flame, do not take internally. Avoid excessive inhalation of spray particles. Keep from children.

X. TRANSPORTATION DATA

Domestic Surface	
Description:	Petroleum Distillate Mixture
Hazard Class:	Combustible Liquid
ID No.:	UN 1253
Label Required:	NONE, for containers less than 100 Gallons
Domestic Air	
Description:	Petroleum Distillate Mixture
Hazard Class:	Combustible Liquid
Label Required:	NONE, for containers less than 110 Gallons

SIGNATURE: R. Mues *R. Mues* TITLE: Technical Director

REVISION DATE: March 1980 SUPERSEDES: April 1988

NA = Not applicable NCA = No data available < = Less than > = More than

We believe the information, technical information and recommendations contained herein are reliable. However, the data is provided without warranty, expressed or implied. It is the users responsibility here to determine safe conditions for use of this product and assume loss, damage or expense, direct or consequential, arising from its use. Before using product, read label.



LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

		PRODUCT NAME Hydrogen Cyanide	
		TELEPHONE (415) 977-8500 EMERGENCY RESPONSE INFORMATION ON PAGE 2	
LIQUID AIR CORPORATION ALPHAGAZ DIVISION One California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596		TRADE NAME AND SYNONYMS Hydrogen Cyanide, Hydrocyanic acid	CAS Number: 74-90-8
		CHEMICAL NAME AND SYNONYMS Hydrogen Cyanide, Formonitrile	
ISSUE DATE OCTOBER 1, 1985 AND REVISIONS CORPORATE SAFETY DEPT.	FORMULA HCN	MOLECULAR WEIGHT 27.018	CHEMICAL FAMILY Cyanide compound

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT Pure hydrogen cyanide is a liquid, is unstable, and must be stabilized with the addition of sulfuric or phosphoric acid. Liquid Air Corporation (Continued on last page.)														
SYMPTOMS OF EXPOSURE Inhalation: At approximately 1 molar PPM concentration, the detection of its odor of "bitter almonds" is possible. At levels of 20-40 molar PPM, slight symptoms of digestive irritation, mental confusion, and slowing of the breathing rate are evident after several hours of exposure. Cyanosis also appears even though the circulatory function is only slightly impaired. (Continued on last page.)														
TOXICOLOGICAL PROPERTIES It is one of the quickest acting poisons: It hinders the vital oxydation-reduction reactions in the body resulting in anoxia affecting the central nervous system resulting in respiratory paralysis.														
<table> <tr> <td>Listed as Carcinogen</td> <td>National Toxicology</td> <td>Yes <input type="checkbox"/></td> <td>I.A.R.C.</td> <td>Yes <input type="checkbox"/></td> <td>OSHA</td> <td>Yes <input type="checkbox"/></td> </tr> <tr> <td>or Potential Carcinogen</td> <td>Program</td> <td>No <input checked="" type="checkbox"/></td> <td>Monographs</td> <td>No <input checked="" type="checkbox"/></td> <td></td> <td>No <input checked="" type="checkbox"/></td> </tr> </table>	Listed as Carcinogen	National Toxicology	Yes <input type="checkbox"/>	I.A.R.C.	Yes <input type="checkbox"/>	OSHA	Yes <input type="checkbox"/>	or Potential Carcinogen	Program	No <input checked="" type="checkbox"/>	Monographs	No <input checked="" type="checkbox"/>		No <input checked="" type="checkbox"/>
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or Potential Carcinogen	Program	No <input checked="" type="checkbox"/>	Monographs	No <input checked="" type="checkbox"/>		No <input checked="" type="checkbox"/>								

RECOMMENDED FIRST AID TREATMENT PROMPT RENDERING OF FIRST AID IS IMPERATIVE. PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HYDROGEN CYANIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD. Treatment is based on forming methemaglobin in the blood which complexes with the cyanide ion rendering it incapable of acting as a poison. It is reported that up to 20% of the hemoglobin can be converted to methemaglobin without danger of anoxia. The formation of methemoglobin is accomplished by injecting intravenously 10 ml of a sterile 3% solution of sodium nitrate followed immediately by 50 ml of a 25% sterile solution of (Continued on last page.)
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Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Liquid Air Corporation warrants no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or consequences of its use. Since Liquid Air Corporation has no control over the use of this product, it assumes no liability for damage or loss of product resulting from proper (or improper) use or application of the product. Data Sheets may be changed from time to time. Be sure to consult the latest edition.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Cyanogen cyanide is slowly polymerized to ammonia. In the presence of moisture, cyanides, potassium and bases, this exothermic, autocatalytic reaction is accelerated. Acids retard this reaction.

PHYSICAL DATA

BOILING POINT 78.3°F (25.7°C)	LIQUID DENSITY AT BOILING POINT 41.7 lb/ft ³ (668 kg/m ³)
VAPOR PRESSURE @ 70°F (21.1°C) 12.3 psia (85 kPa)	GAS DENSITY AT 70°F 1 atm .071 lb/ft ³ (1.14 kg/m ³)
SOLUBILITY IN WATER @ 68°F (20°C) Bunsen coefficient = 224	FREEZING POINT 8.1°F (-13.3°C)
APPEARANCE AND ODOR Colorless liquid with a bitter almond odor. Specific gravity @70°F (Air = 1.0) is .95.	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) -0.4°F (-18°C) Closed cup	AUTO IGNITION TEMPERATURE 1000°F (538°C)	FLAMMABLE LIMITS % BY VOLUME LEL = 5.6 UEL = 40	
EXTINGUISHING MEDIA Water, carbon dioxide		ELECTRICAL CLASSIFICATION Class 1, Group not specified	
SPECIAL FIRE FIGHTING PROCEDURES			

UNUSUAL FIRE AND EXPLOSION HAZARDS

REACTIVITY DATA

STABILITY Unstable	X	CONDITIONS TO AVOID See Hazardous Polymerization below
Stable		
INCOMPATIBILITY (Materials to avoid) Moisture, cyanides, potassium or bases		
HAZARDOUS DECOMPOSITION PRODUCTS Ammonia		
HAZARDOUS POLYMERIZATION May Occur	X	CONDITIONS TO AVOID Pure HCN slowly polymerizes to ammonia. With incompatible materials this reaction is accelerated. Acids are added to pure HCN to retard this exothermic polymerization.
Will Not Occur		

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact the closest Liquid Air Corporation location.

DISPOSAL METHOD

Do not attempt to dispose of residual or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to Liquid Air Corporation for proper disposal. For emergency disposal, contact the closest Liquid Air Corporation location.

EMERGENCY RESPONSE INFORMATION

IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 231-1366

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION Hood with forced ventilation.	LOCAL EXHAUST To prevent accumulation above the TWA.	SPECIAL
	MECHANICAL (Gen.)	OTHER
PROTECTIVE GLOVES Rubber		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION DOT Shipping Name: Hydrocyanic acid, liquefied (RQ 10/4.54) I.D. No.: NA 1051 DOT Shipping Label: Poison gas and flammable gas DOT Hazard Class: Poison A

SPECIAL HANDLING RECOMMENDATIONS Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. For additional handling recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area. It may also be advisable to post signs indicating that a poison is stored in this area. For additional storage recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.
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SPECIAL PACKAGING RECOMMENDATIONS Most common structural materials are compatible with hydrogen cyanide. Equipment for containing HCN must be kept scrupulously dry and leak-tight.

OTHER RECOMMENDATIONS OR PRECAUTIONS Because of hydrogen cyanide's extreme toxicity, it is recommended that a continuous monitoring system with alarm be installed to monitor the atmosphere wherever hydrogen cyanide is being handled or used. The system should have sensitivity and accuracy to a level at least one half of the TWA. Earth-ground and bond all lines and equipment associated with the hydrogen cyanide system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).
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LIQUID AIR CORPORATION
ALPHA GAZ DIVISION

ADDITIONAL DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT: (Continued)

only offers HCN for sale as low concentrations of vapor diluted in other gases. The Ceiling Limit for hydrogen cyanide is 10 molar PPM. (ACGIH, 1984-85) TWA (skin) 10 molar PPM (OSHA, 1985).

SYMPTOMS OF EXPOSURE: (Continued)

- 135 Molar PPM - death within 30 minutes of exposure.
- 180 Molar PPM - death within 10 minutes of exposure.
- 270 Molar PPM - death within 5 minutes of exposure.

RECOMMENDED FIRST AID TREATMENT: (Continued)

Sodium thiosulfate - both solutions injected at a rate of 2.5-5.0 ml per minute. If the victim is unconscious, assisted respiration should be started immediately on clearing the contaminated area. For further information refer to L'Air Liquide's Encyclopedie des Gaz.



LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

		PRODUCT NAME Hydrogen Sulfide	
		TELEPHONE (415) 977-6500 EMERGENCY RESPONSE INFORMATION ON PAGE 2	
LIQUID AIR CORPORATION ALPHAGAZ DIVISION One California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94598	TRADE NAME AND SYNONYMS Hydrogen Sulfide		CAS NUMBER 7783-06-04
	CHEMICAL NAME AND SYNONYMS Hydrogen Sulfide		
ISSUE DATE OCTOBER 1, 1985 AND REVISIONS CORPORATE SAFETY DEPT.	FORMULA H ₂ S	MOLECULAR WEIGHT 34.06	CHEMICAL FAMILY Nonmetal hydride

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT 10 molar PPM; STEL = 15 molar PPM (ACGIH, 1984-85)			
SYMPTOMS OF EXPOSURE Continuous exposure to low (15-50 PPM) concentrations will generally cause irritation to mucous membranes and conjunctivae of the eyes. It may also cause headache, dizziness or nausea. Higher concentrations (200-300 PPM) can result in respiratory arrest leading to coma or unconsciousness. Exposures for more than 30 minutes at concentrations of greater than 700 PPM have been fatal. Continuous inhalation of low concentrations may cause olfactory fatigue or paralysis rendering the detection of its presence by odor ineffective.			
TOXICOLOGICAL PROPERTIES Inhalation of hydrogen sulfide is highly toxic. It is also an irritant to mucous tissue, membranes and the conjunctivae of the eyes. Continued exposure renders the olfactory sensors inoperative. Toxicologically its reaction with enzymes in the blood stream inhibit cell respiration resulting in pulmonary paralysis, sudden collapse and death. This overshadows its irritant effect on mucous membranes and tissues which at worst will cause pulmonary edema or conjunctival lesions.			
Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	I.A.R.C. Monographs Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
			OSHA Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

RECOMMENDED FIRST AID TREATMENT PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HYDROGEN SULFIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. RESCUE PERSONNEL SHOULD RECOGNIZE THE HAZARDS OF OVEREXPOSURE DUE TO OLFACTORY FATIGUE. Inhalation: Extreme fire hazard when rescuing semi-conscious or unconscious persons due to flammability of hydrogen sulfide. Avoid use of rescue equipment which might contain ignition sources or cause static discharge. Move affected person to an uncontaminated area. If breathing has stopped, give assisted respiration. Oxygen or a mixture of 5% carbon dioxide in oxygen should be administered by a qualified person. Keep victim warm and calm. Seek immediate medical assistance. (Continued on last page.)
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HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Hydrogen sulfide will explode or burn over a wide range of mixtures in air. It becomes dangerously reactive when mixed with concentrated nitric acid or other strong oxidizers such as sulfuric acid. Vapors will combust spontaneously when mixed with vapors of chlorine, oxygen difluoride or nitrogen trifluoride.

PHYSICAL DATA

BOILING POINT -76.4°F (-60.2°C)	LIQUID DENSITY AT BOILING POINT 57.11 lb/ft ³ (914.9 kg/m ³)
VAPOR PRESSURE 266.9 psia (1840 kPa)	GAS DENSITY AT 70°F, 1 atm .091 lbs/ft ³ (1.45 kg/m ³)
SOLUBILITY IN WATER Soluble	FREEZING POINT -122.3°F (-85.7°C)
APPEARANCE AND ODOR Shipped and stored as a liquid under its own vapor pressure. Vapor is colorless with a characteristic "rotten egg" odor. Specific gravity (Air=1.0) is 1.21	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) Gas	AUTO IGNITION TEMPERATURE 554°F (290°C)	FLAMMABLE LIMITS % BY VOLUME LEL: 4.0 UEL: 44.0
EXTINGUISHING MEDIA Carbon dioxide, dry chemical or water spray	ELECTRICAL CLASSIFICATION NEC Class I	
SPECIAL FIRE FIGHTING PROCEDURES Shut off flow of gas. Cool surrounding fire-exposed containers with water spray. Fire fighters should use self-contained breathing apparatus.		
UNUSUAL FIRE AND EXPLOSION HAZARDS Hydrogen sulfide is slightly heavier than air so may accumulate in low spots and may "travel" a considerable distance to a flame or other source of ignition.		

REACTIVITY DATA

STABILITY Unstable	CONDITIONS TO AVOID	
Stable	X	Avoid heat, flame or other sources of ignition.
INCOMPATIBILITY (Materials to avoid)	Concentrated nitric acid, chlorine, nitrogen trifluoride, oxygen difluoride or other strong oxidizing agents.	
HAZARDOUS DECOMPOSITION PRODUCTS Oxides of sulfur		
HAZARDOUS POLYMERIZATION May Occur	CONDITIONS TO AVOID	
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact the closest Liquid Air Corporation location.
WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to Liquid Air Corporation for proper disposal. For emergency disposal, contact the closest Liquid Air Corporation location.

EMERGENCY RESPONSE INFORMATION

IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 201-1066 OR CALL CHEMTREC AT (800) 124-1300

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Emergency Use) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION Hood with forced ventilation.	LOCAL EXHAUST To prevent accumulation above the TWA for H ₂ S	SPECIAL
	MECHANICAL (Gen.)	OTHER
PROTECTIVE GLOVES Neoprene or butyl rubber, PVC, polyethylene		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower, eyewash "fountains"		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
 DOT Shipping Name: Hydrogen sulfide (RG-100/45.4) I.D. No.: UN 1053
 DOT Hazard Class: Flammable gas DOT Shipping Label: Flammable gas, Poison

SPECIAL HANDLING RECOMMENDATIONS
 Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<750 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
 Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in, first out" inventory system to prevent full cylinders being stored for excessive period of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional storage recommendations consult L'Air Liquide's Encyclopedie de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS
 Many metals corrode rapidly with wet hydrogen sulfide. Anhydrous (water content <-40F or C) hydrogen sulfide can be handled in carbon steel, aluminum, Inconel[®], Stellite[®] and 304 and 316 stainless steels. Avoid hard steels which are highly stressed since they may be susceptible to hydrogen embrittlement from hydrogen sulfide.

OTHER RECOMMENDATIONS OR PRECAUTIONS
 Earth-ground and bond all lines and equipment associated with the hydrogen sulfide system. All electrical equipment should be non-sparking or explosion proof. Do not rely on the olfactory sense to detect the presence of hydrogen sulfide. Analytical devices and instrumentation are readily available for this purpose. Perform frequent analytical tests to be certain that the TWA is not being exceeded.

Compressed gas cylinders should not be refilled except by qualified producers of
 (Continued on last page.)

*Verify Government agencies, i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The supplier or user of this product should be advised of these regulations.



LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

Recommended First Aid Treatment: (Continued)

Eye Contact: PERSONS WITH POTENTIAL EXPOSURE TO HYDROGEN SULFIDE SHOULD NOT WEAR CONTACT LENSES.

Flush contaminated eye(s) with copious quantities of water. Part eyelids with fingers to assure complete flushing. Continue for at least 15 minutes.

Other Recommendations or Precautions: (Continued)

compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

Appendix B

Specific OHM Health and Safety Procedures

- SOP No. 2-3 Personal Lifting Safety
- SOP No. 2-4 Slip, Trip, Fall Prevention
- SOP No. 4-2 Respiratory Protection
- SOP No. 5-4 Decontamination
- SOP No. 6-5 Excavation



OHM Remediation
Services Corp.

HEALTH & SAFETY PROCEDURES

SLIP, TRIP, AND FALL PREVENTION

PROCEDURE NUMBER 2-4

Page 1 of 2

LAST REVISED 5/96

APPROVED BY: DLM/FHH

1.0 OBJECTIVE

All OHM Remediation Services Corp. (OHM) will prevent injuries or "near misses" which could occur from slip, trip, or fall hazards by identification and control for these hazards.

2.0 PURPOSE

This procedure describes work practices that will reduce or eliminate slips, trips, and falls and thereby reduce or prevent the injuries associated with these types of accidents. The intent is to prevent injuries and maintain an efficient and healthy workforce.

3.0 REQUIREMENTS

The following requirements detail a number of rules and methods to prevent slips, trips, and falls.

- 3.1 General Housekeeping. Personnel shall keep the working area clean and orderly. Tools must not be left lying on the floor or decking where they present tripping hazards during a job or after a job is completed.
- 3.2 Debris. Small, loose items such as, disconnected joints of pipe, wood chips, other small objects and debris shall not be left lying around in any place, particularly in areas where personnel walk.
- 3.3 Walkways and Grating. Walkways and grating shall be kept free of obstacles. Openings in walkways and grating shall be repaired immediately if possible. If not immediately repaired, the section must be roped off or closed until repairs can be made.
- 3.4 Access Points. Access points or holes in gratings shall be covered or surrounded by an adequate guard rail.
- 3.5 Spills. Oil spills and spills of other materials slippery materials shall be cleaned up immediately.
- 3.6 Steel Decks. Personnel shall take extra precautions when walking on steel decking or catwalks during wet weather such as establishing firm hand holds, wearing

suitable footwear, and walking slowly.

- 3.7 Jumping. Personnel shall not jump from elevated places or the backs of trucks or equipment.
- 3.8 Tools. Personnel using hand and mechanical tools shall position themselves properly, consider leverage, and events if a tool is suddenly moved.
- 3.9 Climbing Surfaces. Personnel shall not walk or climb on piping, valves, fittings or any other equipment not designed as walking surfaces.
- 3.10 Stairways, Walkovers, and Ramps. Stairways, walkovers or ramps shall be installed where personnel must walk or step over equipment in the course of their normal duties.
- 3.11 Extension Cord. Electrical extension cords and electrical wiring must be kept clear of walking and working areas and/or covered, buried or otherwise secured.
- 3.12 Winter Conditions. Walking and working surfaces shall be properly maintained during inclement winter weather.
- 3.13 Running. Running is prohibited on job sites unless under emergency conditions.

4.0 FALL PROTECTION

Fall hazards of 4 feet or more must be evaluated by a competent person. Fall protection is required at heights of 6 feet or greater. Refer to SOP 2-9, Fall Protection, for further information.



OHM Remediation
Services Corp.

HEALTH & SAFETY PROCEDURES

SLIP, TRIP, AND FALL PREVENTION

PROCEDURE NUMBER 2-4

Page 1 of 2

LAST REVISED 5/96

APPROVED BY: DLM/FHH

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OHM Remediation
Services Corp.

HEALTH & SAFETY PROCEDURES

RESPIRATORY PROTECTION

PROCEDURE NUMBER 4-2

Page 1 of 13

LAST REVISED 8/96

APPROVED BY: DLM/FHH

1.0 OBJECTIVE

No individual will enter an area where the use of respiratory protective equipment is required unless the person has been trained in the selection, use, care and limitations of the respirators, and the proper respirator has been selected for the task, and the individual is fit tested for that respirator.

2.0 PURPOSE

The purpose of this procedure is to provide information and guidelines for the selection, use, and care of respiratory protective equipment for all OHM Remediation Services Corp. (OHM) and contractor personnel. This procedure complies with the requirements of 29 CFR 1910.134 Respiratory Protection.

3.0 GENERAL

- 3.1 The use of engineering controls should be the primary method to limit employee exposure to respiratory hazards.
- 3.2 Respirators shall be worn when engineering controls are unsuccessful, and:
 - The established PEL (Permissible Exposure Limit) or TLV (Threshold Limit Value) for the particular material is approached or exceeded, as measured by direct reading and/or integrated air sampling applicable for the suspected contaminant.
 - As deemed appropriate by the regional health and safety director or designee.
- 3.3 Respirators can only be issued and worn by individuals who have been properly trained and fit tested.
- 3.4 The respirator program coordinator for each region will be the regional health and safety director.
- 3.5 The regional health and safety director will evaluate annually the effectiveness of the respirator program and denote deficiencies to the vice president of health and safety.

- 3.6 Only respirators approved by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) which are appropriate for the potential hazard shall be worn when potential exposure involves a toxic material.

4.0 SELECTION OF RESPIRATORS

- 4.1 Engineering controls should always be the primary control method of employee exposure to airborne contaminants (i.e. elimination of contamination source, ventilation of area, barriers, remote handling methods, etc).
- 4.2 Once the need for respiratory protection has been established, the respirators shall be selected on the basis of the hazards to which the worker is exposed.
- 4.2.1 Selection criteria should include:
- Identity of airborne hazard
 - Physical form of contaminant
 - The current concentration of the contaminant
 - Potential maximum concentration of the contaminant
 - Whether the contaminant may be present in concentrations to be immediately dangerous to life or health (IDLH)
 - The possibility of oxygen deficiency
 - A suitable approved cartridge is available
 - The useful life of the respirator cartridge
 - The escape routes available
 - Whether the respiratory devices are intended for emergency use, for periodic use, or for stand-by purposes
- 4.3 Other relevant information based on site conditions may be considered to determine type of respirator to be used.
- 4.4 OHM does not routinely permit the use of one half face piece air purifying respirators and disposable dust masks. The regional health and safety director or designee must approve the use of either of these devices.

5.0 MEDICAL SCREENING

- 5.1 Prior to assigning personnel to perform tasks requiring the use of respirators, the employee shall be medically qualified in compliance with requirements of 29 CFR 1910.134(a)(10) and 29 CFR 1910.120(f).
- 5.2 Employees not physically and psychologically capable of wearing respirators shall not be assigned to work requiring the use of respirators.
- 5.3 The medical status of each employee is to be periodically evaluated as outlined in SOP 3-1, Occupational Health Examination Program. Additional evaluations may be deemed necessary if the physical/medical status of the employee changes.

6.0 FIT TESTING

- 6.1 Fit testing will be performed in accordance with accepted fit test procedures by the regional health and safety director or their designated employee who has been trained and qualified to do so. Fit testing will take place at least annually or as required by other specific OSHA standards (i.e. 29 CFR 1926.62). Additionally, fit testing will be performed whenever a new respirator has been issued; there is a change in facial features, for example, weight loss/gain, accident or dental changes; or difficulty in achieving a satisfactory positive/negative fit test. Site specific fit tests will take place when requested by the client. A copy of the Respirator Fit Test Record follows this procedure.
- 6.2 Records of fit testing shall be maintained by the employee's division office and/or the corporate health and safety department. These records will include the manufacturer, model, and size of respirator the employee used in the fit test and the procedures used to perform the fit test.

7.0 RESPIRATOR USE INSTRUCTIONS

- 7.1 Respirators must be used only by those employees who have been properly trained and qualified on the specific type of respirator to be worn.
- 7.2 All employees whose job assignment requires the use of respirators shall be given respirator training and be fit tested prior to being initially assigned to a field project or job requiring respirator usage. A review of operation and maintenance will be performed annually, typically during the HAZWOPER refresher, on each type of respirator worn by the individual. Documentation of this training will be maintained in the Corporate Health and Safety Office.
- 7.3 Only respirators and/or cartridges approved by NIOSH/MSHA and appropriate for the hazardous atmosphere to be encountered will be used.

- 7.4 CAUTION: Air-purifying respirators are not to be used where an oxygen deficiency (less than 19.5 percent) exists. Only air-supplied full face respirators with an emergency escape cylinder or self-contained breathing apparatus will be worn when an oxygen deficiency exists. The regional health and safety director must approve any entry into an oxygen deficient atmosphere.
- 7.5 OHM personnel will not enter atmospheres recognized exceeding the IDLH concentration for a particular material without approval of the regional health and safety director. Only air-supplied full face respirators with an emergency escape cylinder or self-contained breathing apparatus will be worn in IDLH atmospheres. CAUTION: A respirator does not protect against excessive heat or against hazardous substance that can attack the body through the skin.
- 7.6 Contact lenses shall not be worn in contaminated atmospheres requiring the use of respiratory protection.
- 7.7 A person wearing a respirator must be clean-shaven in the area of the face piece seal. Long hair, sideburns, and skull caps that extend under the seal are not allowed. Glasses with temple pieces extending under the seal are not allowed. Persons with facial conditions that prevent a proper seal are not allowed to wear respiratory protection until the condition is corrected. Facial conditions which may cause a seal problem include missing dentures, scars, severe acne, etc.
- 7.8 A minimum of three (3) people must be assigned to each operation involving use of airline egress systems. That two (2) people operating in a buddy system and one (1) person as a cylinder watch. This person may have collateral duties as long as they are in the same general vicinity and the duties would not interfere with monitoring the egress system.

8.0 RESPIRATOR INSPECTION

- 8.1 Respirators shall be inspected by the user before and after each day's use. Respirators not used routinely (e.g. emergency use respirators) shall be inspected once a month.
- 8.2 Inspection procedure for air purifying respirators (full-face piece and one half-face piece cartridge/canister respirators)
- 8.2.1 Examine the face piece for:
- Excessive dirt.
 - Cracks, tears, holes, or distortion from improper storage.
 - Inflexibility.

- Cracked or badly scratched lenses.
- Incorrectly mounted lens or broken or missing mounting clips.
- Cracked or broken air purifying element holder, badly worn threads, or missing gaskets.

8.2.2 Examine the head straps or head harness for:

- Breaks or cracks.
- Broken or malfunctioning buckle . . Excessively worn serrations on the head harness which may permit slippage.

8.2.3 Examine exhalation valve for the following after removing cover:

- Foreign material.
- Cracks, tears, or distortion in the valve material.
- Improper insertion of the valve body into the face piece.
- Cracks, breaks, or chips in the valve body, particularly in the sealing surface.
- Missing or defective valve cover.
- Improper installation of the valve into the valve body.

8.2.4 Examine the air purifying elements (cartridge or canister) for:

- Missing cartridge adapter gasket
- Incorrect cartridge/canister, or filter for the hazard.
- Incorrect installation, loose connections, missing or worn gaskets, or cross threading in the cartridge adapter.
- Cracks or dents in outside case or threads of filter or cartridge /canister.

8.2.5 If the device has a corrugated breathing tube, examine it for:

- Broken or missing end connections.

- Missing or loose hose clamps.
 - Deterioration, determined by stretching the tube and looking for cracks.
- 8.3 Inspection procedure for air-supplied respirators (full face piece air line respirators and self contained breathing apparatus (SCBA)) should be as follows:
- 8.3.1 If the device has a tight-fitting face piece, follow the procedures outlined for air purifying respirators, except those pertaining to the air purifying elements.
- 8.3.2 The inspection of air-supplied respirators should include checks on the following items:
- Tightness of connections
 - Condition of all rubber parts
 - Air cylinder (SCBA & egress) must be fully charged and the hydrostatic test certification must be current (Fiberglass/ composite cylinders-3 years/steel cylinders-5 years).
 - Regulators and warning devices function properly.
 - Each unit (SCBA & egress units) must have a distinct identification number permanently affixed or engraved on the regulator. The manufacturers serial number may be used.
- 8.4 A record of respirator inspections including date and inspectors initials and employee number will be maintained for all respiratory protective equipment designated for emergency response. Egress units and SCBAs shall be inspected on a monthly basis. The SCBA inspection form follows this procedure.
- 8.5 Inspection of hoop-wrapped air cylinders will follow the recommendations set forth in the Compressed Gas Association, Inc. publication CGA C-6.2-1988 "Guidelines for Visual Inspection & Requalification of Fiber Reinforced High Pressure Cylinders" and will be examined for the following five types of damage.
- 8.5.1 Abrasion is damage caused by wearing, grinding, or rubbing away by friction. Abrasions less than 0.005 inch (0.127 mm) deep are acceptable and should have no adverse effects on the safety of the cylinder. Abrasions with isolated groups of fibers exposed or flat spots with a depth greater than 0.005 inch (0.127 mm) but less than 0.0075 inch (0.191 mm) are acceptable if the damaged is repaired. Cylinders

abraded in excess of 0.0075 inch (0.191 mm) should be taken out of service until professionally inspected.

- 8.5.2 Cuts are damage inflicted by a sharp objects. Cuts or scratches less than 0.005 inch (0.127 mm) deep are acceptable regardless of length, number, or direction. For cuts greater than 0.005 inch (0.127 mm) deep and up to a depth of 0.015 inch (0.038 mm) with a maximum 1 or 2 inch (25.4 or 50.8 mm) length transverse to the fiber direction, the cylinder should be removed from service until repaired. Cylinders with cuts greater than 0.015 inch (0.038 mm) with a maximum greater than 2 inches (50.8 mm) length transverse to the fiber direction or with bare metal showing through must be condemned.
- 8.5.3 Impact damage is caused by a cylinder striking or being struck by another object. Impact damage is considered slight if a frosted area is noted in the impact area. These cylinders may be returned to service. Impact damage is severe if evidence of fiber cutting, delamination, and possible structural damage is apparent. Cylinders sustaining severe impact damage should be evaluated using the guidelines for cuts and structural damage.
- 8.5.4 Structural damage is damage which causes a visual change in original cylinder configuration. This change can include any evidence of bulges, a cocked end fitting, concave areas on the domes or on the cylinder section, or, if by visual inspection of the cylinder interior, there is evidence of damage involving deformation of the liner. Structurally damaged cylinders must be immediately removed from service and condemned.
- 8.5.5 Heat or fire damage to a cylinder is evident by discoloration, charring, or burning of the composite, labels, paint, or plastic components of the valve. Such damage would cause a cylinder to be removed from service and condemned. Note: If the cylinder is only soiled from smoke or other debris and is found to be intact underneath, it may be returned to service.

9.0 CLEANING OF RESPIRATORS

- 9.1 Respirators assigned and worn by one individual must be cleaned after each day's use. Visitors' or multi-assigned respirators must be cleaned and disinfected after each use.
- 9.2 Extreme caution must be exercised to prevent damage from rough handling during the cleaning procedure.

- 9.3 After cleaning, respirators must be reassembled.
- 9.4 A respirator spray disinfectant is approved as disinfectant between continuous use but not for cleaning and sanitizing after each day's use.
- 9.5 Cleaning procedure for individually assigned respirators.
- 9.5.1 **Washing:** The respirator must be disassembled and washed with a mild liquid detergent in warm water. A brush should be used. To avoid damaging the rubber and plastic in respirator face pieces, use a soft bristle brush and a cleaner/water solution preferably between 90 and 100°F.
- 9.5.2 **Rinsing:** The respirator should be rinsed thoroughly in clean water (140°F maximum) to remove all traces of detergent. This is very important to prevent skin irritation from the detergent.
- 9.5.3 **Disinfection:** The respirator should be immersed in a solution of water and chlorine in a hypochlorite solution made from household bleach (50:1 ratio or approximately 2 cap fulls per gallon) to disinfect the respirator. The immersion should last for at least two minutes.
- 9.5.4 **Rinsing:** The respirator should be rinsed thoroughly in clean water (140° F maximum) to remove disinfectant solution. This step is important to prevent dermatitis.
- 9.5.5 **Drying:** The following drying methods may be used: draining and drying on a clean surface; draining and drying when hung from racks (take care to prevent damage); or towel drying with a soft cloth or paper towels.
- 9.6 Cleaning procedure for visitor or multi-assigned respirators
- 9.6.1 **Washing:** The respirator must be disassembled and washed with a brush in a cleaning solution in warm water. To avoid damaging the rubber and plastic in respirator face pieces, use a soft bristle brush and a cleaner/water solution preferably between 90 and 100°F.
- 9.6.2 **Rinsing:** The respirator should be rinsed thoroughly in clean water (140°F maximum) to remove all traces of detergent. This step is important to remove all traces of detergent.

- 9.6.3 Disinfection: The respirator should be immersed in a solution of water and chlorine in a hypochlorite solution made from household bleach (50:1 ratio) to disinfect the respirator. The immersion should last for a least two minutes.
- 9.6.4 Rinsing: The respirator should be rinsed thoroughly in clean water (140°F maximum) to remove disinfectant solution. This step is important to prevent dermatitis.
- 9.6.5 Drying: The following drying methods may be used: draining and drying on a clean surface; draining and drying when hung from racks (take care to prevent damage); and drying in steel storage cabinets with built-in circulation fans. (Solid shelves should be replaced with steel mesh).

10.0 MAINTENANCE OF RESPIRATORS

- 10.1 Respirator maintenance shall only be performed by trained personnel.
- 10.2 Manufacturer's approved replacement parts must be used. Substitution of parts from a different brand or type of respirator invalidates the technical approval of the respirator.
- 10.3 Maintenance performed on a self-contained breathing apparatus shall be done only by an individual who has been certified by the manufacturer.
- 10.4 Survivair air supplied respirators (SCBA and egress units) shall be flow tested on an annual basis and overhauled every three years by an authorized factory repair facility. It is OHM's policy to test all air supplied respirators, without regard to manufacturer's requirement, on this basis unless the manufacturer's requirement is more strict.

11.0 STORAGE OF RESPIRATORS

- 11.1 When not in use, respirators must be stored to protect them from dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and physical damage.
- 11.2 Respirators must be stored in reusable plastic bags between shifts.
- 11.3 The respirator storage environment must be clean, dry and away from direct sunlight. Upright cabinets and wall-mounted cases are suggested.

12.0 BREATHING AIR

- 12.1 Breathing air shall meet at least the requirements of the specification for Grade D breathing air or better (D, E, or G not A, K, or L) as described in the American National Standard Commodity Specification for Air ANSI/CGA G-7.1-1989.
- 12.1.1 Grade D breathing air, as per ANSI/CGA G-7.1 - 1989, shall contain between 19.5 and 23.5 percent oxygen with the balance predominantly nitrogen, a maximum of 5 mg/m³ oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, and a maximum of 1000 ppm carbon dioxide.
- 12.1.2 Grade E breathing air, as per ANSI/CGA G-7.1 - 1989, shall contain between 20 and 22 percent oxygen with the balance predominantly nitrogen, a maximum of 5 mg/m³ oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, a maximum of 500 ppm carbon dioxide, and 25 ppm total hydrocarbon content (as methane).
- 12.1.3 Note: The quality verification for oil is not required for synthesized air whose oxygen and nitrogen components are produced by air liquefaction. Carbon monoxide quality verification is not required for Grade D breathing air if synthesized air when nitrogen component was previously analyzed and meets National Foundry (NF) specification and when the oxygen component was produced by air liquefaction and meets United States Pharmacopeia (USP) specification.
- 12.2 Quality Verification. Breathing air suppliers must provide certification of analysis stating conformance, as a minimum, to Grade D breathing air standards as referenced in 12.1.1 for each cylinder and/or air lot.

13.0 RECHARGING BREATHING AIR CYLINDERS

- 13.1 An egress cylinder is fully charged at a pressure of 2550 pounds per square inch (psi). A 45 cubic foot 30 minute low pressure SCBA unit is fully charged at a pressure of 2216 psi.
- 13.2 Recharge the cylinders with pure, respirable compressed air which as a minimum, conforms to ANSI/CGA G-7.1 - 1989 Grade D breathing air standards. Never recharge a cylinder with oxygen.
- 13.3 Block or otherwise stabilize a cylinder to be recharged so that it will not fall or forcibly strike another object, cracking the cylinder connection during charging.
- Cylinders do not need to be submerged in water during charging.

- 13.4 A standard breathing connection should be used to recharge a cylinder. CGA connection No. 346 is used for SCBA units and CGA connection No. 1310 is used for egress cylinders.
- 13.5 Connect the filling hose and open the cylinder valve. Fill the cylinder slowly, at a rate not to exceed 600 psi per minute. Therefore, both types of cylinders (SCBA and egress) should take approximately 4 to 5 minutes to fill. Faster filling times may cause an excessive rise in temperature of the cylinder which results in a decrease of temperature when the cylinder cools. Cylinders may require a slight "top off" when the cylinder cools.
- 13.6 Close the cylinder valve.
- 13.7 Slowly bleed pressure from the filling lines.
- 13.8 Disconnect the filling line.

14.0 SUPPLIED AIR BREATHING AIR SYSTEMS

- 14.1 Air line couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with nonrespirable gases or oxygen.
- 14.2 OHM standard air line couplings for breathing air systems is a Foster quick connect fitting with a locking dot. Hansen quick connect fitting may also be used but must not be used where they can be inadvertently actuated and disconnected. For example, Hansen fittings could be used at the regulator connection but not on the airline laying on the ground unless protected from disconnection by some other means.
- 14.3 Other air line couplings fittings may be used with the approval of the regional health and safety director.
- 14.4 The hose line length shall not exceed 300 feet from the air bank regulator to the user.
- 14.5 No more than three connections, excluding the connection to the regulator and final connection to the respirator, shall be between the breathing air cylinders and the user.
- 14.6 Breathing air hose shall be protected from direct contact with chemical materials which may permeate the hose. Acceptable methods of protection include suspension of the hose from the surface or covering with a commercially available sleeve or visqueen. Breathing air hose which has become contaminated will be removed from service and disposed of properly.

14.7 The breathing air regulator shall be adjusted to provide between 50 to 125 psi pressure.

15.0 COLOR CODE FOR RESPIRATOR CARTRIDGES

NIOSH recognizes the following standard color codes for respirator cartridges. The color codes can be used as a general guideline, however, personnel should refer to the NIOSH technical certification (TC) to verify adequate protection.

Acid gases	White
Organic vapors	Black
Ammonia gas	Green
Acid gases and organic vapors	Yellow
High Efficiency Particulate Air (HEPA) Dust, fumes, and mists (including asbestos and radioactive materials)	Magenta (Purple)
Particulates (dust, fumes, mists, fogs, or smokers in combination with any other of the above gases or vapors.	Canister color for contaminant above, with ½-inch gray stripe completely surrounding the canister near the top.

16.0 OHM RESPIRATORY PROTECTION SELECTION

OHM has designated the following respiratory protection devices for use on OHM projects, shops, and laboratories.

- 16.1 Air purifying respirators shall be the Mine Safety Appliance (MSA) full face piece twin cartridge silicon rubber Ultra-Twin respirator in sizes of small, medium, and large. The respirator should be issued with a nose cup.
- 16.2 For employees who do not satisfactorily fit in the MSA Ultra-Twin respirator, the secondary respirator shall be the Survivair full face piece twin cartridge respirator in the sizes of standard or small. The respirator should be issued with a nose cup.
- 16.3 Self-contained breathing apparatus (SCBA) shall be the Survivair Mark 2 low pressure 30 minute SCBA.
- 16.4 Egress breathing apparatus shall be the Survivair HIP-PAC to be used with a 5 or 10 minute emergency escape cylinder.

- 16.5 OHM shall not use one-half face piece air purifying respirators on hazardous waste sites without permission of the regional health and safety director.
- 16.6 The regional health and safety director may approve other types and manufacturers' NIOSH approved respiratory protection devices to be used based on the particular special requirements of a project site.
- 16.7 Subcontractors may use any NIOSH/MSHA approved respiratory protection as long as it provides an equivalent level of protection as described in the HASP. Subcontractors may not wear one-half facepiece respirators if OHM employees are using full facepiece respirators.
- 16.8 It is OHM company policy to provide either MSA or Survivair respiratory protection to OHM employees. Employees are not to use other manufacturers respirator without the approval of the regional health and safety director or his designee.
- 16.9 OHM may rent supplied air respiratory devices other than Survivair on a case by case basis. Rental can occur only with the approval of the regional health and safety director or designee.



OHM Remediation
Services Corp.

HEALTH & SAFETY PROCEDURES

DECONTAMINATION

PROCEDURE NUMBER 5-4

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LAST REVISED 6/96

APPROVED BY: DLM/FHH

1.0 OBJECTIVE

All personnel, tools and equipment which have entered the contaminated area (exclusion zone) on OHM Remediation Services Corp. (OHM) job sites involving hazardous materials require decontamination upon leaving the exclusion zone.

2.0 PURPOSE

The purpose of this procedure is to describe the minimum requirements for decontamination as required in 29 CFR 1910.120(k).

3.0 REQUIREMENTS

- 3.1 The Health and Safety Plan (HASP) will include a section on decontamination with specific requirements including procedures, methods, handling of used solutions, and disposal of used PPE.
- 3.2 Every exit from the exclusion zone requires decontamination with the exception of emergency situations. If an employee is injured, decontaminate to the extent possible given the nature of the injury.
- 3.3 Large equipment such as drill rigs and heavy equipment will be decontaminated by using a steam or hot water hose wash, high pressure water, or by detergent wash. The resulting water and material will be collected and disposed of in an acceptable manner.
- 3.4 Personnel decontamination will be specified in the HASP.
- 3.5 Personnel assigned to the decontamination process will assist workers and decontaminate equipment and reusable protective gear. Protection levels for decontamination personnel will be generally one level less than that of personnel exiting the exclusion zone. Specific levels of protection will be specified in the HASP.
- 3.6 An on-site shower facility will be provided when necessary.

- 3.7 During hazardous waste site activities, the site supervisor will verify that proper decontamination procedures are being followed. Verification of decontamination for personal protective equipment and large equipment may be accomplished by visual inspection and/or direct reading monitoring instruments as it is brought out of the contamination reduction zone. In some cases, wipe samples may be collected to document that the decontamination effort is effective.



OHM Remediation
Services Corp.

HEALTH & SAFETY PROCEDURES

EXCAVATION

PROCEDURE NUMBER 6-5

Page 1 of 12

LAST REVISED 6/96

APPROVED BY: JFK/FHH

1.0 OBJECTIVE

OHM Remediation Services Corp. (OHM) will control the hazards posed by open excavation through strict compliance with this procedure and the provisions of the excavation permit.

2.0 REGULATORY REQUIREMENTS

This procedure will follow the guidelines of 29 CFR 1926, Subpart P-Excavations. In the event of a conflict between these referenced standards and specific client requirements, the more stringent will prevail.

3.0 APPLICATION

Most sections of this procedure apply to all excavations, including trenches made in the earth's surface. The competent person must decide specifically which sections apply and how all hazards presented by the excavation are being controlled.

4.0 EXCAVATION COMPETENT PERSON

Before any excavation activity begins, OHM will designate an excavation competent person who will oversee all activity in and around the excavation. This procedure applies regardless of whether personnel will enter a trench or an excavation. The competent person will determine the safety measures needed at all OHM projects which involve excavation.

- 4.1 Competent Person Responsibilities. The competent person is defined as one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Additionally the competent person must be on-site during any excavation activity for which he is responsible. The competent person must also perform or be capable of performing the following tasks:

- Application of 29 CFR 1926 Subpart P to the excavation activity;
- Daily inspections of the excavation including an inspection after a hazard increasing event such as a thunderstorm;
- Classifying soil at the excavation;

- Determining proper protective requirements;
- Determining the need for excavation de-watering operations and monitoring all de-watering activity;
- Complete the OHM excavation permit.

5.0 SOIL CLASSIFICATION

Appendix A of 29 CFR 1926 Subpart P outlines the minimum requirements for the classification of soil at OHM project sites. Upon determining the soil type, the competent person must then determine the protection system which will be used to protect any employee or subcontractor who may enter the excavation.

Note: The competent person has the option of following the requirements in section 5 of this procedure to determine soil type or assuming the soil to be Type C and following the protection requirements for Type C soil.

5.1 OSHA Soil Classifications. The following are the soil classifications recognized by OSHA in 29 CFR 1926 Subpart P. The competent person must classify the soil based on the manual and visual tests conducted at the excavation site.

5.1.1 Type A soil means:

Cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

- The soil is fissured; or
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- The soil has been previously disturbed; or
- The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- The material is subjected to other factors that would require it to be classified as a less stable material.

5.1.2 Type B soil means:

- Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
- Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
- Previously disturbed soils except those which would otherwise be classed by Type C soil.
- Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subjected to vibration; or
- Dry rock that is not stable; or
- Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

5.1.3 Type C means:

- Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or
- Granular soils including gravel, sand, and loamy sand; or
- Submerged soil or soil from which water is freely seeping; or
- Submerged rock that is not stable; or
- Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

5.2 Soil Classification Requirements. The competent person must be able to classify each soil and rock deposit associated with a trench or excavation as to stable rock, Type A, Type B, or Type C soil.

5.3 Basis of Classification. The classification of soil type must be accomplished by at least one visual and one manual test. There are several allowable tests that can be used to determine soil

type. This testing must be done by the competent person and performed prior to and during the job. Refer to Appendix A of Subpart P for manual and visual test procedures.

- 5.4 Reclassification. If, after the soil has been classified, conditions change, the competent person is responsible for evaluating the situation and, if necessary, change the classification.

5.5 OSHA Soil Types

5.5.1 Stable Rock

Stable rock is not one of the texture classes. However, it is one of the OSHA classifications of soil. Stable rock is solid mineral material which can be excavated; and the sides stand vertical and remain stable and vertical throughout construction. Coral is not considered stable rock.

5.5.2 Cemented Soil

Cemented soils are soils that are held together by a chemical agent such as calcium carbonate. Examples of cemented soils would include caliche and hardpan. Cemented soils are classified as Type A soils with an unconfined compressive strength greater than 1.5 tsf.

5.5.3 Cohesive Soil

Cohesive soils are basically fine grained soils. Cohesive soils range from clay through clay loam. A cohesive soil will stand unsupported when excavated and is plastic when moist. That is, cohesive soil can be rolled into a ribbon. A cohesive soil is hard to break up when it is dry. Cohesive soils are classified as Type A soils with an unconfined compressive strength greater than 1.5 tsf.

5.5.4 Granular Soil

Granular soils are composed of coarse grained material that have very little cohesive strength. Granular soils include loamy sand, sand and gravel. A soil is classified as granular if more than 65% of the grains are distinguishable with the unaided eye. Granular soils, when excavated will not stand and the walls of the excavation can crumble easily. Some granular soils will exhibit cohesion when wet, but when dry will fall apart. This type of soil is especially dangerous when found at a construction site because the walls of a trench appear to stand with no support, however, when they dry they could crumble and fall into the trench bottom. Granular soils are classified as soil Type B or C, and may require the highest degree of protection. Type C soils

would have an unconfined compressive strength of less than 0.5 tsf.

5.4.5 Granular Cohesionless

Soils that range from silt through sandy loam or are composed of angular particles are said to be granular cohesionless soils. These are difficult soils to work with because the group ranges from a very stable Type B to the unstable Type C soil. Course angular granular soils are classified as Type B soils and have an unconfined compressive strength range from 0.5 tsf to 1.5 tsf.

5.5.6 Layered Soil System

A layered soils system is composed of two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered. The layers may lay on a horizontal plane or be sloped. When they are sloped into the excavation they represent a collapse hazard to the trench wall. A slope greater than 4H:1V would classify any soil as Type C. Sloped layers less than 4H:1V would be classified as Type B soil. No layered system can be Type A soil.

6.0 SELECTION OF PROTECTIVE SYSTEMS

29 CFR 1926.652 requires that each employee in an excavation be protected from cave-ins by an adequate protective system unless excavations are made in stable rock or are less than five feet in depth and examination by the competent person provides no indication of potential cave-in.

Additionally, whichever protective system is chosen must have the capacity to resist without failure all loads that are intended or could reasonably be applied to the system.

6.1 Design of Sloping and Benching Systems. The slopes and configurations of sloping and benching systems must be determined by the competent person in accordance with the requirements of 29 CFR 1926(b)(1) through (b)(4) as well as 29 CFR 1926 Subpart P-Appendix B.

After the competent person has determined the soil type based on one visual and one manual test, he may design the sloping and benching system for excavations less than 20 feet deep using the following table.

MAXIMUM ALLOWABLE SLOPES
BASED ON SOIL CLASSIFICATION

Soil Line	Maximum Allowable Slope for Excavations Less Than 20 Feet Deep
Stable Rock	Vertical Sides (90°)
Type A Soil	3/4H:1V (53°)
Type B Soil	1H:1V (45°)
Type C Soil	1 1/2H:1V (34°)

Note: Sloping and benching for excavations greater than 20 feet deep must be designed by a registered professional engineer.

- 6.2 Design of support systems, shield systems and other protective systems. If the competent person determines that personnel will be protected from cave-ins by a protective system other than sloping and benching, the design of the support systems, shield systems, and other protective systems be based on the conditions at the project site and data provided by an OHM or subcontracted registered professional engineer or from tabulated data provided by the manufacturers of the protective systems.

The design of the protective system must be in accordance with the requirements of 29 CFR 1926.652(c)(1) through (c)(4) and 29 CFR 1926 Subpart P-Appendices C, D, E respectively.

In large/deep excavations where traditional shoring and sloping are not practical, alternate protective measures may be implemented to protect personnel in the excavation. Additionally, the top of the excavation must be protected with stop logs, earthen berms, or other types of protective barriers which will keep pedestrians and vehicles from approaching the edge of the excavation. Any deviations from traditional protective systems must be approved by the regional health and safety director.

7.0 EXCAVATION SAFETY REQUIREMENTS

Excavation activity exposes OHM personnel and subcontractors to many dangers which, if not recognized, can cause death or serious injury.

- 7.1 Surface Hazards. The excavation area should be inspected and any debris, structures, and surface protrusions that are located so as to create a hazard to employees shall be removed as necessary to safeguard employees. Any buildings on the site should be evaluated for structural integrity and supported if necessary.
- 7.2 Underground Installations/Utility Locations. Before conducting any excavation work, the location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined. This requirement is in addition to the requirements in the procedure titled Buried Utility Location and Associated Subsurface Field Activity.

Utility companies or the state utility protection service shall be contacted at least two working days prior to excavation activities to be advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation.

OHM personnel and sub-contractors should be careful to protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations.

If the markings of utility locations are destroyed or removed before excavation commences or is completed, the OHM competent person must notify the utility company or utility protection service to inform them that the markings have been destroyed and need replaced. Normally, it will take two working days advance notice for the utility protection service to remark the locations.

OHM equipment operators shall maintain at least 3-foot clearance between any underground utility and the cutting edge or point of powered equipment. When excavating with powered equipment within 36 inches of the markings of underground facilities, personnel should conduct the excavation in a careful and prudent manner, excavating by hand to determine the precise location of the facility/utility and to prevent damage.

While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

- 7.3 Access and Egress. OHM will provide a safe means of access to and egress from all excavations. The following are considered acceptable methods of entering and exiting excavations.

7.3.1 Structural Ramps

Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by the competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design or structural engineering, and shall be constructed in accordance with the design.

Structural members used for ramps and runways shall be of uniform thickness. Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping. Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

7.3.2 Means of Egress from Trench Excavations

A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for employees. Any ramp used for employee egress must be sloped at an angle which would allow employees to walk upright out of the excavation.

7.4 Exposure to Vehicular Traffic. OHM and subcontract personnel who may be exposed to vehicular traffic both on projects and public highways shall be provided with and shall wear warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

7.5 Exposure to Falling Loads. No OHM employee or subcontractor shall be permitted underneath loads handled by lifting or digging equipment. Personnel must stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Truck drivers may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped with over-cab protective structures, in accordance with 29 CFR 1926.601(b)(6), to provide adequate protection for the operator from falling objects during loading and unloading operations.

7.6 Warning System for Mobile Equipment. When heavy equipment and trucks operate adjacent to an excavation or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals or stop logs. If possible, the approach grade should be away from the excavation.

- 7.7 **Hazardous Atmospheres.** Because there is a likelihood that excavation activity at OHM project sites involve hazardous atmospheres, the OHM competent person must ensure that acceptable atmospheric conditions exist.

The OHM competent person or his designee shall perform direct reading atmospheric monitoring in all excavations of any depth into which OHM personnel or subcontractors must enter where a hazardous atmosphere exists or could reasonably be expected to exist. If there are any questions, the competent person should treat the excavation like a confined space and follow SOP 6-1, Confined Space Entry.

Based on the competent person's visual observation of the excavation and the soil and/or fill material, atmospheric monitoring may not be necessary. However, if conditions change, the competent person must re-evaluate whether atmospheric monitoring is required.

7.7.1 Atmospheric Monitoring

When atmospheric monitoring is required, the site safety officer must check the atmosphere for the following in the order shown:

- Oxygen Content--acceptable conditions: 21%
- Flammable Conditions--acceptable conditions: less than 10% LEL
- Toxic Atmospheres--based on established PEL or TLV

NOTE: Any oxygen reading other than 21% must be investigated prior to employees entering the excavation.

7.7.2 Ventilation

Adequate precautions shall be taken, for example providing ventilation to prevent employee exposure to harmful atmospheres. When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, direct reading air monitoring shall be conducted periodically as determined by the competent person or SSO to ensure that the atmosphere remains safe.

7.7.3 Emergency Rescue Equipment

Emergency rescue equipment, such as self-contained breathing apparatus (SCBA), a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be kept close to the excavation for use in an emergency.

- 7.8 Protection From Hazards Associated With Water Accumulation. Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

If excavation work interrupts the natural drainage of surface water (such as streams); diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to run-off from heavy rains will require an inspection by a competent person.

- 7.9 Stability of Adjacent Structures. Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:

- A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.
- A support system, such as underpinning, designed by a registered professional engineer is provided to ensure the safety of employees and the stability of the structure; or
- The excavation is in stable rock; or
- A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or
- If a support system has been put in place to stabilize an adjacent structure, it must be inspected for movement and structural integrity daily by the competent person.
- Sidewalks, pavements, and other structures shall not be undermined unless a

support system or another method of protection is provided to protect employees from the possible collapse of such structures.

- 7.10 Protection of Employees From Loose Rock or Soil. Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the excavation face to stop and contain falling material; or other means that provide equivalent protection.

Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

- 7.11 Inspections. Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard-increasing occurrence. These inspections are required when employee exposure can be reasonably anticipated. An Excavation/Trenching Permit must be completed by the competent person to document the inspections. Canceled excavation/trenching permits should be placed in the project file upon completion of the project.

Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

- 7.12 Fall Protection. Where employees or equipment are required or permitted to cross over excavations; walkways, or bridges with standard guardrails shall be provided.

Since open excavations are often an attractive nuisance to the public, adequate barrier for physical protection shall be provided at all excavations. Remotely located excavations may require special protection including, but not limited to, highly visible snow fence, concrete "jersey" barriers, chain link fence and flashing warning light. All wells, pits, shafts, etc., shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be covered or backfilled.

8.0 PERMITS

An Excavation/Trenching Permit must be completed by the competent person each day that an excavation is open and possesses safety hazards to personnel who work around or may have to enter the excavation.

If a project site has several excavations open, and active, each excavation must have its own permit completed. Conversely, a project site which has an open excavation that is not active does not require a daily Excavation/Trenching Permit if the competent person determines that the excavation is NOT posing hazards to site personnel or the public, and is adequately guarded. The competent person must determine what type of inspections and documentation will be required.

The Excavation/Trenching Permit should be retained in the project file and will serve as a record of daily excavation inspection.

EXCAVATION/TRENCHING PERMIT

Project Name:	
Project Location:	Project Number:
Name of Competent Person:	Permit Good on This Date Only:

EMPLOYEE TRAINING AND PRE-EXCAVATION BRIEFING

1. Does this job require special training: YES ___ NO ___
2. Safe excavation and rescue training conducted on: _____ DATE
3. Mandatory pre-excavation briefing conducted on: _____ DATE

SOIL CLASSIFICATION

1. Will the competent person classify the soil based on its properties and site conditions? YES ___ NO ___

If yes, proceed to 2-6 of this section. If no, then soil is assumed to be Type C and the competent person will apply the requirements for Type C protective systems.
2. Based on visual observation, which best describes the soil in this excavation?
 Stable Rock Cemented Soil Cohesive Soil Granular Soil
 Granular Cohesionless Layered System
3. Based on visual observation, which best describes the moisture condition of the soil?
 Dry Soil Moist Soil Wet Soil Saturated Soil
4. Is a pocket penetrometer available for use on site? YES ___ NO ___ N/A ___

If yes, what is the average tons per square foot of the soil in this excavation? _____ tsf
5. Based on at least one manual test, what classification is the soil in this excavation?
 Stable Rock Type A Soil Type B Soil Type C Soil
6. What manual test was used to determine the soil type?
 Plasticity Dry Strength Thumb Penetration Other _____

ELECTRICAL SAFETY

1. Are all electrical devices grounded and/or GFCI protected? YES ___ NO ___ N/A ___

SURFACE ENCUMBRANCES

1. Have all surface encumbrances that are located so as to create a hazard to employees been removed or supported, as necessary, to safeguard employees? YES ___ NO ___ N/A ___

UNDERGROUND INSTALLATIONS

1. Have the estimated locations of all underground installations been determined prior to excavation? YES ___ NO ___ N/A ___
2. Have utility companies been contacted and advised of proposed work? YES ___ NO ___ N/A ___
3. If underground installations are exposed, are they protected, supported or removed while excavation is open? YES ___ NO ___ N/A ___

EXCAVATION/TRENCHING PERMIT

(continued)

ACCESS AND EGRESS

1. Are stairways, ladders, or ramps provided every 25 feet? YES ___ NO ___ N/A ___
2. Are structural ramps that are used for access and egress of equipment and/or personnel designed by a competent person qualified in structural design and constructed in accordance with the design? YES ___ NO ___ N/A ___

EXPOSURE TO VEHICULAR TRAFFIC

1. Are personnel exposed to public or project vehicular traffic wearing reflectorized or high visibility vests? YES ___ NO ___ N/A ___

EXPOSURE TO FALLING LOADS

1. Are employees prohibited from standing underneath loads handled by lifting or digging equipment? YES ___ NO ___ N/A ___

WARNING SYSTEMS FOR MOBILE EQUIPMENT

1. Are warning systems utilized when mobile equipment is operated adjacent to or at the edge of an excavation? YES ___ NO ___ N/A ___

If yes, which type is being used?

- Hand Signals Stop Logs Earthen Berm Other _____

TESTING FOR HAZARDOUS ATMOSPHERES

1. Are the atmospheric hazards that can be reasonably expected to exist in excavations greater than 4 feet deep tested and controlled? YES ___ NO ___ N/A ___
2. Is testing conducted as often as necessary to ensure safety or personnel? YES ___ NO ___ N/A ___

TIMES & READINGS:	Time: _____ LEL: _____ % Oxygen: _____ % Toxic: _____ PPM of _____	Time: _____ LEL: _____ % Oxygen: _____ % Toxic: _____ PPM of _____	Time: _____ LEL: _____ % Oxygen: _____ % Toxic: _____ PPM of _____	Time: _____ LEL: _____ % Oxygen: _____ % Toxic: _____ PPM of _____	Time: _____ LEL: _____ % Oxygen: _____ % Toxic: _____ PPM of _____

SPECIAL PRECAUTIONS:

EMERGENCY RESCUE EQUIPMENT

1. Is emergency rescue equipment such as SCBA, safety harness and line, or basket stretcher readily available and attended when hazardous atmospheric conditions exist? YES ___ NO ___ N/A ___

PROTECTION FROM HAZARDS ASSOCIATED WITH WATER ACCUMULATION

1. Is water being controlled or prevented from accumulating in excavation by the use of water removal equipment? YES ___ NO ___ N/A ___
2. Is water control equipment operation being monitored by a competent person? YES ___ NO ___ N/A ___

EXCAVATION/TRENCHING PERMIT

(continued)

STABILITY OF ADJACENT STRUCTURES

1. Are support systems such as shoring, bracing, or underpinning provided to ensure stability of adjoining structures (i.e., buildings, walls) endangered by excavation activities? YES___ NO___ N/A___
2. Has the support system been designed by a registered professional engineer? YES___ NO___ N/A___

PROTECTION OF EMPLOYEES FROM LOOSE ROCK OR SOIL

1. Are employees protected from excavated or other material and equipment by placing this material a minimum of two (2) feet from the edge of excavations or by the use of retaining devices? YES___ NO___ N/A___

INSPECTIONS

1. Are daily inspections of excavations where employee exposure can be reasonably anticipated being done by the competent person? YES___ NO___ N/A___
2. Are inspections being performed by a competent person after every rainstorm or other hazard increasing occurrence? YES___ NO___ N/A___
3. Are employees removed from the excavation if the competent person finds evidence at any time of a situation that could result in a possible cave-in, protective system failure, hazardous atmosphere or other hazardous condition? YES___ NO___ N/A___

FALL PROTECTION

1. Are standard guardrails provided on walkways and bridges that cross over excavations? YES___ NO___ N/A___
2. Are all remotely located excavations adequately barricaded or covered? YES___ NO___ N/A___

SHORING AND OTHER PROTECTIVE SYSTEM

1. Has all shoring and/or other protective system been designed by a registered professional engineer or accompanied by tabulated data from the manufacturer? YES___ NO___ N/A___
2. Is shoring and other protective system checked/measured each day to detect movement and possible failure? YES___ NO___ N/A___

I have inspected the excavation described in this permit:

(Signature of Competent Person)

(Date)

Copy: Project file

Appendix C

Health and Safety Forms

Accident/Injury/Illness Report Form
Accident/Injury/Illness Status Report Form
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



SUPERVISOR'S ACCIDENT INVESTIGATION REPORT

- Check all that apply: Injury/Illness Fatality Complaint Not Work Related
 Auto Liability Auto Physical Damage
 General Liability Property Damage Environmental

Exact Date and Time of Incident _____ a.m. _____ p.m. Shift 1st 2nd 3rd

OHM CORPORATION _____
(Employee's Home Division/Regional Office/Subsidiary)

Address _____
City _____ State _____

PROJECT IDENTIFICATION (Project Related Incidents Only)

Project No. _____ Project Start Date _____ Completion Date _____

Location (Full Address) _____

Telephone _____ Project Manager _____

EMPLOYEE INFORMATION

Employee's Full Name _____ Employee No. _____

- Regular Full Time Regular Part Time Temporary Non-Employee

Address _____

Date of Birth _____ Age _____ Social Security No. _____ - _____ - _____ Sex M F

Job Title _____ Department _____ Date Hired _____

Length of Employment In Training, _____ Mos. _____ Yrs. Time in Job Class In Training, _____ Mos. _____ Yrs.

Name of Employee's Direct Supervisor _____

- Supervision at Time of Accident Directly Supervised Indirectly Supervised Not Supervised

Specific Location Where Incident Occurred _____
_____ OHM Facility Project Site Other _____

To Whom Was Incident Reported? _____ When? _____

Witness Name/Address _____

Witness Job Title/Reason in Area _____

Describe Employee's Job Duties Being Performed When Injured _____

Fully the Events Which Resulted in the Accident/Injury/Illness _____

(Use Extra Page if Needed)

Describe the Injury/Illness in Detail; Indicate Part of Body Affected _____

Name of Object/Substance Which Directly Injured Employee _____

Has/Will Employee Seek Treatment? Yes No Did Employee Die? Yes No

Name/Address of Hospital/Doctor _____

Describe Treatment Given _____

Was Employee Able To Return To Work? Yes No

If YES: Regular Work Work with Restricted Activities

Restriction _____

If NO: Date Last Time Began _____ Date/Est. Date To Return _____

Identify Personal Protective Equipment Used by Injured Employee _____

What Training or Instruction Had Been Given? _____

How Could This Accident Have Been Prevented? _____

Corrective Action _____

Signature _____ (Supvr/Manager) Date _____

Signature _____ (Safety Officer) Date _____

Signature _____ (Proj. Manager) Date _____

DISTRIBUTION

Original To: Division Secretary at Employee's Home Office

Copy To: Corporate Health & Safety
 Project Manager

Regional Health & Safety Manager
 Site Safety File



OHM Remediation
Services Corp.

EMPLOYEE'S ACCIDENT REPORT

Check all that apply: Injury/Illness Fatality Complaint Not Work Related
 Auto Liability Auto Physical Damage
 General Liability Property Damage Environmental

Date, Day, and Time of Incident _____ am pm

Your Name: _____ Your Emp. No.: _____

Home Address: _____ Home Phone # _____

Birth Date: _____ Age: _____ Social Security No.: _____ Sex: _____

Job Title: _____ Dept.: _____ Date of Hire: _____

Accident location (If Project related, give Project #, Client, Address and Phone #): _____

On OHM premises? Yes No

Witness Name/Address _____

How did accident occur?: _____

Was medical attention required? Yes No

Did you return to work? Yes No Your usual Job? Yes No If not explain: _____

Was the accident reported to a supervisor? Yes No Supervisor's name: _____

Employee's Signature

Date



INJURY/ILLNESS STATUS REPORT

Employee _____ Social Security No. _____
 Home Address _____ Phone _____
 Job Title _____ Home Division _____
 Date of Injury/Illness _____ Description of Injury/Illness _____

AUTHORIZATION TO RELEASE INFORMATION

I hereby authorize all physicians, hospitals, clinics and all persons to discuss with, and release to OHM Remediation Services Corp. and its authorized agents, any information or copies thereof acquired in the course of my examination or treatment for the injury identified above. This authorization shall not extend to any other medical condition, past or present, unless the same is causally or historically relevant or related to the injury referred to above.

Employee Signature _____ Date _____

PHYSICIAN OR MEDICAL PERSONNEL TO COMPLETE REMAINDER OF FORM

WORK STATUS

Employee may return to work with no limitations

Date _____

Employee may return to work on _____

Date

with limitations indicated. These restrictions are in

effect until _____ or until Reevaluation

Date

on _____

Date

Employee may work _____ hours in a work day.

Employee is totally incapacitated at this time.

Patient will be reevaluated on _____

Date

DEGREE

Sedentary Work. Lifting 10 pounds maximum and occasionally lifting and/or carrying such articles as dockets, ledgers, and small tools. Although a sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required only occasionally and other sedentary criteria are met.

Light Work. Lifting 20 pounds maximum with frequent lifting and/or carrying of objects weighing up to 10 pounds. Even though the weight lifted may be only a negligible amount, a job is in this category when it requires walking or standing to a significant degree or when it involves sitting most of the time with a degree of pushing and pulling of arm and/or leg controls.

Medium Work. Lifting 50 maximum with frequent lifting and/or carrying of objects weighing up to 25 pounds.

Heavy Work. Lifting 100 pounds maximum with frequent lifting and/or carrying of objects weighing up to 50 pounds.

Very Heavy Work. Lifting objects in excess of 100 pounds with frequent lifting and/or carrying of objects weighing 50 pounds or more.

LIMITATIONS

1. The Employee may:

a. Stand/walk

None 1-4 hours
 4-6 hours 6-8 hours

b. Sit

1-3 hours 3-5 hours
 5-8 hours

c. Drive

1-3 hours 3-5 hours
 5-8 hours

2. Employee may use hands for repetitive:

Single grasping Pushing & pulling
 Fine manipulation

3. Employee may use feet for repetitive movement as in operating foot controls:

Yes No

4. Employee is able to:

Frequenty Occasionally Not all All

a. Bend.....

b. Squat.....

c. Climb.....

PHYSICIAN'S REPORT

Diagnosis _____

Treatment _____

Other _____

Date of this Report _____

Physician's Name _____

Print

Physician's Signature _____

Address _____ Phone _____

Referred to company physician
 Employee referred/admitted to:

Whom _____

Address _____

Phone _____

Date _____ Time _____

OHM REMEDIATION SERVICES CORP
PROJECT SAFETY RULES
PROJECT NO. _____

- All unsafe acts/conditions must be corrected promptly and reported to supervisor at first opportunity
- Participate in the Safety Observer Program
- Good housekeeping standards must be maintained at all times
- Non-work injuries that could become aggravated on the job must be reported to supervisor within 1/2 hour of starting work
- Lockout/tagout procedures must be followed at all times
- Use fall protection where required
- Inspect all vehicles and equipment before use
- Know proper emergency response procedures and location of emergency equipment
- Use safety guards on all machinery where required
- Know what contaminants are present in the work area and their exposure routes and symptoms
- Only authorized personnel may operate equipment
- Use the "Buddy System" at all times when working in an Exclusion Zone area
- Any person present in or passing through an area must observe the rules of that area
- Suit up and de-suit according to OHM procedures
- Wear proper personal protective equipment for the task
- Inspect, wash, store and care for respirator properly
- Eat, drink, smoke, chew only in designated areas of Support Zone
- Sign in and out whenever entering or leaving Exclusion Zone
- Be clean shaven
- _____
- _____
- _____

Site Supervisor

Failure to comply with these rules will result in disciplinary action.



JEM Corporation

DAILY SAFETY MEETING LOG

Date: _____

Class: _____

Specific Location: _____

Job No.: _____

SAFETY TOPICS PRESENTED:

Protective Clothing/Equipment: _____

Chemical Hazards: _____

Physical Hazards: _____

Emergency Procedures: _____

Hospital/Clinic: _____

Phone: _____

Hospital Address: _____

EMS Phone: _____

Special Equipment: _____

Other: _____

ATTENDEES:

Name Printed

Signature

Meeting Conducted By:

Name Printed

Signature



COMBUSTIBLE GAS INDICATOR
CALIBRATION DATA SHEET

PROJECT # _____

INSTRUMENT NO.: _____

CALIBRATION GAS % LEL: _____

CALIBRATION GAS: _____

CHEMICAL MONITORED: _____

CAL GAS O₂ CONCENTRATION: _____

CONVERSION FACTOR: _____

DATE	PERSON CALIBRATING	CGI READING (% LEL)	OXYGEN READING	TOX IN PPM	REMARKS

NOTE: METER READING × CONVERSION FACTOR = LEL OF ATMOSPHERE
(Conversion factor can be found in instrument manual)



DAILY HEAVY EQUIPMENT SAFETY INSPECTION CHECKLIST

JHM Corporation

EQUIPMENT I.D. NO.: _____

EQUIPMENT NAME: _____

WEEK OF: _____

ITEM INSPECTED	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Falling Object Protective Structure (FOP)							
Roll-Over Protective Structure (ROP)							
Seat Belts							
Operator Seat Bar(s)							
Side Shields, Screens or Cab							
Lift Arm Restraining Device							
Grab Handles							
Back-Up Alarm - Working							
Lights							
Guards							
Horn							
Anti-Skid Tread Steps Clear of Mud							
Safety Signs (i.e. counterbalance swing area)							
Fire Extinguisher							
General Condition							
Fuel Connection							
Oil (full and no leaks)							
Clear Of Extra Materials							
Controls function properly							
Damaged Parts							
Hydraulic System (full and no leaks)							
Parking brake							
Lift Arm and Bucket							
Tires/Tracks							
Steering							
Inspectors Name and Employee No.							

INSTRUCTIONS - Inspect all applicable items indicated, each shift. If an unsatisfactory condition is observed, suspend operation of the equipment and report the unsatisfactory condition to the site supervisor immediately.



PORTABLE FIRE EXTINGUISHER CHECKLIST

Office/Shop Location _____

INVENTORY

Serial No.	Location	Serial No.	Location
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Inspection Points

1. Fire extinguisher is in assigned location
2. Access is not obstructed
3. Fire extinguisher is fully charged
4. Lock-pin in place
5. Test tag attached and current

INSPECTIONS COMPLETED

<u>Month</u>	<u>Initials</u>	<u>Month</u>	<u>Initials</u>
January	_____	July	_____
February	_____	August	_____
March	_____	September	_____
April	_____	October	_____
May	_____	November	_____
June	_____	December	_____



OHM Corporation

SCBA MONTHLY INSPECTION CHECKLIST

SCBA ID NO. _____

YEAR _____

ITEM INSPECTED	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Connections are tight												
Piece piece in good condition												
Rubber parts pliable												
Regulator functions properly												
Alarm bell functions properly												
Cylinder fully charged												
Cylinder hydrotest current (within 3 years)												
Unit is clean												
Emergency bypass functions properly												
Inspector's initials and employee number												

DEFICIENCIES IN ABOVE ITEMS REQUIRE UNIT TO BE TAGGED AND REMOVED FROM SERVICE.



OHM Corporation

OHM Corporation
Project Site Safety Inspection Checklist

Project Name: _____
Project Number: _____
Project Location: _____
Site Supervisor: _____
Inspector's Name: _____

MEDICAL AND FIRST AID

YES NO

- 1. Are First Aid Kits accessible and identified? _____
- 2. Are emergency eye wash and safety showers available? _____
- 3. Are daily logs for first aid present and up to date? _____
- 4. Are First Aid Kits inspected weekly? _____

PERSONAL PROTECTIVE EQUIPMENT

- 1. Have levels of personnel protection been established? _____
- 2. Do all employees know their level of protection? _____
- 3. Are respirators used decontaminated, inspected, and stored according to standard procedures? _____
- 4. Have employees been fit-tested? _____
- 5. Is defective personal protective equipment tagged? _____
- 6. Does compressed breathing air meet CGA Grade "D" minimum? _____
- 7. Are there sufficient quantities of safety equipment and repair parts? _____
- 8. Does Level D protection consist of safety glasses, hard hats, and steel toe boots? _____

FIRE PREVENTION

- 1. Is smoking prohibited in flammable storage areas? _____
- 2. Are fire lanes established and maintained? _____
- 3. Are flammable dispensing systems grounded and bonded? _____
- 4. Are approved safety cans available for storage of flammable liquids? _____
- 5. Has the local fire department been contacted? _____
- 6. Are fire extinguishers available near refueling areas? _____

AIR MONITORING

- 1. Is air monitoring being conducted as required by the site safety plan? _____
- 2. Are air monitoring instruments calibrated daily? _____
- 3. Is the air monitoring logbooks up to date? _____
- 4. Are user manuals available? _____
- 5. Are instruments clean and charged? _____

WELDING AND CUTTING (29 CFR 1926 Subpart J)

- 1. Are fire extinguishers present at welding and cutting operations? _____
- 2. Are confined spaces; such as, tanks, pipelines, and trenches; tested prior to cutting and welding operations? _____
- 3. Are Hot Work Permits available? _____
- 4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations? _____
- 5. Are welding machines properly grounded? _____
- 6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart? _____
- 7. Are only trained personnel permitted to operate welding and cutting equipment? _____

HAND AND POWER TOOLS (29 CFR 1926 Subpart I)

- 1. Are defective hand and power tools tagged and taken out of service? _____
- 2. Is eye protection available and used when operating power tools? _____
- 3. Are guards and safety devices in place on power tools? _____
- 4. Are power tools inspected before each use? _____
- 5. Are non-sparking tools available? _____

MOTOR VEHICLES

- 1. Are vehicles inspected daily? _____
- 2. Are personnel licensed for the equipment they operate? _____
- 3. Are unsafe vehicles tagged and reported to supervision? _____
- 4. Are vehicles shut down before fueling? _____
- 5. When backing vehicles, are spotters provided? _____
- 6. Is safety equipment on vehicles? _____
- 7. Are loads secure on vehicles? _____
- 8. Are vehicle occupants using safety belts if provided? _____

EMERGENCY PLANS

- 1. Are emergency telephone numbers posted? _____
- 2. Have emergency escape routes been designated? _____
- 3. Are employees familiar with the emergency signal? _____
- 4. Has the emergency route to the hospital been established and posted? _____

MATERIALS HANDLING

- 1. Are materials stacked and stored as to prevent sliding or collapsing? _____
- 2. Are flammables and combustibles stored in non-smoking areas? _____
- 3. Is machinery braced when personnel are performing maintenance? _____
- 4. Are tripping hazards labeled? _____
- 5. Are semi-trailers chocked? _____
- 6. Are fixed jacks used under semi-trailers? _____
- 7. Are riders prohibited on materials handling equipment? _____
- 8. Are cranes inspected as prescribed and logged? _____
- 9. Are OSHA approved manlifts provided for the lifting of personnel? _____
- 10. Are personnel in manlifts wearing approved fall protection devices? _____

FIRE PROTECTION

- 1. Has a fire alarm been established? _____
- 2. Do employees know the location and use of all fire extinguishers? _____
- 3. Are fire extinguisher locations marked? _____

WALKING AND WORKING SURFACES

- 1. Are ladders a Type I or Type II? _____
- 2. Are accessways, stairways, ramps, and ladders clean of ice, mud, snow, or debris? _____
- 3. Are ladders being used in a safe manner? _____
- 4. Are ladders kept out of passageways, doors, or driveways? _____
- 5. Are broken or damaged ladders tagged and taken out of service? _____
- 6. Are metal ladders prohibited in electrical service? _____
- 7. Are stairways and floor openings guarded? _____
- 8. Are safety feet installed on straight and extension ladders? _____
- 9. Is general housekeeping up to OHM standards? _____
- 10. Are ladders tied off? _____

SITE SAFETY PLAN

- 1. Is a site safety plan available on site or accessible to all employees? _____
- 2. Does the safety plan accurately reflect site conditions and tasks? _____
- 3. Have potential hazards been described to employees on site? _____
- 4. Is there a designated safety official on site? _____
- 5. Have all employees signed the acknowledgement form? _____

SITE POSTERS

- 1. Are the following documents posted in a prominent and accessible area?
 - A. Minimum Wage _____
 - B. OSHA Health and Safety _____
 - C. Equal Employment Opportunity _____

SITE CONTROL

- 1. Are work zones clearly defined? _____
- 2. Are support trailers located to minimize exposure from a potential release? _____
- 3. Are support trailers accessible for approach by emergency vehicles? _____
- 4. Is the site properly secured during and after work hours? _____

HEAVY EQUIPMENT (29 CFR 1926 Subpart O)

- 1. Is heavy equipment inspected as prescribed by the manufacturer? _____
- 2. Is defective heavy equipment tagged and taken out of service? _____
- 3. Are project roads and structures inspected for load capacities and proper clearances? _____
- 4. Is heavy equipment shut down for fueling and maintenance? _____
- 5. Are back-up alarms installed and working on equipment? _____
- 6. Are designated operators only operating equipment? _____
- 7. Are riders prohibited on heavy equipment? _____
- 8. Are guards and safety appliances in place and used? _____

EXCAVATION (29 CFR 1926 Subpart P)

- 1. Has a "competent person" been designated to supervise this excavation activity? _____
- 2. Have utility companies been advised of excavation activities? _____
- 3. Prior to opening excavations, are utilities located and marked? _____
- 4. Has a professional engineer evaluated all excavations greater than 20 feet deep? _____
- 5. Is there rescue equipment on-site and accessible to excavation? _____
- 6. Is excavated material placed a minimum of 24 inches from the excavations? _____
- 7. Are the sides of excavations sloped or shored to prevent caving in on employees? _____

FIRE PROTECTION (Continued)

- 4. Are combustible materials segregated from open flames? _____
- 5. Have fire extinguishers been professionally inspected during the last year? _____
- 6. Are fire extinguishers visually inspected monthly? _____

ELECTRICAL (29 CFR 1926 Subpart K)

- 1. Is electrical equipment and wiring properly guarded? _____
- 2. Are electrical lines, extension cords, and cables guarded and maintained in good conditions? _____
- 3. Are extension cords kept out of wet areas? _____
- 4. Is damaged electrical equipment tagged and taken out of service? _____
- 5. Have underground electrical lines been identified by proper authorities? _____
- 6. Has positive lock-out system been established by a certified project electrician? _____
- 7. Are GFCI's being used as needed? _____
- 8. Are extension cords being inspected daily for ground continuity and structural integrity? (i.e., group pin in place, no unapproved splices) _____
- 9. Are warning signs exhibited on high voltage equipment (250V or greater)? _____
- 10. Is extension cord inspection documented? _____

CRANES AND RIGGING (29 CFR 1926.550)

- 1. Are cranes inspected daily? _____
- 2. Are crane swing areas barricaded or demarked? _____
- 3. Is all rigging equipment tagged with an identification number and rated capacity? _____
- 4. Is rigging equipment inspection documented? _____
- 5. Are slings, chains, and rigging inspected before each use? _____
- 6. Are damaged slings, chains, and rigging tagged and taken out of service? _____
- 7. Are slings padded or protected from sharp corners? _____
- 8. Do employees keep clear of suspended loads? _____
- 9. Are employees in the lift area wearing hard hats? _____

COMPRESSED GAS CYLINDERS

- 1. Are breathing air cylinders charged only to prescribed pressures? _____
- 2. Are like cylinders segregated in well ventilated areas? _____
- 3. Is smoking prohibited in cylinder storage areas? _____
- 4. Are cylinders stored secure and upright? _____
- 5. Are cylinders protected from snow, rain, etc.? _____
- 6. Are cylinder caps in place before cylinders are moved? _____
- 7. Are fuel gas and O2 cylinders stored a minimum of 20 feet apart? _____
- 8. Are propane cylinders stored and used outside the structure? _____

SCAFFOLDING (29 CFR 1926.451)

- 1. Is scaffolding placed on a flat, firm surface? _____
- 2. Are scaffold planks free of mud, ice, grease, etc.? _____
- 3. Is scaffolding inspected before each use? _____
- 4. Are defective scaffold parts taken out of service? _____
- 5. Does mobile scaffold height exceed 4 times the width or base dimension? _____
- 6. Does scaffold planking overlap a minimum of 12 inches? _____
- 7. Does scaffold planking extend over end supports between 6 to 18 inches? _____
- 8. Are employees restricted from working on scaffolds during storms and high winds? _____
- 9. Are all pins in place and wheels locked? _____
- 10. Is perimeter guarding (top rail, mid rail, and toe board) present? _____

EXCAVATION (29 CFR 1926 Subpart P - Continued)

- 8. Has excavation greater than 4-feet deep been monitored for hazardous atmospheres (i.e. LEL/O2 deficiency)? _____
- 9. Are ladders used in excavations over 4-feet deep? _____
- 10. Are ladders present every 25 feet? _____
- 11. Are barriers, i.e. guardrails or fences placed around excavations near pedestrian or vehicle thoroughfares? _____
- 12. Is excavation inspected daily by competent persons and documented? _____

CONFINED SPACES (Proposed Regulation 29 CFR 1910.146)

- 1. Have employees been trained in the hazards of confined spaces? _____
- 2. Are confined space permits available on project site? _____
- 3. Is the contractors confined space safety procedure on the project? _____
- 4. Has a rescue plan been established? _____

PERSONNEL DECONTAMINATION

- 1. Are decontamination stations set up on site? _____
- 2. Are waste receptacles available for contaminated clothing? _____
- 3. Are steps taken to contain liquids used for decontamination? _____
- 4. Have decontamination steps and procedures been covered by the site supervisor or safety official? _____
- 5. Is all personal protective equipment and respiratory equipment being cleaned on a daily basis? _____

EQUIPMENT DECONTAMINATION

- 1. Has equipment decontamination been established? _____
- 2. Is contamination wash water properly contained and disposed of? _____
- 3. Are all pieces of equipment inspected for proper decontamination before leaving the site? _____
- 4. Is all equipment being cleaned on a daily basis? _____

HAZARD COMMUNICATION (29 CFR 1926.59)

- 1. Is there a written program on-site? _____
- 2. Is there a MSDS FOR EACH CHEMICAL present on-site? _____
- 3. Are all containers properly labeled, as to content, hazard? _____
- 4. Have employees been trained on chemical hazards? _____
- 5. Are employee's trained on chemical hazards while doing non-routine tasks? _____
- 6. Do employees (including subcontractors) know and understand the acute and chemical effects of exposure from the chemicals on-site? _____
- 7. Have all subcontractors signed the Haz-Comm acknowledgement form? _____

I have reviewed this inspection checklist with the safety inspector and fully understand the recommendation and will make every attempt to correct them immediately.

Signature

Date

Site Supervisor: _____

Project Manager: _____

OHM Compliance Inspector: _____



SITE SAFETY OFFICER DAILY REPORT

DATE: _____

PROJECT NO. _____

SSO: _____

PROJECT NAME: _____

SITE SUPERVISOR: _____

Safety Meeting Topics:

Air Monitoring Instruments	Calculated/Checked	Task Monitored
----------------------------	--------------------	----------------

Other Activities

EM Site Activities

Task Performed	Protection Level	Type Air Monitoring

Subcontractor Activities

Safety Observation/Issues

Appendix D

Safety Plan Acknowledgment

Appendix B

Construction Quality Control Plan

**Construction Quality Control Plan
Soil Remediation
Montford Point Water Tower
MCB Camp Lejeune, North Carolina**

Prepared for:

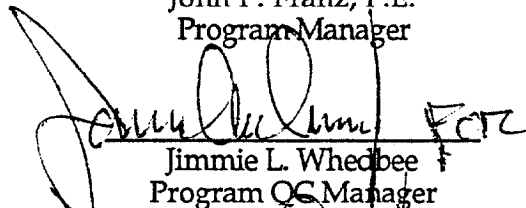
DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032
Delivery Order 0151

Prepared by

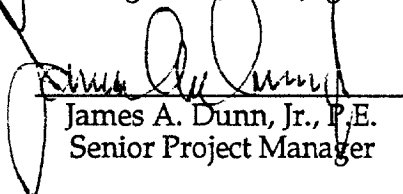
OHM Remediation Services Corp.
Norcross, Georgia



John P. Franz, P.E.
Program Manager



Jimmie L. Whedbee
Program QC Manager



James A. Dunn, Jr., P.E.
Senior Project Manager

August 1997

OHM Project No. 19668

OHM Remediation Services Corporation

Delivery Order No. _____

Project Location _____

Quality Control Plan Review

By signing this document, I am stating that I have read and understand the site Quality Control Plan for this Delivery Order/Project. Any questions or comments should be addressed to either the Program or site QC Manager.

<i>Name (Print)</i>	<i>Signature</i>	<i>Title</i>	<i>Company</i>	<i>Date</i>
		QC MANAGER		
		PROJECT MANAGER		
		PROJECT SUPERINTENDENT		
		PROJECT ENGINEER		
		PROJECT GENERAL FOREMAN		
		PROJECT FOREMAN		
		SITE SAFETY OFFICER		



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1.0 STATEMENT OF QC PROGRAM

OHM Remediation Services Corporation (OHM), a subsidiary of OHM Corporation, will provide and maintain an effective Contractor Quality Control (CQC) Program. This program will be performed in conjunction with the Program Quality Control Plan (OHM, December 14, 1995) as applicable and in accordance with the requirements of Contract No. N62470-93-D-3032, Atlantic Division, Naval Facilities Engineering Command, dated August 1993. OHM will perform the inspection and test required to ensure that materials, workmanship, and construction conform to drawings, specifications, and contract requirements. OHM will perform each test or inspection specified, unless the required inspection or test is designated to be performed by the Government.

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 person 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.

2.0 QC ORGANIZATION AND RESPONSIBILITIES

2.1 Organization

The QC organization is depicted in the Organizational Chart (Exhibit 2.1). Other positions are reflected to show organizational interface and lines of communication. Depending upon the scope, size and complexity of the project, the Project Superintendent may also fulfill the duties of the Project QC Manager when approved by the Navy.

2.2 QC Managers

The Program QC Manager's resume is included in the Program QC Plan and the QC Manager's resume (delivery order specific) is included herein as Exhibit 2.2.

2.3 Duties, Responsibilities and Authorities

1. The **Program QC Manager** shall report to the Program Manager and shall be responsible for developing, maintaining, and enforcing the quality control program.
2. The **QC Manager** shall report to the Program QC Manager and shall be responsible for the management and implementation of the Program QC Plan and the delivery order specific QC Plan for both on-and off-site activities. Specific duties include: attend the Coordination and Mutual Understanding Meeting; conducting the scheduled QC meetings; perform the three phases of control; perform submittal reviews; perform submittal approval except for submittals designated for Contracting Officer approval; ensure tests are performed; and prepare QC certifications and QC documentation as required by this Plan. Except for managing and implementing the QC program, the QC Manager shall perform no other duties without the authorization of the Contracting Officer. The QC Manager shall be responsible for delivering the following documentation to the Contracting Officer:
 - Combined Contractor Production Report/Contractor Quality Control Report, original and one copy, by 10:00 AM the next working day after each day that work is performed.
 - Testing Plan and Log, three copies, at the end of each month.
 - Monthly Summary Report of Field Tests, original and two copies attached to the Contractor Quality Control Report at the end of each month. (See paragraph entitled "Test Results" in Section 4.0)

- QC meeting minutes, three copies within two calendar days of the meeting.
 - Rework items list, three copies at the end of each month.
 - Completion Certification attesting that “the work has been completed, inspected, tested, and is in compliance with the contract.”
3. The QC Manager is expected to attend the daily site safety meetings and abide by all site rules and regulations.

2.4 Appointment Letters

The appointment letter for the site QC Manager is included as Exhibit 2.4. The appointment letter for the Program QC Manager can be found in the Program QC Plan.

3.0 Submittals

3.1 Reviewing, Approving, and Managing Submittals

A. Contractor's Responsibility

The following responsibilities are those of the contractor and not the QC organization. They are included only for the purpose of providing an understanding of the contractor's responsibility. While the QC organization is expected to assist the contractor in fulfillment of their responsibilities, no part of these responsibilities shall be assumed by the QC organization without the expressed written permission of the Contracting Officer.

1. Coordinate preparation and processing of submittals with performance of work so that work will not be delayed by submittal processing.
2. Except as specified otherwise, allow a review period, beginning with receipt by the approving authority, that includes at least 15 working days for submittals for QC Manager approval and 20 working days for submittals requiring Contracting Officer approval. The period of review for submittals with Contracting Officer approval begins when the Government receives the submittal from the QC organization. The period of review for each resubmittal is the same as for the initial submittal.
3. Determine and verify field measurements, materials, field construction criteria; review each submittal; check and coordinate each submittal with requirements of the work and contract documents.
4. Transmit submittals to the QC organization in orderly sequence, in accordance with the submittal register, and to prevent delays in the work, delays to the Government, or delays to separate contractors.
5. Correct and resubmit submittals as directed by the approving authority. Direct specific attention, in writing or on resubmitted submittals, to revisions not requested by the approving authority on previous submissions.
6. Furnish additional copies of submittals when requested by the Contracting Officer, to a maximum limit of 20 copies.

7. Complete work that must be accomplished as a basis of a submittal in time to allow the submittal to occur as scheduled.
8. Ensure no work has begun until submittals for that work have been returned as "approved" or "approved as noted" except to the extent that a portion of the work must be accomplished as a basis of the submittal.

- **Format of Submittals**

Transmittal Form. Transmit each submittal, except sample installations and sample panels, to the office of the approving authority utilizing transmittal forms standard for the project. The transmittal form shall identify the Contractor, indicate the date of the submittal, and include information prescribed by the transmittal form and required in the paragraph entitled "Identifying Submittals". Transmittal forms for submittals of sample panels and sample installations shall record any actions and locations of the samples.

Identifying Submittals. Except sample panel and sample installation, submittals shall be identified with the following information permanently adhered to or noted on each separate component of each submittal and noted on the transmittal form. Mark each copy identically, with the following:

1. Project title and location.
2. Construction contract number and delivery order number.
3. The section and paragraph number of the section for which the submittal is required.
4. The Submittal Description (SD) number (see Exhibit 3.1) of each component of the submittal.
5. If a resubmittal, add an alphabetic suffix to the submittal description, for example, SD-10A, to indicate the resubmission.
6. The name, address, and telephone number of the subcontractor, supplier, manufacturer, and any other second tier contractor associated with the submittal.
7. Product identification and location in project.

- **Format of Product Data**

1. Present product data submittals for each section as a complete, bound volume. Include a table of contents listing page and catalog item numbers for product data.
2. Indicate, by prominent notation, each product that is being submitted, indicate the specification section number, and paragraph number to which it pertains.
3. Supplement product data with material prepared for the project to satisfy submittal requirements for which product data does not exist. Identify this material as developed specifically for the project.

- **Format of Shop Drawings**

1. Shop drawings shall be not less than 8 1/2 by 11 inches nor more than 30 by 42 inches.
2. Present 8 1/2 by 11 inches sized shop drawings as a part of the bound volume for the submittals required by the section. Present larger drawings in the sets.
3. Include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to the information required in the paragraph entitled "Identifying Submittals."
4. Dimension drawings, except diagrams and schematic drawings; prepare drawings demonstrating interface with other trades to scale. Identify materials and products for work shown.

- **Format of Samples**

1. Furnish samples in the sizes below, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately the same size as specified:
 - Sample of equipment or device: Full size.
 - Sample of materials less than 2 by 3 inches: Built-up to 8 1/2 by 11 inches.
 - Sample of materials exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.

- Sample of linear devices or materials, such as conduit and handrails: 10-inch length or length to be supplied, if less than 10 inches.
 - Sample of non-solid naturals, (e.g., sand, paint, etc.): One pint, unless specified otherwise in technical sections.
 - Sample panel: 4 feet by 4 feet.
 - Sample Installation: 100 square feet.
2. Samples showing range of variation: Where unavoidable variations must be expected, submit sets of samples of not less than three units showing the extremes and middle of the range.
 3. Reusable samples: Incorporate returned samples into the work only if so specified or indicated. Incorporated samples shall be in an undamaged condition at the time of use.
 4. Recording of sample installation: Note and preserve the notation of the area constituting the sample installation but remove the notation at the final cleanup of the project.
 5. When a color, texture, or pattern is specified in naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.
- **Format of Administrative Submittals**
 1. When the submittal includes a document which is to be used in the project or become a part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document, but to a separate sheet accompanying the document.
 2. Operation and Maintenance Manual Data: Submit in accordance with the section entitled "Operation and Maintenance Data" of the individual delivery order.
 - **Number of Copies of Product Data**
 1. Submit six (6) copies of submittals of product data requiring review and approval only by the QC organization and seven (7) copies of product data requiring review and approval by the Contracting Officer.

- **Number of Copies of Shop Drawings**

1. For shop drawings presented on sheets larger than 8 1/2 by 14 inches, submit seven (7) prints of each shop drawing prepared for this project.
2. For shop drawings presented on sheets 8 1/2 by 14 inches or less, conform to the quality requirements for the product data.

- **Number of Samples**

1. Submit two (2) samples, or two (2) sets of samples showing range of variation of each required item. One (1) approved sample or set of samples will be retained by the approving authority and one will be returned to the Contractor.
2. Submit one (1) sample panel. Include components listed in the technical section or as directed.
3. Submit one (1) sample installation, where directed.
4. Submit one (1) sample of non-solid materials.

- **Number of Copies of Administrative Submittals**

1. Unless otherwise specified, submit administrative submittals which are 8 1/2 by 14 inches or smaller in size in the quantity required for product data.
2. Unless otherwise specified, submit administrative submittals larger than 8 1/2 by 14 inches in size in the quantities required for shop drawings.

B. QC Organization Responsibilities

The Quality Control (QC) organization shall be responsible for reviewing and certifying that submittals are in compliance with contract requirements. The approving authority on submittals is the QC Manager unless submission to the Contracting Officer is specified for the specific submittal. The specific QC responsibilities for submittals are as follows:

1. Note the date on which the submittal was received from the contractor on each submittal for which the Site QC Manager is the approving authority.
2. Determine and verify field measurements, materials, field construction criteria; review each submittal; and check and coordinate each submittal with requirements of the work and contract documents.
3. Review submittals for conformance with project design concepts and compliance with the contract documents.
4. Act on submittals, determining the appropriate action based on the review of the submittal.
 - When the QC Manager is the approving authority, take the appropriate action on the submittal from the paragraph of "Possible Actions."
 - When the Contracting Officer is the approving authority or when a variation has been proposed, forward the submittal to the Contracting Officer with the certifying statement or return the submittal marked "Not Reviewed" or "Revise and Resubmit" as appropriate.
5. Ensure that the material is clearly legible.
6. Stamp each sheet of each submittal with the appropriate stamp, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only. When agreed to by the Contracting Officer, a single cover sheet containing the required certification wording (see Exhibit 3.1a and 3.1b) may be utilized instead of the above. The stamp or cover sheet shall contain the following wording:
 - When the approval authority is the Contracting Officer, the QC organization will certify submittals forwarded to the Contracting Officer with the following certifying statement:

I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into Contract Number N62470-93-D-3032, is in compliance with the Contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval. Government approval of proposed variation, if any, is recommended.

Certified by Submittal Reviewer _____, Date _____

Certified by QC Manager _____, Date _____

- When approving authority is the QC Manager, the QC Manager will use the following approval statement when returning submittals to the Contractor as "Approved" or "Approved as Noted":

I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated into Contract Number N62470-93-D-3032, is in compliance with the Contract drawings and specification, can be installed in the allocated spaces, and is ___ approved for use, ___ approved for use subject to Government approval of proposed variation.

Certified by Submittal Reviewer _____, Date _____

Approved by QC Manager _____, Date _____

7. Sign the certifying statement or approval statement. The signatures shall be in original ink. Stamped signatures are not acceptable.
8. Update the submittal register as submittal actions occur and maintain the submittal register at the project site until final acceptance by the Contracting Officer.
9. Retain a copy of approved submittals at the project site, including the contractor's copy of approved samples.
10. When the approving authority is the QC Manager, forward two copies of each approved submittal, except "Samples", where only one set is required, to the Contracting Officer.

- **Actions Possible**

Submittals returned to the contractor shall contain one of the following notations:

1. "Not Reviewed" shall indicate the submittal has been previously reviewed and approved, is not required as a submittal, does not have evidence of being reviewed and approved by the Contractor, or is not complete. A submittal marked "Not Reviewed" shall be returned with explanation of the reason it is not reviewed. Returned submittals deemed to lack review by the Contractor or to be incomplete shall be resubmitted with appropriate action, coordination, or change.

2. Submittals marked “**Approved**” or “**Approved as Submitted**” authorize the Contractor to proceed with the work covered.
3. Submittals marked “**Approved as Noted**” authorize the Contractor to proceed with the work as noted provided the Contractor takes no exception to the notations.
4. Submittals marked “**Revise and Resubmit**” or “**Disapproved**” indicates the submittal is incomplete or does not comply with the design concept or the requirements of the Contract documents and shall be resubmitted with appropriate changes.

3.2 Personnel Authorized to Review and Certify Submittals

In addition to the QC Manager, the personnel listed in Exhibit 3.2 are authorized to review and certify submittals as indicated. Any additional personnel required to review and certify submittals will be submitted in writing to the Contracting Officer for approval.

3.3 Submittal Register

The submittal register is shown in Exhibit 3.3. The submittal register shall be maintained as follows:

1. Column (a): List each specification section in which a submittal is required.
2. Column (b): List each submittal description (SD No. and type, e.g., SD-04, Drawings) required in each specification section. Follow each submittal description with the list of material of products to be addressed in each submittal description.
3. Column (c): List one principle paragraph in the specification section where a material or product is specified. This listing is only to facilitate submittal reviews. Do not consider entries in column (c) as limiting project requirements; do not consider that a blank must be filled in by the Contractor or the Government.
4. Column (d): Indicates approving authority for each submittal. A “G” indicates approval by the Contracting Officer; a blank indicates approval by the site QC Manager.

5. Column (e): Indicates for submittals to be approved by Contracting Officer, specific reviewers other than the QC organization. This column may or may not be filled out on the copy supplied by the Government.

Columns (f) through (o) will be completed by the QC organization as follows:

6. Column (f): As submittals are processed, list a consecutive number assigned by the Contractor for each group of submittals. Place this same number in the appropriate block on the "Submittal Transmittal Form". For a resubmission, repeat transmittal control number of the original submittal with a suffix; e.g., No. "100B" is second resubmission of material originally transmitted under No. "100".
7. Column (g): List dates scheduled for approving authority to receive submittals. These dates are the scheduled beginnings of submittal review period. The Contractor proposes these dates and the Contracting Officer approves them to establish the approved submittal register.
8. Columns (h) and (i): Use to record Contractor's review when forwarding submittals to the QC organization.
9. Column (j): Enter date QC organization receives submittal from contractor.
10. Columns (k) and (l): If approving authority is Contracting Officer, enter date QC organization forwards certified submittal to Contracting Officer.
11. Columns (m) and (n): If approving authority is Contracting Officer, enter the Government action and date of action as shown on returned submittal. If approving authority is QC Manager, enter QC action and date of action.
12. Column (o): Enter date QC organization returns submittal to Contractor, regardless of who is approving authority. If QC Manager is approving authority, it is also the date the information is forwarded to the Government.

4.0 ACCREDITED LABORATORIES/TESTING LABORATORIES

4.1 Testing Laboratory Requirements

Testing services will be provided by an independent accredited testing laboratory qualified to perform sampling and tests. When the proposed testing laboratory is not accredited by an acceptable accreditation program, as described by the paragraph entitled "Accredited Laboratories," submit to the Contracting Officer for approval, certified statements signed by an official of the testing laboratory attesting that the proposed laboratory meets or conforms to the following requirements:

1. Sampling and testing shall be under the technical direction of a registered professional engineer (PE) with at least five years of experience in sampling and testing.
2. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of ASTM C 1077, 1990.
3. Laboratories engaged in testing of bituminous paving materials shall meet the requirements of ASTM D 3666, 1990 (Rev. A).
4. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, shall meet the requirements of ASTM D 3740, 1988.
5. Laboratories engaged in nondestructive testing (NDT)/nondestructive examination (NDE) shall meet the requirements of ASTM E 543, 1989 (Rev. A).
6. Laboratories performing work in connection with specific sampling and chemical analysis of contaminated media according to the delivery order specification shall be handled as defined in the Sampling and Analysis Plan (SAP).

4.2 Accredited Laboratories

Acceptable accreditation programs are the National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO) program, and the American Association for Laboratory Accreditation (AALA) program. Furnish to the Contracting Officer, a copy of the Certificate of Accreditation, Scope of Accreditation and latest directory of the accrediting organization for

accredited laboratories. The scope of the laboratory's accreditation shall include the test methods required by the contract.

4.3 Inspection of Testing Laboratories

Prior to approval of non-accredited laboratories, the proposed testing laboratory facilities and records may be subject to inspection by the Contracting Officer. Records subject to inspection include equipment inventory, equipment calibration dates and procedures, library of test procedures, audit and inspection reports by agencies conducting laboratory evaluations and certifications, testing and management personnel qualifications, test report forms, and the internal QC procedures.

4.4 Test Results

Test reports shall cite applicable contract requirements, tests or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. Test results shall be signed by a testing laboratory representative authorizes to sign certified test reports. Furnish the signed reports, certifications, and other documentation to the Contracting Officer via the QC Manager. The QC Manager shall furnish a summary report of field tests by attaching a copy of the report to the last daily Contractor Quality Control Report of each month.

5.0 TESTING PLAN AND LOG

5.1 Testing Plan and Log

As tests are performed, the QC Manager shall record on the "Testing Plan and Log" (Exhibit 5.1) the date the test was conducted, the date the test results were forwarded to the Contracting Officer, any remarks and acknowledgment that an accredited or Contracting Officer approved testing laboratory was used. Attach a copy of the updated testing plan and log to the last daily Contractor Quality Control Report of each month.

In development of the Testing Plan and Log, consideration shall be given to the use of multiple Testing Plans and Logs subdivided by definable features of the specification and/or of different materials within a definable feature section of the specification. When materials are tested on a specific frequency, accumulated material totals shall be recorded in the remarks section or on an attachment to each specific Testing Plan and Log to provide assurance that the test are conducted at the required intervals.

5.2 Testing

Except as stated otherwise in the specification sections, perform sampling and testing required under the contract.

6.0 REWORK

6.1 Rework Documentation Requirements

The QC Manager shall maintain a list of work that does not comply with the contract, identifying what items need to be reworked, the date the item was originally discovered, and the date the item was corrected. There is no requirement to report a rework item that is corrected the same day it is discovered. Attach a copy of the Rework Items List (Exhibit 6.1) to the last daily Contractor Quality Control Report of each month. The Contractor shall also be responsible for including on this list, items needing rework including those identified by the Contracting Officer.

7.0 MEETING

7.1 Coordination and Mutual Understanding Meeting

After submission of the QC Plan and prior to start of construction, meet with the Contracting Officer to discuss the QC program required for this contract. The purpose of this meeting is to develop a mutual understanding of the QC details, including forms to be used; administration of on-site and off-site work, and coordination of the Contractor's management, production and the QC Manager's duties with the Contracting Officer. A sample agenda is included as Exhibit 7.1. As a minimum, the Contractor's personnel required to attend shall include the Project Manager, Project Superintendent and QC Manager. Minutes of the meeting shall be prepared by the QC Manager and signed by both the Contractor and the Contracting Officer.

7.2 QC Meetings

After the start of construction, the QC Manager shall conduct QC meetings once every two weeks or as scheduled by the Contracting Officer or delivery order. The meetings will be held at the work site, or where specified, with the project superintendent and the foreman responsible for the upcoming work in attendance. The QC Manager shall take steps as may be necessary to prevent the QC Meeting from becoming a production meeting. Often it is convenient to hold a production meeting following the QC meeting, however the minutes of these meetings shall be maintained separate. The QC Manager shall notify the Contracting Officer at least 48 hours in advance of each meeting. The QC Manager shall prepare the minutes of the meeting and provide a copy to the Contracting Officer within two working days after the meeting. As a minimum, the following shall be accomplished at each meeting:

1. Review the minutes of the previous meeting.
2. Review the schedule and the status of work.
 - Work or testing accomplished since last meeting.
 - Rework items identified since last meeting.
 - Rework items completed since last meeting.
3. Review the status of submittals.

- Submittals reviewed and approved since last meeting.
 - Submittals required in the near future.
4. Review the work to be accomplished in the next two weeks and documentation required. Schedule the three phases of control and testing:
- Establish completion dates for rework items.
 - Identify Preparatory Phases required.
 - Identify Initial Phases required.
 - Identify Follow-up Phases required.
 - Identify Testing required.
 - Identify status of off-site work or testing.
 - Identify documentation required.
5. Resolve QC and production problems.
6. Address items that may require revising the QC plan or changes in procedures.

In addition to the normal project distribution which includes the Contracting Officer, a copy shall be forwarded to the C.O.T.R., LANTDIV, the Program QC Manager, and the OHM Program Manager.

8.0 THREE PHASES OF CONTROL

The QC Manager shall perform the three phases of control to ensure that work complies with contract requirements. The three phases of control shall adequately cover both on-site and off-site work and shall include the Inspection Plan activities (see Exhibit 8.0) of each definable feature of work as listed in Exhibit 9.1.

8.1 Preparatory Phase

Notify the Contracting Officer at least two working days in advance of each preparatory phase. Conduct the preparatory phase meeting with the superintendent and the foreman responsible for the definable feature of work. Document the results of the preparatory phase actions in the daily Contractor Quality Control Report (Exhibit 8.1). Perform the following prior to beginning work on each definable feature of work:

- Review each paragraph of the applicable specification sections.
- Review the contract drawings.
- Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required.
- Review the testing plan and ensure that provisions have been made to provide the required QC testing.
- Examine the work area to ensure that the required preliminary work had been completed.
- Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data.
- Review the safety plan and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets (MSDS) are submitted.
- Discuss construction methods.

8.2 Initial Phase

Notify the Contracting Officer at least two working days in advance of each initial phase meeting. When crews are ready to start work on a definable feature of work, conduct the initial phase meeting with the personnel responsible for that definable feature of work. Observe the initial segment of the definable feature of work to ensure that the work complies with contract requirements. Document the results of the initial phase in the daily Contractor Quality Control Report. Repeat the initial phase for changes in personnel assigned responsibility for the work, or when acceptable levels of specified quality are not being met. Perform the following for each definable feature of work:

- Establish the quality of workmanship required.
- Resolve conflicts.
- Review the Safety Plan and the appropriate activity hazard analysis to ensure that applicable safety requirements are met.
- Ensure that testing is performed.

8.3 Follow-up Phase

Perform the following for ongoing work daily, or more frequently as necessary, until the completion of each definable feature of work and document in the daily Contractor Quality Control Report:

- Ensure the work is in compliance with contract requirements.
- Maintain the quality of workmanship required.
- Ensure that testing is performed.
- Ensure that rework items are being corrected.

8.4 Notification of Three Phases of Control for Off-Site Work

Notify the Contracting Officer at least two weeks prior to the start of the preparatory and initial phases.

8.5 Receipt Inspection

The QC organization shall conduct Receipt Inspection of materials and equipment procured in accordance with the delivery order specification. In addition to the submittal documentation, which will be reviewed and approved as required under Section 3.0, Submittals, the following attributes will be inspected for each order/shipment as applicable:

- Material is same as specified by the Delivery Order Specification
- Quantity as specified by the procurement document
- Dimensions as required by the procurement document
- Shipping Damage
- Physical Damage
- Identification and Marking
- Protective Covers and Seals
- Cleanliness
- Workmanship

Materials and equipment found to be unacceptable at receipt inspection shall be rejected and "RED Tagged" (see Exhibit 8.5) until correction or replacement can be made. This material/equipment shall not be used until the corrective action results in satisfactory reinspection.

The results of the receipt inspection, by attribute, will be included in the Contractor Quality Control Report (Exhibit 8.1) for the date of inspection.

8.6 Documentation

Reports are required for each day that work is performed and for every seven consecutive calendar days of no work and on the last day of no work periods. Account for each calendar day throughout the life of the contract. The reporting of work shall be identified by terminology consistent with the construction schedule. Contractor Quality Control Reports are to be prepared, signed and dated by the QC Manager and shall contain the following information:

- Identify the control phase and the definable feature of work.
- Results of the preparatory phase meetings held, including the location of the definable feature of work and a list of personnel present at the meeting. Indicate in the report that for this definable feature of work, the drawings and specifications have been reviewed, submittals have been approved, materials comply with approved submittals, materials are stored properly, preliminary work was done correctly, the testing

plan has been reviewed, and work methods and schedules have been discussed.

- Results of the initial phase meetings held, including the location of the definable features of work and a list of personnel present at the meeting. Indicate in the report that for this definable feature of work, the preliminary work was done correctly, samples have been prepared and approved, the workmanship is satisfactory, test results are acceptable, work is in compliance with the contract, and the required testing has been performed and include a list of who performed the tests.
- Results of the follow-up phase inspections held, including the location of the definable features of work. Indicate in the report that for this definable feature of work that the work complies with the contract as approved and that required testing has been performed and include a list of who performed the tests.
- Results of the three phases of control for off-site work, if applicable, include actions taken.
- List the rework items identified, but not corrected by close of business.
- As rework items are corrected, provide a revised rework items list along with the corrective action taken.
- Include in the remarks section of the report pertinent information including directions received, quality control problem areas, deviations from the QC Plan, construction deficiencies encountered, QC meetings held, acknowledgment that as-built drawings have been updated, corrective direction given by the QC Manager and corrective action taken by the contractor.
- When the QC Manager believes that an attribute list-type inspection is more appropriate for the inspection of specific definable features of work, he/she may use any type of form desired for this purpose. However, this or any other form utilized shall become an attachment to the daily Contractor Quality Control Report and shall not preclude any other requirements of the contract or this plan.

9.0 DEFINABLE FEATURES OF WORK

9.1 Definable Features of Work

Exhibit 9.1 contains a list of definable features of work for this delivery order. A definable feature of work is a task that is separate and distinct from other tasks and requires separate control requirements. As a minimum, each division of the specification is considered a definable feature of work. However, at times there may be more than one definable feature of work in each division of the specification or a definable feature of work may include several specification sections. The QC Manager shall discuss the list with the Contracting Officer for possible expansion of the list.

10.0 EXHIBITS

The following forms are acceptable for providing the information required by this QC Plan and the contract, except as otherwise directed by the Contracting Officer. While use of these specific forms are not required by the contract, any other format used shall contain the same information and be approved by the Program QC Manager. Exhibit 10.1 includes additional forms used by the contractor. These forms and their use are not addressed in this QC Plan.

NOTE: Exhibit numbers refer to the paragraph from which the Exhibit was first addressed.

10.1 Index of Exhibits

- Exhibit 2.1 Organizational Chart
- Exhibit 2.2 Project QC Manager's Resume
- Exhibit 2.4 Project QC Manager Appointment Letter
- Exhibit 3.1 Submittal Descriptions (SD)
- Exhibit 3.2 List of Personnel Authorized to Review and Certify Submittals
- Exhibit 3.3 Submittal Register
- Exhibit 5.1 Testing Plan and Log
- Exhibit 6.1 Rework Items List
- Exhibit 7.1 Sample agenda for the Coordination and Mutual Understanding Meeting
- Exhibit 8.0 Inspection Plan
- Exhibit 8.1 Contractor Quality Control Report
- Exhibit 8.5 Reject Tag (RED Tagged)
- Exhibit 9.1 Definable Features of Work
- Exhibit 10.1 Contractor Forms

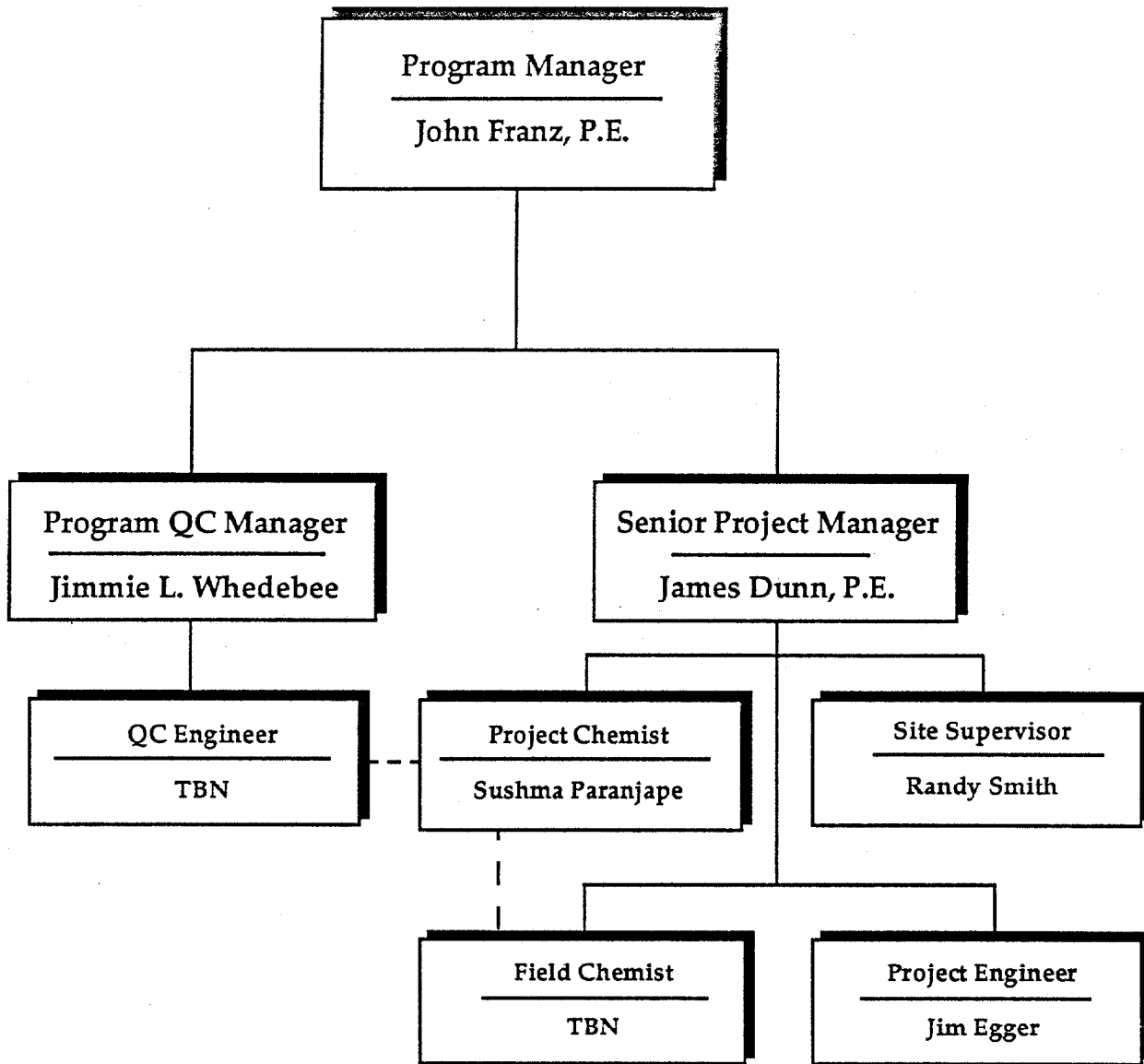


Figure 2.1

QC Organization Chart



OHM Remediation
Services Corp.



**OHM Remediation
Services Corp.**

A Subsidiary of OHM Corporation

Exhibit 2.4

(Date)

(Name of QC Manager)
OHM Remediation Services Corporation
(Site Address)
(City, State ZIP)

RE: Site QC Manager
(Delivery Order description)
Contract N62470-93-D-3032
Delivery Order 0000

Dear (Name)

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 (617) 589-2306

Sincerely,

Jimmie L. Whedbee
Program QC Manager
LANTDIV RAC Program

SD-01, Data

Submittals that provide calculations, descriptions, descriptions, or other documentation regarding the work.

SD-02, Manufacturer's Catalog Data

Data composed of catalog cuts, brochures, circulars, specifications and product data, printed information in sufficient detail and scope to verify compliance with requirements of the contract documents. A type of product data.

SD-03, Manufacturer's Standard Color Charts

Preprinted illustrations displaying choices of color and finish for a material or product. A type of product data.

SD-04, Drawings

Submittals that graphically show relationship of various components of the work, schematic diagrams of systems detail of fabrications, layout of particular elements, connections, and other relational aspects of the work. A type so shop drawing.

SD-05, Design Data

Design calculations, mix design, analyses, or other data written in nature and pertaining to a part of the work. A type of shop drawings.

SD-06, Instructions

Preprinted material describing installation of a product, system, or material, including special notices and Material Safety Data Sheets, if any, concerning impedances, hazards, and safety precautions. A type of product data.

SD-07, Schedules

A tabular list of data or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work. A type of shop drawing

SD-08, Statements

A document, required of the Contractor, or through the Contractor by way of a supplier, installer, manufacturer, or other lower tier contractor, the purpose of which is to further the quality or orderly progression of a portion of the work by documenting procedures, acceptability of method or personnel, qualifications, or other verification of quality. A type of shop drawing.

SD-09, Reports

Reports of inspection and laboratory test, including analysis and interpretation of test results. Each report shall be properly identified. Test method used and compliance with recognized test standards shall be described.

SD-10, Test Reports

A report signed by an authorized official of a testing laboratory that a material, product, or system identical to the material, product or system to be provided has been tested in accordance with requirements specified by naming the test method and material. The test report must state the test was performed in accordance with the test requirements; state the test results; and indicate whether the material, product, or system has passed or failed the test. Testing must have been within three years of the date of Contract award. A type of product data.

SD-11, Factory Test Reports

A written report that includes the findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for this project before it is shipped to the job site. The report must be signed by an authorized official of a testing laboratory and must state the test was performed in accordance with the test requirements; state the test results; and indicate whether the material, product, or system has passed or failed the test. A type of shop drawing.

SD-12, Field Test Reports

A written report that includes the findings of a test made at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation. The report must be signed by an authorized official of a testing laboratory or agency and must state the test was performed in accordance with the test requirements; state the test results; and indicate whether the material, product, or system has passed or failed the test. A type of shop drawing.

SD-13, Certificates

Statements signed by responsible officials of a manufacturer of a product, system, or material attesting that the product, system, or material meet specified requirements. The statements must be dated after the award of this contract, name the project, and list the specific requirements that it is intended to address. A type of shop drawing.

SD-14, Samples

Samples, including both fabricated and unfabricated physical examples of materials, products, and units of work as complete units or as portions of units of work. A type of sample.

SD-15, Color Selection Samples

Samples of the available choice of colors, textures, and finishes of a product or material, presented over substrates identical in texture to that proposed for the work. A type of sample.

SD-16, Sample Panels

An assembly constructed at the product site in a location acceptable to the Contracting Officer and using materials and methods to be employed in the work; completely finished; maintained during construction; and removed at the conclusion of the work or when authorized by the Contracting Officer. A type of sample.

SD-17, Sample Installations

A portion of an assembly or material constructed where directed and, if approved, retained as a part of the work. A type of sample.

SD-18, Records

Documentation to ensure compliance with an administrative requirement or to establish and administrative mechanism. A type of administrative and close-out submittal,

SD-19, Operation and Maintenance Manuals

Data intended to be incorporated in an operations and maintenance manual. A type of administrative and close-out submittal.

List of Personnel Authorized to Review and Certify Submittals

Specification Section:	Submittal Type:	Authorized Personnel:
01010, 01011 and 01012	All others	Randy Smith Jim Dunn Greg Gilles Robert Keskonis LANTDIV RPM

**Montford Point Water Tower Site
MCB Camp Lejeune - DO 0151**

Submittal Register

Spec. No.	SD No. and Type of Submittal Material or Product	Spec. Para. No.	Approval by CO	Gov. or A/E Reviewer	Trans. Control No.	Planned Sub. Date	Action Code	Date of Action	Date Forwarded to Appro. Auth./Date Received from Contr.	Date Forwarded to Other Reviewer	Date Received from Other Reviewer	Action Code	Date of Action	Mailed to Contr./Recd. from Appro. Auth.	Remarks
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
01010	Work Plan	1.2.1				7/25/97									
01010	As-built Records	3.6.1				CR									
01010	As-built Record of Material	3.6.2				CR									
01010	Site Health and Safety Plan	3.6.3				WP									
01010	Environmental Protection Plan	3.6.4				WP									
01010	MIS Reports	3.6.6				WP									
01010	CQC Plan Addenda	3.6.7				WP									
01010	Testing Laboratory Qualifications	3.6.8				WP									
01010	CQC Meeting Minutes	3.6.9				As received									
01010	Non-compliance Check-off List	3.6.10				Monthly									
01010	Test Results Summary Report	3.6.11				As received/ CR									
01010	Daily Report to Inspector (DRI)	3.6.12				Daily									
01010	CQC Report	3.6.13				CR									
01010	Submittal Status Log	3.6.14				Monthly									
01010	Permits	3.6.15				CR									

CR - Closeout Report
 WP - Work Plan
 A - Approved
 AN - Approved as noted

SAMPLE DOCUMENT
COORDINATION AND MUTUAL UNDERSTANDING MEETING AGENDA
FOR
DELIVERY ORDER No. _____
AT THE

U.S. NAVAL STATION,

_____, 1996

The purpose of this meeting is to develop a mutual understanding of the QC details, including forms to be used; administration of on-site and off-site work, and coordination of the Contractor's management, production and the QC Manager's duties with the Contracting Officer.

The QC program consists of a QC Organization, QC Manager, a QC Plan for this Delivery Order, this Coordination and Mutual Understanding Meeting, QC meetings, three phases of control, submittal review, submittal approval except for submittals designated for Contracting Officer approval, testing, and QC certifications and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations which comply with requirements of this contract.

QC Manager duties (contract para. 6.6.1)

- Attend this meeting
- Conduct the QC Meetings
- Perform the three phases of control
- Perform submittal review
- Perform submittal approval
- Ensure testing is performed
- Prepare QC certifications and documentation
- Perform other activities when approved by the Contracting Officer

Submittal Reviewers Duties and Qualifications (contract para. 6.7)

- Provide submittal reviewers qualified in the disciplines being reviewed other than the QC Manager, to review and certify that the submittals meet the requirements of the contract.

QC Plan (contract para. 6.8)

- (as specified therein)

SAMPLE DOCUMENT

Coordination and Mutual Understanding Meeting (contract para. 6.9)

- (see purpose above)

QC meetings (contract para. 6.10)

- The QC Manager shall conduct QC meetings once every two weeks or as otherwise directed by the Contracting Officer.
- Meeting minutes to be prepared by the QC Manager in accordance with the contract outline and a copy provided to the Contracting Officer within two working days of the meeting.
- A copy will be distributed to the Program QC Manager.

Three phases of control (contract para. 6.11)

- Preparatory Phase Meeting
- Initial Phase Meeting
- Follow-Up Phase Inspection

Submittal review and approval (contract para. 6.12 and Part 7.0, "Submittals")

- Review
- Approval
- Certification
- Submittal Register

Testing (contract para. 6.13)

- Testing Laboratory Requirements
- Accredited Laboratories
- Inspection and Testing Laboratories
- Capability Checks
- Test Results

QC certifications (contract para. 6.14)

- Contractor Quality Control Report Certification
- Invoice Certification
- Completion certification

Documentation (contract para. 6.15)

SAMPLE DOCUMENT

- Contractor Production Report
 - Contractor Quality Control Report
 - Testing Plan and Log
 - Rework Items List
 - As-Built Records
 - Report Forms
-
1. Contractor Production Report
 2. Contractor Quality Control Report
 3. Testing Plan and Log
 4. Rework Items List

INSPECTION SCHEDULE
(Project Description)
(Project Location)
Delivery Order No. _____

Exhibit 8.0

Spec. Section	Activity*	Preparatory Report No.	Initial Report No.	Follow-up Report Nos.**

CONTRACTOR QUALITY CONTROL REPORT

DATE _____

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

PHASE	(BLANK NOT APPLICABLE)	YES	NO	IDENTIFY SPECIFICATION SECTION, DEFINABLE FEATURE OF WORK, LOCATION AND LIST PERSONNEL PRESENT		
PREPARATORY	PLANS AND SPECS HAVE BEEN REVIEWED	<input type="checkbox"/>	<input type="checkbox"/>	<p style="font-size: 1.2em;">Exhibit 8.1</p> <p style="font-size: 1.2em;">Page 1 of 3</p>		
	THE SUBMITTALS HAVE BEEN APPROVED.	<input type="checkbox"/>	<input type="checkbox"/>			
	MATERIALS COMPLY WITH APPROVED SUBMITTALS	<input type="checkbox"/>	<input type="checkbox"/>			
	MATERIALS STORED PROPERLY.	<input type="checkbox"/>	<input type="checkbox"/>			
	PRELIMINARY WORK WAS DONE CORRECTLY.	<input type="checkbox"/>	<input type="checkbox"/>			
	TESTING PLAN HAS BEEN REVIEWED.	<input type="checkbox"/>	<input type="checkbox"/>			
	WORK METHOD AND SCHEDULE DISCUSSED.	<input type="checkbox"/>	<input type="checkbox"/>			
	JOB SAFETY / HAZARD ANALYSIS ADDRESSED	<input type="checkbox"/>	<input type="checkbox"/>			
	INITIAL	PRELIMINARY WORK WAS DONE CORRECTLY	<input type="checkbox"/>		<input type="checkbox"/>	<table border="1" style="width: 100%; height: 100%;"> <tr> <th style="text-align: center;">TESTING PERFORMED & WHO PERFORMED TEST</th> </tr> <tr> <td style="height: 100px;"> </td> </tr> </table>
TESTING PERFORMED & WHO PERFORMED TEST						
SAMPLE HAS BEEN PREPARED/APPROVED		<input type="checkbox"/>	<input type="checkbox"/>			
WORKMANSHIP IS SATISFACTORY		<input type="checkbox"/>	<input type="checkbox"/>			
TEST RESULTS ARE ACCEPTABLE.		<input type="checkbox"/>	<input type="checkbox"/>			
WORK IS IN COMPLIANCE WITH THE CONTRACT.		<input type="checkbox"/>	<input type="checkbox"/>			
WORK COMPIES WITH SAFETY REQUIREMENTS	<input type="checkbox"/>	<input type="checkbox"/>				
FOLLOW-UP	WORK COMPIES WITH CONTRACT AS APPROVED INITIAL PHASE	<input type="checkbox"/>	<input type="checkbox"/>	<table border="1" style="width: 100%; height: 100%;"> <tr> <th style="text-align: center;">TESTING PERFORMED & WHO PERFORMED TEST</th> </tr> <tr> <td style="height: 100px;"> </td> </tr> </table>	TESTING PERFORMED & WHO PERFORMED TEST	
	TESTING PERFORMED & WHO PERFORMED TEST					
WORK COMPIES WITH SAFETY REQUIREMENTS	<input type="checkbox"/>	<input type="checkbox"/>				

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)	REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)

REMARKS

On behalf of the contractor, I certify that this report is completed and correct and complete and material used and work performed during the reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.

AUTHORIZED QC MANAGER AT SITE

DATE

GOVERNMENT QUALITY ASSURANCE REPORT

DATE _____

QUALITY ASSURANCE REPRESENTATIVE'S REMARKS AND/OR EXCEPTIONS TO THE REPORT

GOVERNMENT QUALITY ASSURANCE MANAGER

DATE

CONTRACTOR QUALITY CONTROL REPORT CONTINUATION SHEET
(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

PHASE	BLANK NOT APPLICABLE			IDENTIFY SPECIFICATION SECTION, DEFINABLE FEATURE OF WORK, LOCATION AND LIST PERSONNEL PRESENT
		YES	NO	
PREPARATORY	PLANS AND SPECS HAVE BEEN REVIEWED	<input type="checkbox"/>	<input type="checkbox"/>	
	THE SUBMITTALS HAVE BEEN APPROVED.	<input type="checkbox"/>	<input type="checkbox"/>	
	MATERIALS COMPLY WITH APPROVED SUBMITTALS	<input type="checkbox"/>	<input type="checkbox"/>	
	MATERIALS STORED PROPERLY.	<input type="checkbox"/>	<input type="checkbox"/>	
	PRELIMINARY WORK WAS DONE CORRECTLY.	<input type="checkbox"/>	<input type="checkbox"/>	
	TESTING PLAN HAS BEEN REVIEWED.	<input type="checkbox"/>	<input type="checkbox"/>	
	WORK METHOD AND SCHEDULE DISCUSSED.	<input type="checkbox"/>	<input type="checkbox"/>	
	JOB SAFETY / HAZARD ANALYSIS ADDRESSED	<input type="checkbox"/>	<input type="checkbox"/>	

Exhibit 8.1
Page 2 of 3

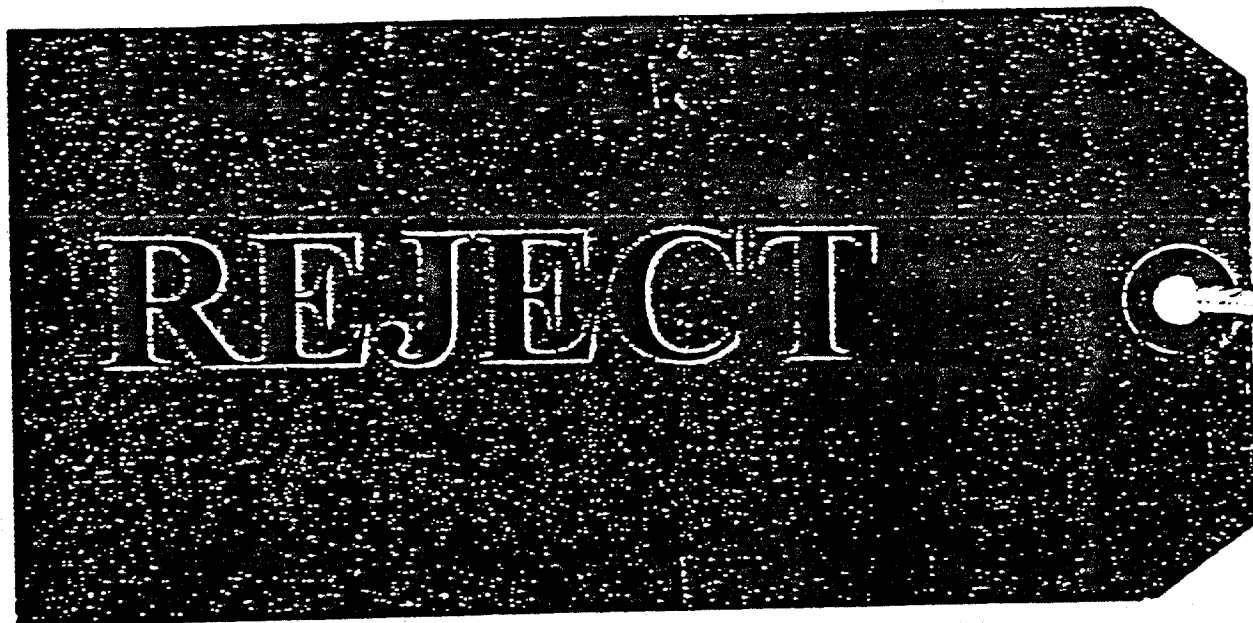
INITIAL	PRELIMINARY WORK WAS DONE CORRECTLY	<input type="checkbox"/>	<input type="checkbox"/>	
	SAMPLE HAS BEEN PREPARED/APPROVED	<input type="checkbox"/>	<input type="checkbox"/>	
	WORKMANSHIP IS SATISFACTORY	<input type="checkbox"/>	<input type="checkbox"/>	
	TEST RESULTS ARE ACCEPTABLE.	<input type="checkbox"/>	<input type="checkbox"/>	
	WORK IS IN COMPLIANCE WITH THE CONTRACT.	<input type="checkbox"/>	<input type="checkbox"/>	
	WORK COMPLIES WITH SAFETY REQUIREMENTS	<input type="checkbox"/>	<input type="checkbox"/>	
				TESTING PERFORMED & WHO PERFORMED TEST

CONTRACTOR QUALITY CONTROL REPORT CONTINUATION SHEET

DATE

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

PHASE	(BLANK NOT APPLICABLE)	YES	NO	IDENTIFY SPECIFICATION SECTION, DEFINABLE FEATURE OF WORK, LOCATION AND LIST PERSONNEL PRESENT
	WORK COMPLIES WITH CONTRACT AS APPROVED INITIAL PHASE	<input type="checkbox"/>	<input type="checkbox"/>	
	WORK COMPLIES WITH SAFETY REQUIREMENTS	<input type="checkbox"/>	<input type="checkbox"/>	
FOLLOW-UP				<p>Exhibit 8.1 Page 3 of 3</p>



Montford Point Water Tower Site
 MCB Camp Lejeune - DO151

Table 1
 Definable Features of Work

Spec. Section	Paragraph No.	Feature of Work	Preparatory		Initial Reg.	Follow-up			Remarks
			Reg.	Date		Date	Reg.	Date	
*	--	Site Mobilization	X						Ref. RAWP
*	--	Clearing and grubbing	X		X		X		Ref. RAWP
*	--	Initial Characterization for Disposal	X		X		X		Ref. RAWP
*	--	Pre-excavation Sampling	X		X		X		Ref. RAWP
*	--	Soil Treatment	X		X		X		Ref. RAWP
*	--	Confirmation Sampling	X		X		X		QC review
*	--	Backfill	X		X		X		QC review
*	-	Underground Utilities	X		X		X		QC review
*	--	Transportation and Disposal	X		X		X		Ref RAWP
*	--	Site Restoration	X		X		X		QC review
*	--	Site Demobilization					X		Ref. RAWP

*typical specification not provided with design package



OHM Remediation Services Corp.

Routing: Contr. Adm.
Proj. Mgr
Site Supv.
Proj. Acct.
CSE
QC
Job File

Project Name: _____
Delivery Order: _____
Contract Purchase Order N62470-93-D-3032
OHM Project Order _____

OVERTIME AUTHORIZATION (OTA)

Date of Request: _____ WBS Code: _____ OTA No: _____

Reason for request	Explanation: _____
<input type="checkbox"/> Emergency	_____
<input type="checkbox"/> Equipment Maintenance	_____
<input type="checkbox"/> Keep critical activities on schedule	_____
<input type="checkbox"/> Accelerate schedule	_____ Exhibit 10.1b _____
<input type="checkbox"/> Other	_____
Initiated by:	_____
<input type="checkbox"/> Navy	_____
<input type="checkbox"/> OHM	_____
<input type="checkbox"/> Other	_____

Estimated period of overtime work _____ Start Date: _____ End Date: _____
ROM Cost Estimate _____

Requested By: _____ Date: _____
OHM Project Manager

APPROVALS

Approved Modified Rejected

Modification (if any)

RPM: _____ Date: _____
ROICC/NTR: _____ Date: _____



OHM Remediation
Services Corp.

Routing: Contr. Adm.
Site Supv.
Proj. Acct.
CSE
QC
Job File

Project Name: _____
Delivery Order: _____
Contract Purchase Order N62470-93-D-3032
OHM Project Order _____

REQUEST FOR INFORMATION (RFI)

Date of Request: _____ Suspense Date: _____ VR No: _____

SITUATION/CONDITION Dwg Ref: _____ Spec Sec: _____
REQUIRING CLARIFICATION Site Location _____

DESCRIPTION:

_____ Exhibit 10.1c _____

DATE RECEIVED BY:
Certifying Engineer: _____ Tech. Rep: _____ ROICC: _____
RESPONSE:

Note: This is a clarification and does not create additional work that could be considered as a change to the contract drawings and /or specification.

RPM: _____ Date: _____

ROICC/NTR: _____ Date: _____



OHM Remediation
Services Corp.

Routing: Contr. Adm.
Site Supv.
Proj. Acct.
CSE
QC
Job File

Project Name: _____
Delivery Order: _____
Contract Purchase Order N62470-93-D-3032
OHM Project Order _____

VARIANCE REQUEST (VR)

Date of Request: _____ Suspense Date: _____ VR No: _____

PROPOSED VARIANCE

Dwg Ref.: _____ Spec Sec: _____
Site Location _____

DESCRIPTION:

Note: Approval of this variance will not result in an increase in cost or in time of performance to this contract.

- Initiated By Navy
 OHM
 Regulatory Agency
 Other

On-Site Engineer: _____ Date: _____
OHM Project Engineer _____ Date: _____
Site Quality Control Manager: _____ Date: _____
OHM Project Manager: _____ Date: _____

APPROVALS Approved Modified (see below) Rejected

Note: This is a clarification and does not create additional work that could be considered as a change to the cost of the project.

RPM: _____ Date: _____
ROICC/NTR: _____ Date: _____



OHM Remediation Services Corp.

Project Name: _____

Delivery Order: _____

Contract Purchase Order N62470-93-0-3032

OHM Project No. _____

Routing: Contr. Adm.
Proj. Mgr.
Site Supv.
Proj. Acct.
GSE
QC
Job File
John Franz-Proc
COTR- J. Haste

WORK DIRECTIVE (WD)

Date of Request: _____ WBS Code: _____ [] new code WD No: _____

WBS Description: _____

TITLE OF WORK DIRECTIVE: _____

DESCRIPTION OF WORK: _____

WORK DIRECTIVE TYPE

[] Technical direction Explanation: _____

[] Scope Growth (Mod to follow) _____

[] Quantity Increase _____

[] New Scope Item _____

[] Other _____

[] Scope Reduction (Mod to follow) _____

[] Quantity Decrease _____

[] Scope Reduction Attachments: _____

[] Other _____

Initiated By: _____

[] Navy _____

[] OHM _____

[] Regulatory Agency _____

[] Other _____

COST IMPACT Rough order of Magnitude (ROM) Estimated value of item: _____

NOTE: This estimate includes direct costs, fringes and mark-ups. No fee.

SCHEDULE IMPACT Estimated Duration of Item _____ Work Days

Estimated Schedule Impact _____ Calendar days

Is approval date critical [] yes [] no Reason for critical approval date: _____

If yes, indicate date: _____

OHM Representative: _____ Date: _____

On-Site Engineer: _____ Date: _____

OHM Project Manager: _____ Date: _____

APPROVALS Note: Failure to approve by the critical date may result in additional cost and/or schedule impact.

[] Approved [] Modified (see attached) [] Rejected

RPM: _____ Date: _____

POICC/NTR: _____ Date: _____

CAO File

DL 3/18/98

Plot Scale

Work Directive (WD)

- 1.0 Purpose: The purpose of the Work Directive is to provide a standardized document that communicates approval, modification, or rejection of either scope change (growth or reduction) or cost change (growth or reduction) by field personnel. The WD is a communication vehicle and individually is not justification for a contract modification. Other factors will determine whether a contract modification is required. The WD should be used for significant issues that will have a cost, scope, and/or schedule impact to a delivery order.

Should the field condition requiring the WD arise from change in scope such as: Differing site conditions, changed or evolving design, design errors or omissions, or direction by the Navy to perform significant additional work, formal contract modification may be required. Several work directives may be consolidated under one contract modification. Submission of a contract modification request should be coordinated in advance with the customer, and in any event should occur prior to 75% financial completion.

Examples of cost growth items requiring the execution of WD are: Technical direction that does not significantly change the scope of work or the need for personnel, equipment or material required to complete the current scope that are not in the budget (this includes modified resources loading due to schedule changes). Refer to program established guidelines for identifying cost versus scope growth as applicable.

2.0 Completing the Form

All lines on the form are to be completed. If particular information is not applicable write N/A on the line.

Lines that should never say N/A are: Date of request, Cost Code, WD No., Change Title, Reason for Change, ROM Estimate, Schedule impact, OHM signature, ROICC signature. It is the responsibility of both the Navy and OHM to ensure that sufficient explanation is provided so that the work proceeds as required. If sufficient room is not available on this form additional pages should be attached.

All parties listed on the distribution must be copied on all work directives. All work directives whether accepted or rejected must be logged and kept on-site for inspection by OHM and the Navy.

(ROM) Rough order of magnitude estimate should be included on all work directives. This estimate should be in Navy cost (OHM revenue) dollars.

Schedule Impact. 1) How long will it take to execute the directed task, and 2) How the overall project schedule will be impacted should be addressed. (If you are extending the rental a on piece of equipment, the duration for the extension is put on line 1).

3.0 Flow of Responsibility

- A As soon as possible upon OHM's discovery of a cost or scope change or direction by Navy personnel on a proposed change, the OHM project manager should prepare and submit a WD to the ROICC.
- The ROICC may elect to confirm the change with the NTR, RPM, the Engineer of Record or the Certifying engineer.
- B The ROICC reviews the WD and indicates its approval status: Approved, Modified, or Rejected.
- C The ROICC then forwards the WD to OHM for action as required.
- D The contractor modifies the Construction Schedule, The Schedule of Values, the WBS and all reports as appropriate. OHM enters the WD in the WD log for submission in the Monthly Status Report to the Navy. OHM will track cost associated with the WD either as separate WBS or as part of an existing WBS.
- E If a Modification to the Delivery Order is required, the WD(s) should be used as the basis for the request.

Appendix C

Sampling and Analysis Plan

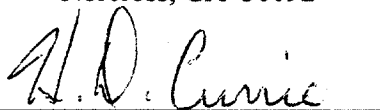
**SAMPLING AND ANALYSIS PLAN
FOR
Lead-Contaminated Soil Removal
at
Montford Point Water Tower
MCB Camp Lejeune, North Carolina**

Submitted to:

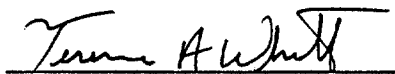
**Department of the Navy
Contract No. N62470-93-D-3032
Delivery Order 0151**

Submitted by:

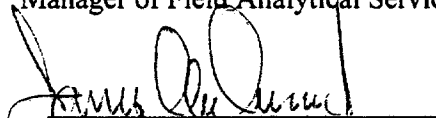
**OHM Remediation Services Corp.
5335 Triangle Parkway, Suite 450
Norcross, GA 30092**



**John Franz, P.E.
Program Manager**



**Terence A. Whitt
Manager of Field Analytical Services**



**James A. Dunn, Jr., P.E.
Project Manager**

OHM Project No. 19668

August 1997

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Table 2.1 Action Items

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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 removal actions for lead contaminated soil at the Montford Point Water Tower Camp Lejeune. This work will be performed under Delivery Order 0151 of Contract Number N62470-93-D-3032 for the Navy Atlantic Division (LANTDIV) at the Marine Corps Base, Camp Lejeune, North Carolina. Figures 1 and 2 in the RAWP shows the location of the site and the surrounding vicinity.

This SAP integrates the required components of a generic quality assurance project plan (QAPP) and a field sampling plan (FSP). This document shall be implemented by the Project Manager, Project QC Manager, Project Chemist, Field Chemist/Scientist, and Sample Technicians. Any field changes shall be approved by the Navy's Technical Representative (NTR), 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.

2.0 PROJECT MANAGEMENT

2.1 PROJECT OBJECTIVE AND SCOPE OF WORK

The project objective is to perform Interim Measures at the Montford Point Water Tower. These measures include lead contamination delineation, removal, treatment, disposal, backfill and site restoration. All soil that has TCLP lead concentrations greater than 5 mg/L or total lead exceeding 270 mg/kg will be removed and disposed. On-site treatment of the soil before disposal may be performed to reduce disposal costs and decrease future liabilities.

2.2 PROJECT TASK DESCRIPTIONS

The project tasks applicable to the SAP are the following:

- Pre-excavation delineation
- Soils excavation and stabilization
- Confirmation sampling and analysis to document that cleanup criteria has been met
- Sample and analyze water from decon operations, stormwater runoff, dewatering operations, etc.
- Sample and analyze "incidental waste" generated from site activities
- Backfill excavations
- Perform surveillance and technical audits of site sampling activities
- Validation of analytical confirmation results

In the event that additional material not indicated on the drawings is encountered that may be dangerous to human health, the Navy Technical Representative (NTR) will be informed immediately and consulted for further actions.

2.3 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 manager will be supported by the project team consisting of a supervisory, health and safety, technical, 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. Specific responsibilities may be

assigned by the project manager to the deputy project manager and other members of the project staff. An organizational chart of the project team is presented in Figure 2-1.

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

Project Manager - James A. Dunn, Jr.

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 meet 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.

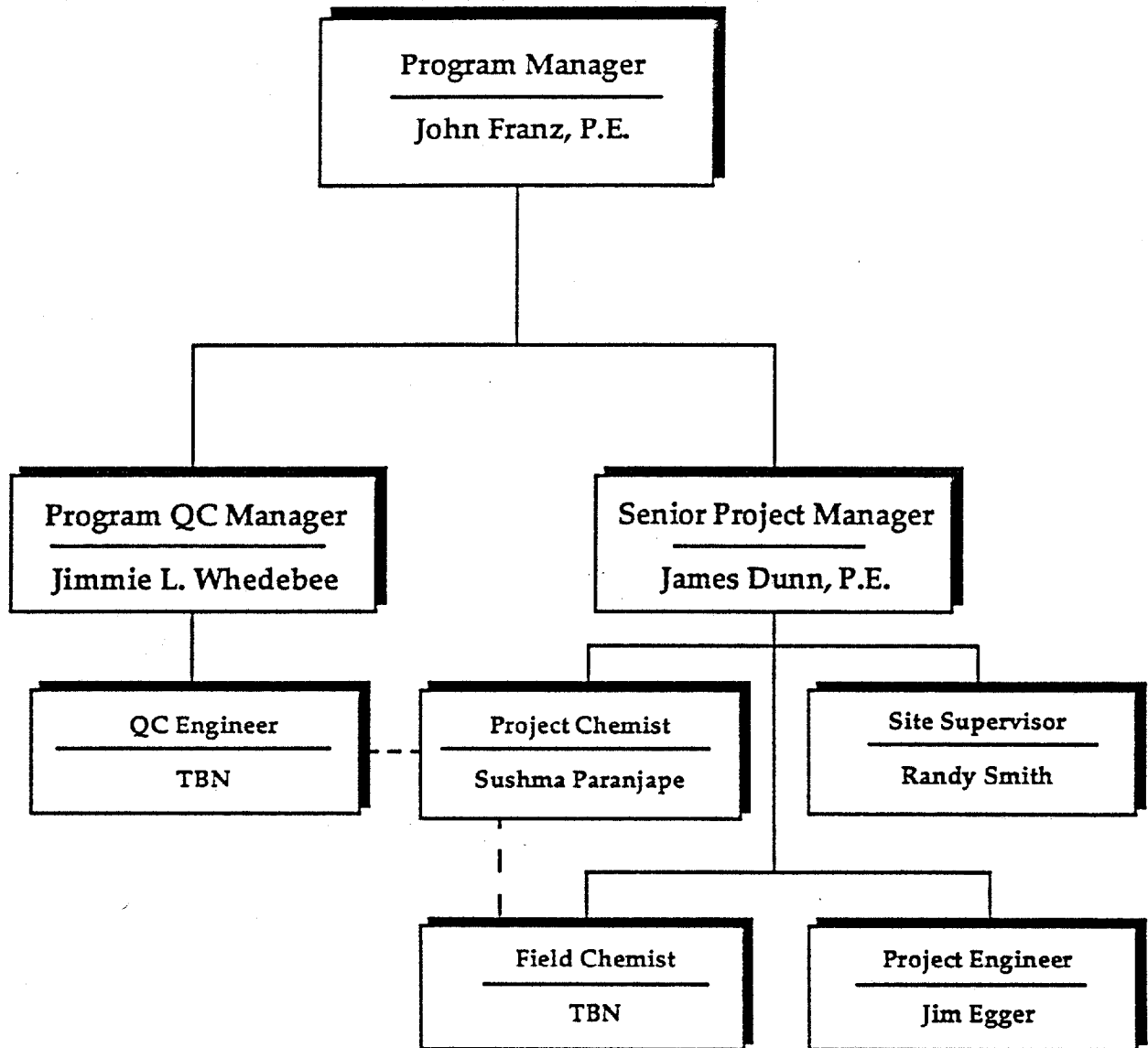


Figure 2.1

QC Organization Chart



OHM Remediation Services Corp.

- 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 - Randy Smith

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.

Project Chemical QA Officer - Theresa D. Rojas

The chemical QA officer 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 is not limited to, the following:

- 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.

Project Chemist - Sushama Paranjape

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. She is also responsible for informing the chemical QA officer of any site-specific problems and for coordinating QA efforts with the contracted laboratory. Her 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.

Laboratory Coordinator - Missy Art

The laboratory coordinator is responsible for procuring a certified laboratory based on the requirements needed for the project. Her responsibilities include, but are not limited to, the following:

- 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.

Field Chemist -(Duties to be performed by the Project Chemist)

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.
- Ensuring that the samples are handled, packaged, and shipped according to the SAP.
- Ensuring that the laboratory supplies the sample containers, shipping supplies, chain-of-custody records, and the required QC samples (i.e., trip blanks).

Sample Technician - To Be Determined

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.

2.4 DATA QUALITY OBJECTIVES FOR MEASUREMENT DATA

Data generated from those tasks described in Section 2.2 will be used to make the decisions that are listed in Table 2.1. The criteria by which these decisions will be based and the persons responsible for making the decisions are also listed. 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 in the Norcross 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.

As directed by the client, all confirmation samples will meet OHM maximum Data Deliverable Requirements which are equivalent to Level C requirement for the QA/QC as specified in NEESA 20.2-047B. Other samples (disposal, delineation) will meet OHM minimal data deliverable requirements. Appendix C contains a summary of the OHM Standard Analytical Data Deliverables. Although the NFESC 1996 document replaces NEESA 20.2-047B document, for the continuity of the QA/QC levels, NEESA 20.2-047B will be used for determining QA/QC levels of these samples. 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-1, "Sampling Summary" in Appendix A.

Data evaluation will be performed by the project chemist on all data before it is used. Third party data validation will be performed on the final data by a subcontractor with procedures specified in Navy Installation Restoration Laboratory Quality Assurance Guide, February 1996 by NFESC and the National Functional Guidelines for validation of organics and inorganics to ensure that raw data are not altered and that an audit trail is developed for those data which require reduction. Data validation results will be provided in the project closeout report.

**Table 2-1
Action Items**

Project Task	Decision Maker	Criteria	Decision
Delineation	OHM	If: Lead levels are above cleanup criteria (270 mg/kg total or 5.0 mg/L TCLP)	Then: expand the vertical or horizontal area of concern. If not then: decrease the vertical or horizontal area of concern.
Excavation Confirmation	OHM and NTR	If: Lead levels are above cleanup criteria (270 mg/kg total or 5 mg/L TCLP)	Then: additional excavation and confirmation is required (notify NTR). If not then: backfill excavation

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 Horizontal and Vertical Delineation of Contamination

A 10 foot square grid will be located and marked around the center point of the water tower base. Figure 3 shows the grid layout and the grid numbering system. The x and y axes outside the expected contamination areas will be identified with labeled stakes or flags. Samples will be obtained at the grid nodes throughout the contaminated area. Initially, OHM will focus the soil sampling within an arbitrary 60 feet by 60 feet area surrounding the water as shown on Figure 2 in the RAWP. Sampling will begin in grids near the water tower. If analytical results are greater than 270 mg/kg total lead or greater than 5.0 mg/l TCLP lead, a sample will be obtained one grid further from the expected contaminated area. If the results are less than 270 mg/kg total lead and less than 5.0 mg/l TCLP lead, the sample location will be moved inward one grid toward the expected contaminated area if it has not been previously sampled.

Samples will be collected using a stainless steel (SS) bucket auger. Each sample will be a composite of the soil from 0-6 inches and 6-12 inches (two samples for each location). Each sample will be homogenized by the quartering technique using a clean SS bowl and a SS spoon. One 4-oz jar will be filled for each sample at the grid nodes.

The samples will be analyzed at the off-site laboratory as described in Section 4. The 0-6 inch samples will be put on a separate COC from the 6-12 inch samples. The deeper samples will be shipped to the laboratory at the same time but held until the top sample data is reviewed. If the top sample is below the cleanup criteria the deeper sample will not be processed.

Sampling equipment will be thoroughly cleaned between samples using decontamination procedures described in Section 3.5. 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 PPE may be required for sampling per the site HASP. Contact with sample will be avoided to minimize the potential for cross-contamination.

3.1.2 Excavation Confirmation Sampling

After excavation of the contaminated areas, confirmation samples will be collected for each 500 ft² of floor and every 50 linear ft. of side wall. These samples will be 5-point composites from grab samples every 100ft² of excavation floor and every 10 linear feet of side walls. All samples will be analyzed for total lead. A composite of the floor samples and a composite of the sidewall samples will be analyzed for TCLP lead. The grid node closest to the sample location will be used to identify the sample point.

For the floor samples, remove the top 2 inches (discard) with a SS spoon of each grab sample point, collect the sample and composite in an SS bowl. Use the quartering technique to homogenize the sample and then fill the 4-oz jar directly with the SS spoon. For the sidewall samples, locate an area halfway between the top and bottom of the excavation. Remove the first 2 inches (discard) with a SS spoon of each grab sample point, collect the sample and composite in a SS bowl. Use the quartering technique to homogenize the sample and then fill the 4-oz jar directly with the SS spoon.

Sampling equipment will be thoroughly cleaned between samples using decontamination procedures described in Section 3.5. 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 PPE may be required for sampling per the site HASP. Contact with sample will be avoided to minimize the potential for cross-contamination. The samples will be analyzed by the off-site laboratory as described in section 4.0. Table A-1 summarizes the required analysis for the confirmation samples.

Areas where the off-site confirmation samples exceed the cleanup criteria in Table 2.1 will be further excavated and re-sampled following the procedures above. Areas where the off-site confirmation samples meet the cleanup criteria can be backfilled. Backfilling will only occur after receipt of off-site confirmation results.

3.1.3 Backfill Samples

If analytical data is not available on the borrow soils to be used as backfill, then analysis will be required to document backfill soil quality. A judgmental four-point composite sample will be collected if the documentation is not available. This will be collected using a SS spoon and SS bowl. The sample will be homogenized using the quartering technique. The sample will be sent to an off-site laboratory for analyses listed in Table A-1, appendix A.

Sampling equipment will be thoroughly cleaned between samples using decontamination procedures described in Section 3.5. 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 PPE may be required for sampling per the site HASP. Contact with sample will be avoided to minimize the potential for cross-contamination.

3.1.4 Contractor Generated Waste Samples

Samples may be required for the treated (stabilized) soil, decontamination fluid or PPE wastes for disposal analysis. If samples are required, Table A-1 in Appendix A lists the required analysis for disposal of these materials. Depending on the disposal facility, additional analysis may be required.

Aqueous wastes (waters from decontamination activities, stormwater runoff, and dewatering activities) will be collected by direct fill from the holding containers. PPE wastes will be collected using scissors or knives.

3.1.5 Treated (Stabilized) Soil Samples

A single composite soil sample will be collected of the treated soil following chemical stabilization from the roll-off boxes to verify that characteristically hazardous lead soils have been decharacterized to below 5.0 mg/l lead and other TCLP parameters are below criteria. A five-point composite sample will be collected from each roll-off using SS spoons and homogenized using SS bowls. The composite sample will be made of one sample from each corner, and one sample from the center of each roll-off box. The samples will be analyzed for full TCLP as listed in Table A-1 of Appendix A.

3.2 SAMPLE IDENTIFICATION

The samples collected on-site will be provided with a unique sample designation. The number will serve to identify the site, location, and specific sample identification number. The sample designation format will be as follows:

CLXXX-NNN-DD

where:

CL = Camp Lejeune
XX = Delivery Order for the project (151)
NNN = Sequential number starting at 001
DD = QC identifier

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

FB - Field Blank
RB- Equipment Rinsate Blank
(Duplicates must not to be identified to the laboratory)

Sample location information will be included in the sample description area of the COC. This will include the grid location, the sample point associated within the grid and the depth of the sample in inches. Additional samples in the same grid point but deeper will be given new sample designations. 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.

Usually 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. The soil samples for metal analysis on this project do not require cooling to 4°C. 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) witch 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 in all other ways 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 for NEESA Level C QC requirements. 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 which 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 (metal samples only).
- 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 data base program that been prepared for the site. It will be entered daily by the field chemist or sample technician. This person will be the point of contact for all sampling and analytical information. Report outputs from the database is 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:

- (1) PROJECT NUMBER
- (2) DATE- Month, day, year
- (3) TIME- Military time
- (4) SAMPLE NUMBER- See Section 3.2 for designations
- (5) SAMPLE DESCRIPTION
- (6) SAMPLER- Sampler's name
- (7) PRESERVATIVES
- (8) 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 log book. 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 procedures are followed as described below:

A sample is under your custody if:

- (1) It is in your actual possession, or
- (2) It is in your view, after being in your physical possession, or
- (3) It was in your physical possession and then you locked it up to prevent tampering, or
- (4) 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:

- (1) Project Name
- (2) Project Location- City and State in which the project site is located
- (3) Project Number
- (4) 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)
- (5) Site Telephone Number- The telephone number of on-site office trailer or number where person responsible for samples can be contacted.
- (6) Sample Date-Month, Day, Year
- (7) Sample Time- Military time
- (8) Sample Identification- Sample number and location
- (9) Sample Type-Designation of sample as grab or composite
- (10) Sample Description- Sample matrix, and a brief description of the sampling location
- (11) Sample Preservation- Preservatives used
- (12) Analytical Parameters Requested -- Analytical parameter, method numbers, and specific compounds of interest, if applicable.
- (13) Air bill Number
- (14) Laboratory -- Laboratory where samples are to be sent
- (15) Laboratory Phone -- Telephone number of laboratory
- (16) Laboratory Contact -- Contact person for laboratory
- (17) Relinquished By -- Signature of sender (OHM)
- (18) Date Relinquished -- Date samples were relinquished
- (19) Accepted By -- Signature of acceptor
- (20) Date Received -- Date samples were accepted

(21) Turnaround Time -- Turnaround times requested or date the results are required from the lab

(22) 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 instruction 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 be 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 HASP. 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 samples are within established control limits
- Blanks 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. He/she reviews 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

Project Chemist Data Review Responsibilities

The project 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 acceptable criteria
- Reviewing blank data for contamination
- Reviewing field quality control results for inconsistencies
- Verifying that the data generated meet the project Data Quality Objectives.

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 REPORTING

The preliminary data will be faxed to the project 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 project 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 and final copy data will be evaluated by the project chemist and assessed against the 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.

5.5 DATA STORAGE AND ARCHIVE

After OHM has completed its work for the project, all documents generated will be assembled in the project file. Individuals may retain clean (no handwritten comments) copies of documents for their personal files but only after personally verifying that the original or similar copy is in the project file. The project manager/supervisor is responsible for ensuring the collection, assembly, and inventory of all documents relative to the project at the time the objectives are met. The file then becomes 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:

- A. Project logbooks
- B. Drum logs and other forms
- C. Sample identification documents
- D. Chain-of-custody records
- E. Analytical logbooks, laboratory data, calculations, graphs, etc.
- F. Correspondence
 - Inter-office
 - Client
 - Regulating agencies
 - Record of confidential material

- G. Report notes, calculations, drafts
- H. References, literature
- I. Sample (on-hand) inventory
- J. Check-out logs
- K. Litigation documents
- L. 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:

$$\text{Upper control limit} = p + 3 \text{ SD}$$

$$\text{Lower control limit} = p - 3\text{SD}$$

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 RPDs 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 $\pm 2s$ and $\pm 3s$, 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 relative percent differences 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 relative percent difference (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 QAPP. 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 actions 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 following information 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

Sample Type	Sample Point	Matrix	Sampling Frequency	Approx. Number of Samples	Sample Type	Sampling Method	TAT	QC Level	Required Analysis	Analytical Method	Holding Time	Preservatives	Containers for each sample
Delineation	Grid nodes	Soil	10 ft grid each Node	39+4 Dups	Grab	Hand Auger	24 Hrs	NEESA Level E (OHM Min)	Total Lead TCLP Lead	6010 1311/6010	6 Months	NA	4 oz w/Teflon cap seals
Confirmation Samples	Excavation Floor and Sidewall	Soil	1ea 5 point composite every 500 ft ² of floor and every 50 ft of sidewall	8+1 Dup	Comp	SS Spoon and Bowl	24 Hrs	NEESA Level C (OHM Max)	Total Lead	6010	6 Months	NA	4 oz w/Teflon cap seals
Confirmation TCLP	Sidewall Floor	Soil	One per Floor and one per wall	2	Comp	SS Spoon and Bowl	48 Hrs	NEESA Level C (OHM Max)	TCLP Lead	1311/6010	6 Months	NA	4 oz w/Teflon cap seals
Confirmation TCLP	Sidewall Floor	Soil	One per Floor and one per wall	2	Comp	SS Spoon and Bowl	48 Hrs	NEESA Level C (OHM Max)	TCLP Lead	1311/6010	6 Months	NA	4 oz w/Teflon cap seals
QA Rinsate Blanks	As Needed	Water	One per Day of Confirmation Sampling	2	Grab	Prepared by Sampling Crew	24 Hr	NEESA Level C (OHM Max)	Total Lead	6010	6 Months	pH<2 Nitric	500 ml plastic
Backfill Analysis	Borrow Area	Soil	Once	1	Comp	SS Bowl	7 Days	NEESA Level C (OHM Max)	TAL Metals TCL Organics	6010/7471 8260 8270 8081	6m Metals (Hg 28d) 14d VOA 14d/40 extr SEMVOA and Pesticides	Cool 4°C	1ea 4 oz and 2ea 8 oz w/Teflon cap seal

Table A-1 Sampling Summary

Sample Type	Sample Point	Matrix	Sampling Frequency	Approx. Number of Samples	Sample Type	Sampling Method	TAT	QC Level	Required Analysis	Analytical Method	Holding Time	Preservatives	Containers for each sample
Disposal Analysis	As Needed	Liquids	As Needed	1	Grab	NA	7 Days	NEESA Level E (OHM Min)	Full TCLP RCI (Check with T&D personnel)	1311/8260/8270/8081/8150/6010/7470/1020 9040 Chapter 7	14 Days	Cool 4°C Metals pH<2 Nitric	2ea 40 ml VOA 500 ml Metals 4ea 1 liter
Disposal Analysis (Stabilized Soils)	Rolloff Box 5 point Composite of Each Rolloff	Soils	Once	1	Comp	NA	7 Days	NEESA Level E (OHM Min)	Full TCLP RCI and Paint Filter (Check with T&D personnel)	1311/8260/8270/8081/8150/6010/7471/1020 9045/9095 Chapter 7	14 Days	Cool 4°C	1ea 4 oz and 2ea 8 oz jars w/Teflon seal

Method No ¹	Analyte / Component	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	
		Water ug/L	Soil ² ug/kg	Water ug/L	Soil ² ug/kg	Water %	Soil ² %	Water %	Soil ² %	Water %	Soil ² %	Water <50	Soil ² <75	Water %	Soil ² %
PCB															
8081	Arochlor-1016	NS	NS	300	300	40-140	40-150	<30	<50	50-114	50-114	<50	<75	95	90
8081	Arochlor-1221	NS	NS	300	300	40-140	40-150	<30	<50	15-178	15-178	<50	<75	95	90
8081	Arochlor-1232	NS	NS	300	300	40-140	40-150	<30	<50	10-215	10-215	<50	<75	95	90
8081	Arochlor-1242	NS	NS	300	300	40-140	40-150	<30	<50	39-150	39-150	<50	<75	95	90
8081	Arochlor-1248	NS	NS	300	300	40-140	40-150	<30	<50	38-158	38-158	<50	<75	95	90
8081	Arochlor-1254	NS	NS	300	300	40-140	40-150	<30	<50	29-131	29-131	<50	<75	95	90
8081	Arochlor-1260	NS	NS	300	300	40-140	40-150	<30	<50	8-127	8-127	<50	<75	95	90
ORGANOCHLORINE PESTICIDES															
8081	Aldrin	NS	NS	0.04	3	60-140	20-150	<30	<50	47-116	47-116	<50	<75	95	90
8081	Alpha BHC	NS	NS	0.03	2	60-141	20-151	<30	<50	81-125	81-125	<50	<75	95	90
8081	Beta BHC	NS	NS	0.06	4	60-142	20-152	<30	<50	51-123	51-123	<50	<75	95	90
8081	Delta BHC	NS	NS	0.09	6	60-143	20-153	<30	<50	76-126	76-126	<50	<75	95	90
8081	Gamma BHC (Lindane)	NS	NS	0.04	3	60-144	20-154	<30	<50	73-120	73-120	<50	<75	95	90
8081	Chlordane	NS	NS	0.14	9	60-145	20-155	<30	<50	45-119	45-119	<50	<75	95	90
8081	4,4'-DDD	NS	NS	0.04	3	60-146	20-156	<30	<50	48-136	48-136	<50	<75	95	90
8081	4,4'-DDE	NS	NS	0.12	8	60-147	20-157	<30	<50	45-139	45-139	<50	<75	95	90
8081	4,4'-DDT	NS	NS	0.02	10	60-148	20-158	<30	<50	34-143	34-143	<50	<75	95	90
8081	Dieldrin	NS	NS	0.14	9	60-149	20-159	<30	<50	42-132	42-132	<50	<75	95	90
8081	Endosulfan I	NS	NS	0.04	3	60-150	20-160	<30	<50	49-143	49-143	<50	<75	95	90
8081	Endosulfan II	NS	NS	0.66	40	60-151	20-161	<30	<50	78-159	78-159	<50	<75	95	90
8081	Endosulfan Sulfate	NS	NS	0.06	4	60-152	20-162	<30	<50	46-141	46-141	<50	<75	95	90
8081	Endrin	NS	NS	0.23	20	60-153	20-163	<30	<50	43-134	43-134	<50	<75	95	90
8081	Endrin Aldehyde	NS	NS	0.03	2	60-154	20-164	<30	<50	75-150	75-150	<50	<75	95	90
8081	Heptachlor	NS	NS	0.83	60	60-155	20-165	<30	<50	45-128	45-128	<50	<75	95	90
8081	Heptachlor Epoxide	NS	NS	1.76	100	60-156	20-166	<30	<50	53-134	53-134	<50	<75	95	90
8081	Methoxychlor	NS	NS	2.4	200	60-157	20-167	<30	<50	73-142	73-142	<50	<75	95	90
8081	Toxaphene	NS	NS	1	1000	60-158	20-168	<30	<50	41-126	41-126	<50	<75	95	90
ORGANOCHLORINE HERBICIDES															
8150	2,4-D	NS	NS	12	800	40-140	40-150	<30	<50	65-89	65-89	<50	<75	95	90
8150	2,4-DB	NS	NS	9	600	40-140	40-150	<30	<50	65-89	65-89	<50	<75	95	90
8150	2,4,5-T	NS	NS	2	100	40-140	40-150	<30	<50	71-95	71-95	<50	<75	95	90
8150	2,4,5-TP	NS	NS	1.7	100	40-140	40-150	<30	<50	76-100	76-100	<50	<75	95	90
8150	Dalapon	NS	NS	60	4000	40-140	40-150	<30	<50	70-122	70-122	<50	<75	95	90
8150	Dicamba	NS	NS	2.7	200	40-140	40-150	<30	<50	59-113	59-113	<50	<75	95	90
8150	Dichloroprop	NS	NS	6.5	500	40-140	40-150	<30	<50	63-81	63-81	<50	<75	95	90

Method No ¹	Analyte / Component	Project Action Limits		Minimum PQL		Accuracy Limits MS/MSD Recoveries		Precision Limits MS/MSD Deviation		Accuracy Limits ICS Recoveries		Precision Limits Field Dup Deviation		Completeness Limits	
		Water ug/L	Soil ² ug/kg	Water ug/L	Soil ² ug/kg	Water %	Soil ² %	Water %	Soil ² %	Water %	Soil ² %	Water <50	Soil ² <75	Water %	Soil ² %
8150	Dinoseb	NS	NS	0.7	50	40-140	40-150	<30	<50	72-90	72-90	<50	<75	95	90
8150	MCPA	NS	NS	2500	170000	40-140	40-150	<30	<50	64-82	64-82	<50	<75	95	90
8150	MCPP	NS	NS	1900	130000	40-140	40-150	<30	<50	88-106	88-106	<50	<75	95	90
VOLATILES BY GC/MS		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
8260A	1,1,1,2-Tetrachloroethane	NS	NS	2.5	15	60-140	20-150	<30	<50	62-108	62-108	<50	<75	95	90
8260A	1,1,1-Trichloroethane	NS	NS	4	20	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1,1,2,2-Tetrachloroethane	NS	NS	2	10	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260A	1,1,2-Trichloroethane	NS	NS	5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1,1-Dichloroethane	NS	NS	2	10	60-140	20-150	<30	<50	62-135	62-135	<50	<75	95	90
8260A	1,1-Dichloroethene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1,1-Dichloropropane	NS	NS	5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1,2,3-Trichlorobenzene	NS	NS	1.5	10	60-140	20-150	<30	<50	65-147	65-147	<50	<75	95	90
8260A	1,2,3-Trichloropropane	NS	NS	16	100	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1,2,4-Trichlorobenzene	NS	NS	2	10	60-140	20-150	<30	<50	65-145	65-145	<50	<75	95	90
8260A	1,2,4-Trimethylbenzene	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1,2-Dichloroethane	NS	NS	3	15	60-140	20-150	<30	<50	58-137	58-137	<50	<75	95	90
8260A	1,2-Dichlorobenzene	NS	NS	1.5	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1,2-Dibromo-3-chloropropane	NS	NS	13	50	60-140	20-150	<30	<50	49-135	49-135	<50	<75	95	90
8260A	1,2-Dichloropropane	NS	NS	2	10	60-140	20-150	<30	<50	60-135	60-135	<50	<75	95	90
8260A	1,2-Ethylene Dibromide	NS	NS	3	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1,3,5-Trimethylbenzene	NS	NS	2.5	15	60-140	20-150	<30	<50	62-135	62-135	<50	<75	95	90
8260A	1,3-Dichlorobenzene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1,3-Dichloropropane	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1,4-Dichlorobenzene	NS	NS	1.5	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	1-Chlorohexane	NS	NS	2.5	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	2,2-Dichloropropane	NS	NS	17.5	100	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	2-Chlorotoluene	NS	NS	2	10	60-140	20-150	<30	<50	63-135	63-135	<50	<75	95	90
8260A	4-Chlorotoluene	NS	NS	3	15	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260A	Benzene	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Bromobenzene	NS	NS	1.5	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Bromochloromethane	NS	NS	2	10	60-140	20-150	<30	<50	63-135	63-135	<50	<75	95	90
8260A	Bromodichloromethane	NS	NS	4	20	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Bromoform	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Bromomethane	NS	NS	5.5	25	60-140	20-150	<30	<50	62-135	62-135	<50	<75	95	90
8260A	Carbon Tetrachloride	NS	NS	10.5	50	60-140	20-150	<30	<50	52-135	52-135	<50	<75	95	90
8260A	Chlorobenzene	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Chloroethane	NS	NS	5	25	60-140	20-150	<30	<50	55-135	55-135	<50	<75	95	90

Method No ¹	Analyte / Component	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	
		Water ug/L	Soil ² ug/kg	Water ug/L	Soil ² ug/kg	Water %	Soil ² %	Water %	Soil ² %	Water %	Soil ² %	Water <50	Soil ² <75	Water %	Soil ² %
8260A	Chloroform	NS	NS	1.5	10	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260A	Chloromethane	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Cis-1,2-Dichloroethene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Cis-1,3-Dichloropropene	NS	NS	5	25	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260A	Dibromochloromethane	NS	NS	2.5	15	60-140	20-150	<30	<50	63-135	63-135	<50	<75	95	90
8260A	Dibromomethane	NS	NS	12	50	60-140	20-150	<30	<50	59-137	59-137	<50	<75	95	90
8260A	Dichlorodifluoromethane	NS	NS	5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Ethylbenzene	NS	NS	3	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Hexachlorobutadiene	NS	NS	5.5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Isopropylbenzene	NS	NS	2.5	40	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	m-Xylene	NS	NS	2.5	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Methylene Chloride	NS	NS	1.5	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	n-Butylbenzene	NS	NS	5.5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	n-Propylbenzene	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Naphthalene	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	o-Xylene	NS	NS	5.5	25	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	p-Isopropyltoluene	NS	NS	6	30	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	p-Xylene	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Sec-Butylbenzene	NS	NS	6.5	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Styrene	NS	NS	2	10	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Trichloroethylene	NS	NS	5	50	60-140	20-150	<30	<50	61-135	61-135	<50	<75	95	90
8260A	Tert-Butylbenzene	NS	NS	7	35	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Tetrachloroethylene	NS	NS	7	35	60-140	20-150	<30	<50	61-135	61-135	<50	<75	95	90
8260A	Toluene	NS	NS	5.5	25	60-140	20-150	<30	<50	64-135	64-135	<50	<75	95	90
8260A	Trans-1,2-Dichloroethene	NS	NS	3	15	60-140	20-150	<30	<50	65-135	65-135	<50	<75	95	90
8260A	Trans-1,3-Dichloropropene	NS	NS	5	25	60-140	20-150	<30	<50	56-135	56-135	<50	<75	95	90
8260A	Trichlorofluoromethane	NS	NS	4	20	60-140	20-150	<30	<50	57-135	57-135	<50	<75	95	90
8260A	Vinyl Chloride	NS	NS	5.5	45	60-140	20-150	<30	<50	36-144	36-144	<50	<75	95	90
8260A	Dibromofluoromethane (surr)	NS	NS	NA	NA	75-125	65-135	NA	NA	NA	NA	NA	NA	95	90
8260A	Toluene-d8 (surr)	NS	NS	NA	NA	75-125	65-135	NA	NA	NA	NA	NA	NA	95	90
8260A	4-Bromofluorobenzene (surr)	NS	NS	NA	NA	75-1225	65-135	NA	NA	NA	NA	NA	NA	95	90
8260A	1,2-Dichloroethane-d4 (surr)	NS	NS	NA	NA	62-139	52-149	NA	NA	NA	NA	NA	NA	95	90

SEMI-VOLATILES BY GC/MS		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	%	%	%	%
8270B	1,2,4-Trichlorobenzene	NS	NS	10	660	60-140	20-150	<30	<50	44-142	44-142	<50	<75	95	90
8270B	1,2-Dichlorobenzene	NS	NS	10	660	60-140	20-150	<30	<50	42-105	42-105	<50	<75	95	90
8270B	1,3-Dichlorobenzene	NS	NS	10	660	60-140	20-150	<30	<50	36-109	36-109	<50	<75	95	90

TABLE A-2 PROJECT QUALITY CONTROL OBJECTIVES

Method No ¹	Analyte / Component	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	
		Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²
		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	<50	<75	%	%
8270B	1,4-Dichlorobenzene	NS	NS	10	660	60-140	20-150	<30	<50	30-107	30-107	<50	<75	95	90
8270B	2,4,5-Trichlorophenol	NS	NS	50	330	60-140	20-150	<30	<50	22-183	22-183	<50	<75	95	90
8270B	2,4,6-Trichlorophenol	NS	NS	10	660	60-140	20-150	<30	<50	39-128	39-128	<50	<75	95	90
8270B	2,4-Dichlorophenol	NS	NS	10	660	60-140	20-150	<30	<50	46-123	46-123	<50	<75	95	90
8270B	2,4-Dimethylphenol	NS	NS	10	660	60-140	20-150	<30	<50	45-139	45-139	<50	<75	95	90
8270B	2,4-Dinitrophenol	NS	NS	50	3300	60-140	20-150	<30	<50	30-151	30-151	<50	<75	95	90
8270B	2,4-Dinitrotoluene	NS	NS	10	660	60-140	20-150	<30	<50	39-139	39-139	<50	<75	95	90
8270B	2,6-Dinitrotoluene	NS	NS	10	660	60-140	20-150	<30	<50	51-125	51-125	<50	<75	95	90
8270B	2-Chloronaphthalene	NS	NS	10	660	60-140	20-150	<30	<50	60-118	60-118	<50	<75	95	90
8270B	2-Chlorophenol	NS	NS	10	660	60-140	20-150	<30	<50	41-121	41-121	<50	<75	95	90
8270B	2-Methylnaphthalene	NS	NS	10	660	60-140	20-150	<30	<50	41-123	41-123	<50	<75	95	90
8270B	2-Nitroaniline	NS	NS	50	3300	60-140	20-150	<30	<50	50-123	50-123	<50	<75	95	90
8270B	2-Nitrophenol	NS	NS	10	660	60-140	20-150	<30	<50	44-123	44-123	<50	<75	95	90
8270B	3,3'-Dichlorobenzidine	NS	NS	20	1300	60-140	20-150	<30	<50	29-183	29-183	<50	<75	95	90
8270B	3-Nitroaniline	NS	NS	50	3300	60-140	20-150	<30	<50	51-118	51-118	<50	<75	95	90
8270B	4,6-Dinitro-2-methyl phenol	NS	NS	50	3300	60-140	20-150	<30	<50	26-134	26-134	<50	<75	95	90
8270B	4-Bromophenyl phenyl ether	NS	NS	10	660	60-140	20-150	<30	<50	53-127	53-127	<50	<75	95	90
8270B	4-Chloroaniline	NS	NS	20	1300	60-140	20-150	<30	<50	45-136	45-136	<50	<75	95	90
8270B	4-Chloro-3-methyl phenol	NS	NS	20	1300	60-140	20-150	<30	<50	44-117	44-117	<50	<75	95	90
8270B	4-Chlorophenyl phenyl ether	NS	NS	10	660	60-140	20-150	<30	<50	51-132	51-132	<50	<75	95	90
8270B	4-Nitroaniline	NS	NS	50	3300	60-140	20-150	<30	<50	40-143	40-143	<50	<75	95	90
8270B	4-Nitrophenol	NS	NS	50	1600	60-140	20-150	<30	<50	11-131	11-131	<50	<75	95	90
8270B	Acenaphthalene	NS	NS	10	660	60-140	20-150	<30	<50	47-115	47-115	<50	<75	95	90
8270B	Acenaphthene	NS	NS	10	660	60-140	20-150	<30	<50	49-124	49-124	<50	<75	95	90
8270B	Anthracene	NS	NS	10	660	60-140	20-150	<30	<50	45-165	45-165	<50	<75	95	90
8270B	Benzo (a) anthracene	NS	NS	10	660	60-140	20-150	<30	<50	51-133	51-133	<50	<75	95	90
8270B	Benzo (a) pyrene	NS	NS	10	660	60-140	20-150	<30	<50	41-113	41-113	<50	<75	95	90
8270B	Benzo (b) fluoranthene	NS	NS	10	660	60-140	20-150	<30	<50	37-119	37-119	<50	<75	95	90
8270B	Benzo (g,h,i) perylene	NS	NS	10	660	60-140	20-150	<30	<50	34-149	34-149	<50	<75	95	90
8270B	Benzo (k) fluoranthene	NS	NS	10	660	60-140	20-150	<30	<50	37-123	37-123	<50	<75	95	90
8270B	Benzoic acid	NS	NS	50	1600	60-140	20-150	<30	<50	1-162	1-162	<50	<75	95	90
8270B	Benzyl alcohol	NS	NS	20	1300	60-140	20-150	<30	<50	35-121	35-121	<50	<75	95	90
8270B	Bis (2-chloroethoxy) methane	NS	NS	10	660	60-140	20-150	<30	<50	49-104	49-104	<50	<75	95	90
8270B	Bis (2-chloroethyl) ether	NS	NS	10	660	60-140	20-150	<30	<50	44-106	44-106	<50	<75	95	90
8270B	Bis (2-chloroisopropyl) ether	NS	NS	10	660	60-140	20-150	<30	<50	36-166	36-166	<50	<75	95	90
8270B	Bis (2-ethylhexyl) phthalate	NS	NS	10	660	60-140	20-150	<30	<50	33-129	33-129	<50	<75	95	90
8270B	Butyl benzyl phthalate	NS	NS	10	660	60-140	20-150	<30	<50	26-123	26-123	<50	<75	95	90
8270B	Carbazole	NS	NS	10	660	60-140	20-150	<30	<50	34-132	34-132	<50	<75	95	90

TABLE A-2 PROJECT QUALITY CONTROL OBJECTIVES

Method No ¹	Analyte / Component	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	
		Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²
		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	<50	<75	%	%
8270B	Chrysene	NS	NS	10	660	60-140	20-150	<30	<50	55-133	55-133	<50	<75	95	90
8270B	Di-n-butyl phthalate	NS	NS	10	660	60-140	20-150	<30	<50	34-126	34-126	<50	<75	95	90
8270B	Di-n-octyl phthalate	NS	NS	10	660	60-140	20-150	<30	<50	38-127	38-127	<50	<75	95	90
8270B	Dibenzo (a,h) anthracene	NS	NS	10	660	60-140	20-150	<30	<50	50-118	50-118	<50	<75	95	90
8270B	Dibenzofuran	NS	NS	10	660	60-140	20-150	<30	<50	52-124	52-124	<50	<75	95	90
8270B	Diethyl phthalate	NS	NS	10	660	60-140	20-150	<30	<50	37-114	37-114	<50	<75	95	90
8270B	Dimethyl phthalate	NS	NS	10	660	60-140	20-150	<30	<50	6-186	6-186	<50	<75	95	90
8270B	Fluoranthene	NS	NS	10	660	60-140	20-150	<30	<50	47-111	47-111	<50	<75	95	90
8270B	Fluorene	NS	NS	10	660	60-140	20-150	<30	<50	48-139	48-139	<50	<75	95	90
8270B	Hexachlorobenzene	NS	NS	10	660	60-140	20-150	<30	<50	46-133	46-133	<50	<75	95	90
8270B	Hexachlorobutadiene	NS	NS	10	660	60-140	20-150	<30	<50	24-116	24-116	<50	<75	95	90
8270B	Hexachlorocyclopentadiene	NS	NS	10	660	60-140	20-150	<30	<50	41-115	41-115	<50	<75	95	90
8270B	Hexachloroethane	NS	NS	10	660	60-140	20-150	<30	<50	7-153	7-153	<50	<75	95	90
8270B	Indeno (1,2,3-c,d) pyrene	NS	NS	10	660	60-140	20-150	<30	<50	27-160	27-160	<50	<75	95	90
8270B	Isophorone	NS	NS	10	660	60-140	20-150	<30	<50	26-177	26-177	<50	<75	95	90
8270B	3-Methylphenol	NS	NS	10	660	60-140	20-150	<30	<50	41-144	41-144	<50	<75	95	90
8270B	N-Nitrosodi-n-propylamine	NS	NS	10	660	60-140	20-150	<30	<50	37-117	37-117	<50	<75	95	90
8270B	N-Nitrosodiphenylamine	NS	NS	10	660	60-140	20-150	<30	<50	27-116	27-116	<50	<75	95	90
8270B	Naphthalene	NS	NS	10	660	60-140	20-150	<30	<50	50-120	50-120	<50	<75	95	90
8270B	Nitrobenzene	NS	NS	10	660	60-140	20-150	<30	<50	46-133	46-133	<50	<75	95	90
8270B	2-Methylphenol	NS	NS	10	660	60-140	20-150	<30	<50	25-125	25-125	<50	<75	95	90
8270B	p-Chloroaniline	NS	NS	10	660	60-140	20-150	<30	<50	56-107	56-107	<50	<75	95	90
8270B	4-Methylphenol	NS	NS	10	660	60-140	20-150	<30	<50	33-108	33-108	<50	<75	95	90
8270B	Pentachlorophenol	NS	NS	50	3300	60-140	20-150	<30	<50	28-136	28-136	<50	<75	95	90
8270B	Phenanthrene	NS	NS	10	660	60-140	20-150	<30	<50	54-120	54-120	<50	<75	95	90
8270B	Phenol	NS	NS	10	660	60-140	20-150	<30	<50	17-118	17-118	<50	<75	95	90
8270B	Pyrene	NS	NS	10	660	60-140	20-150	<30	<50	47-136	47-136	<50	<75	95	90
8270B	Nitrobenzene-d5	--	--	--	--	35-114	23-120	--	--	--	--	--	--	95	90
8270B	2-Fluorobiphenyl	--	--	--	--	43-116	30-115	--	--	--	--	--	--	95	90
8270B	Terphenyl-d14	--	--	--	--	33-141	18-137	--	--	--	--	--	--	95	90
8270B	Phenol-d5	--	--	--	--	10-94	24-113	--	--	--	--	--	--	95	90
8270B	2-Fluorophenol	--	--	--	--	21-100	25-121	--	--	--	--	--	--	95	90
8270B	2,4,6-Tribromophenol	--	--	--	--	10-123	19-122	--	--	--	--	--	--	95	90

METALS BY ICP		mg/L	mg/kg	mg/L	mg/kg	%	%	<30	<50	%	%	%	%	%	%
6010	Aluminum	NS	NS	0.5	50	50-150	30-170	<30	<50	84-115	84-115	<50	<75	95	90
6010	Antimony	NS	NS	0.4	40	50-150	30-170	<30	<50	81-112	81-112	<50	<75	95	90

Method No ¹	Analyte / Component	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	
		Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²	Water	Soil ²
		ug/L	ug/kg	ug/L	ug/kg	%	%	%	%	%	%	<50	<75	%	%
6010	Arsenic	NS	NS	0.6	60	50-150	30-170	<30	<50	79-115	79-115	<50	<75	95	90
6010	Barium	NS	NS	0.02	2	50-150	30-170	<30	<50	85-112	85-112	<50	<75	95	90
6010	Beryllium	NS	NS	0.003	0.3	50-150	30-170	<30	<50	83-114	83-114	<50	<75	95	90
6010	Cadmium	NS	NS	0.04	4	50-150	30-170	<30	<50	78-118	78-118	<50	<75	95	90
6010	Calcium	NS	NS	0.1	10	50-150	30-170	<30	<50	84-114	84-114	<50	<75	95	90
6010	Chromium	NS	NS	0.07	7	50-150	30-170	<30	<50	82-115	82-115	<50	<75	95	90
6010	Cobalt	NS	NS	0.07	7	50-150	30-170	<30	<50	82-113	82-113	<50	<75	95	90
6010	Copper	NS	NS	0.06	6	50-150	30-170	<30	<50	83-114	83-114	<50	<75	95	90
6010	Iron	NS	NS	0.07	7	50-150	30-170	<30	<50	84-115	84-115	<50	<75	95	90
6010	Lead	NS	270,000	0.5	50	50-150	30-170	<30	<50	79-116	79-116	<50	<75	95	90
6010	Magnesium	NS	NS	0.3	30	50-150	30-170	<30	<50	84-112	84-112	<50	<75	95	90
6010	Manganese	NS	NS	0.02	2	50-150	30-170	<30	<50	84-114	84-114	<50	<75	95	90
6010	Molybdenum	NS	NS	0.08	8	50-150	30-170	<30	<50	83-113	83-113	<50	<75	95	90
6010	Nickel	NS	NS	0.15	15	50-150	30-170	<30	<50	82-112	82-112	<50	<75	95	90
6010	Potassium	NS	NS	5	500	50-150	30-170	<30	<50	82-114	82-114	<50	<75	95	90
6010	Selenium	NS	NS	0.8	80	50-150	30-170	<30	<50	68-121	68-121	<50	<75	95	90
6010	Silver	NS	NS	0.07	7	50-150	30-170	<30	<50	75-123	75-123	<50	<75	95	90
6010	Sodium	NS	NS	0.3	30	50-150	30-170	<30	<50	84-115	84-115	<50	<75	95	90
6010	Thallium	NS	NS	0.4	40	50-150	30-170	<30	<50	80-112	80-112	<50	<75	95	90
6010	Vanadium	NS	NS	0.08	8	50-150	30-170	<30	<50	82-112	82-112	<50	<75	95	90
6010	Zinc	NS	NS	0.02	2	50-150	30-170	<30	<50	82-113	82-113	<50	<75	95	90
METALS BY COLD VAPOR		mg/L	mg/kg	mg/L	mg/kg	%	%	%	%	%	%	%	%	%	%
7470	Mercury	NS	NA	0.001	NA	50-150	30-170	<30	<50	74-124	74-124	<50	<75	95	90
7471	Mercury	NA	NS	NA	0.1	50-150	30-170	<30	<50	74-124	74-124	<50	<75	95	90

TABLE A-2 PROJECT QUALITY CONTROL OBJECTIVES

Method No ¹	Analyte / Component	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
		TCLP	TCLP	TCLP	TCLP	TCLP	TCLP	TCLP
TCLP Volatiles		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)	(%)
8240	1,1-Dichloroethylene	0.7	0.1	50-150	<50	70-130	<50	90
8240	1,2-Dichloroethane	0.5	0.1	50-150	<50	70-130	<50	90
8240	Benzene	0.5	0.1	50-150	<50	70-130	<50	90
8240	Carbon Tetrachloride	0.5	0.1	50-150	<50	70-130	<50	90
8240	Chlorobenzene	100	20	50-150	<50	70-130	<50	90
8240	Chloroform	6	1	50-150	<50	70-130	<50	90
8240	Methyl Ethyl Ketone	200	20	50-150	<50	70-130	<50	90
8240	Tetrachloroethylene	0.7	0.7	50-150	<50	70-130	<50	90
8240	Trichloroethylene	0.5	0.1	50-150	<50	70-130	<50	90
8240	Vinyl Chloride	0.2	0.05	50-150	<50	70-130	<50	90
TCLP Semi-Volatiles		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)	(%)
8270B	1,4-Dichlorobenzene	7.5	1	50-150	<50	70-130	<50	90
8270B	2,4,5-Trichlorophenol	400	80	50-150	<50	70-130	<50	90
8270B	2,4,6-Trichlorophenol	2	0.4	50-150	<50	70-130	<50	90
8270B	2,4-Dinitrotoluene	0.13	0.02	50-150	<50	70-130	<50	90
8270B	Cresol	200	40	50-150	<50	70-130	<50	90
8270B	Hexachlorobenzene	0.13	0.02	50-150	<50	70-130	<50	90
8270B	Hexachloroethane	3	0.5	50-150	<50	70-130	<50	90
8270B	Hexachlorobutadiene	0.5	0.4	50-150	<50	70-130	<50	90
8270B	Nitrobenzene	2	0.4	50-150	<50	70-130	<50	90
8270B	Pentachlorophenol	100	80	50-150	<50	70-130	<50	90
8270B	Pyridine	5	1	50-150	<50	70-130	<50	90
TCLP Pesticides		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)	(%)
8080	Endrin	0.003	0.0005	50-150	<50	70-130	<50	90
8080	Lindane	0.06	0.01	50-150	<50	70-130	<50	90
8080	Methoxychlor	1.4	0.1	50-150	<50	70-130	<50	90
8080	Toxaphene	0.07	0.01	50-150	<50	70-130	<50	90
8080	Chlordane	0.03	0.005	50-150	<50	70-130	<50	90
8080	Heptachlor and its Hydroxide	0.001	0.0005	50-150	<50	70-130	<50	90
TCLP Herbicides		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)	(%)
8150	2,4-D	1.4	0.1	50-150	<50	70-130	<50	90
8150	2,4,5-TP	0.14	0.01	50-150	<50	70-130	<50	90

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	TCLP	TCLP	TCLP	TCLP	TCLP	TCLP	TCLP
TCLP Metals		(mg/L)	(mg/L)	(%)	(%)	(%)	(%)	(%)
6010	Arsenic	100	20	50-150	<50	70-130	<50	90
6010	Barium	100	20	50-150	<50	70-130	<50	90
6010	Cadmium	1	0.2	50-150	<50	70-130	<50	90
6010	Chromium	5	1	50-150	<50	70-130	<50	90
6010	Lead	5	1	50-150	<50	70-130	<50	90
7470	Mercury	0.2	0.04	50-150	<50	70-130	<50	90
6010	Selenium	1	0.2	50-150	<50	70-130	<50	90
6010	Silver	5	1	50-150	<50	70-130	<50	90
Characteristics		(mg/kg)	(mg/kg)	(%)	(%)	(%)	(%)	(%)
7.3	Reactive Sulfide	500	50	N/A	<50	N/A	<50	90
7.3	Reactive Cyanide	250	25	N/A	<50	N/A	<50	90
1010	Ignitability (Pensky Martens)	< 60 C or <140°F	40 C or 100°F	N/A	<50	N/A	<50	90
1020A	Ignitability (Setaflash)	< 60 C or <140°F	40 C or 100°F	N/A	<50	N/A	<50	90
9040	pH (Corrosivity)	<2 ; ≥12.5	N/A	N/A	<50	N/A	<50	90
Miscellaneous				(%)	(%)	(%)	(%)	(%)
9095	Paint Filter	Pass	Pass/Fail	N/A	N/A	N/A	N/A	90

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 _____ (signature) Sample No. _____
Date Collected _____ Time Collected _____

Custody Seal

Sample Label



OHM Remediation
Services Corp.



OHM Remediation Services Corp
 Subsidiary of OHM Corporation
 U.S. Route 224 East • Findlay, Ohio 45840 • (419) 423-3576

CHAIN-OF-CUSTODY RECORD

LABORATORY COPY

205391

FORM 0219 REV. 2-97

OHM LAB INFORMATION 1	LAB COORDINATOR'S PHONE 2	LAB COORDINATOR'S FAX 3	LABORATORY SERVICE ID 16	LABORATORY CONTACT 17	MAIL REPORT (COMPANY NAME) 22					
PROJECT NAME 4	PROJECT LOCATION 5	PROJECT NUMBER 6	LABORATORY PHONE 18	LABORATORY FAX 19	RECIPIENT NAME 23					
PROJECT CONTACT 7	PROJECT PHONE NUMBER 8	PROJECT FAX 9	LABORATORY ADDRESS 20	ADDRESS 24						
PROJECT ADDRESS 10	CITY STATE AND ZIP CODE 11	CLIENT 12	CITY STATE AND ZIP CODE 21	CITY STATE AND ZIP CODE 25						
PROJECT MANUAL # 13	PROJECT NUMBER 1 PHONE 14	PROJECT NUMBER 2 FAX 15	21 Analysis							
Item 26 Sample Identifier	27 Matrix	28 Date	29 Time	30 Preserved	31 # of Cont.	32 QC Level	33 T.A.	34 Analysis	Comments 35	
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
SAMPLES COLLECTED BY 36	CARRIER AND AIR BILL NUMBER 37		CARRIER TEMPERATURE LOG IN RECEIPT			SAMPLE RECEIPTION UPON RECEIPT				
DELIVERED BY 38	RECEIVED BY 39	DATE 40	TIME 41							

Distribution: White - Laboratory (To be returned with Analytical Report); Goldenrod - Project File; Yellow - Project Data Manager

45

**Project Information Section
 For Project Personnel Only
 Do Not Submit to Laboratory**

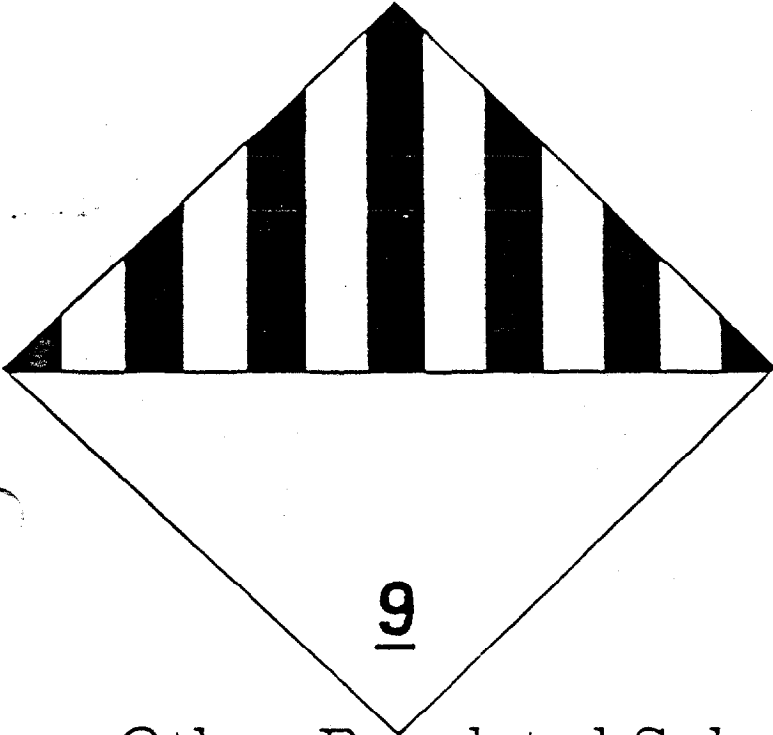
42 Sample Point Location	43 Sample Type			
	G	C	F	QC

Comment: **49**

Sample Type: G - Grab, C - Composite, F - Field Sample, QC - Quality Control Sample

CHAIN OF CUSTODY RECORD





OHM Corporation



From:	
Phone:	
To:	
Phone:	

Other Regulated Substances, ID# 8027

Class 9 Shipping Label

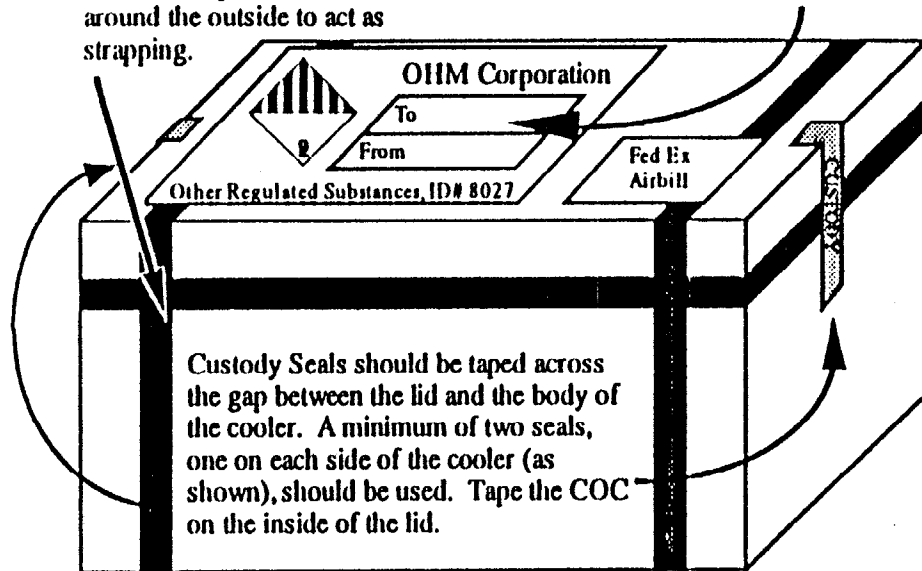


OHM Remediation
Services Corp.

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 cannot 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

0792772120

Please completed and signed copies of this Declaration must be provided to the operator.

WARNING
Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. This Declaration must also, in any circumstances, be completed and signed by a consignor, a forwarder or an IATA cargo agent.

Transport Details: Hazardous Materials (IMDG) IATA DGR

Shipment type: Non-Radioactive Radioactive

NATURE AND QUANTITY OF DANGEROUS GOODS							
Dangerous Goods Identification							
Proper Shipping Name	Class or Division	ID No.	Packing Group	Quantity and type of packing	Packing Inst.	Authorisation	
Other Regulated Substances	Class 9	ID 8027	NA	Plastic Box Containing _____ x 1 kg inner containers	906		

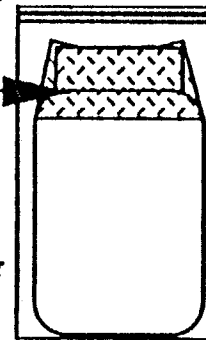
Additional Handling Information: FOR USE ONLY BY TRAINED PERSONNEL

I hereby declare that the contents of this packing are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in the proper condition for transport by air according to the applicable International and National Government Regulations.

- Samples must be shipped in "Strong outer packaging". Fed-Ex stated that a rigid plastic cooler like we are currently using would be acceptable.
- 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.
- Inner packages cannot exceed 1 gallon each, and the entire shipment (cooler & samples) cannot exceed 66 lb.
- 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.
- Inner containers should have their lids securely closed and packed in a ziplock baggie to prevent leaks
- 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-PEDEX for more instructions on filling out this form.
- 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.

Don't forget to sign and include the 24-hr Emergency Response Phone number. Check with the Regional T&D Coordinator for this number

Lids are taped to prevent leaks or loosening. Entire jar is sealed in a zip-lock baggie



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

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 drill #9A"

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

OHM Analytical Data Deliverables

Data Deliverables Package Requirements

Method	Deliverable Requirement	Equivalent EPA Form	OIIM Minimum Level	OIIM Standard Level	OIIM Maximum Level
Metals	Case Narrative		X	X	X
	Corrective Action Report		X	X	X
	Cross-reference of OIIM 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)	

Notes:

- 1) Must include: OIIM 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.

Data Deliverable Package Requirements

Method	Deliverable Requirement	Equivalent EPA Form	OIIM Minimum Level	OIIM Standard Level	OIIM Maximum Level
Organics by GC or HPLC	Case Narrative		X	X	X
	Corrective Action Report		X	X	X
	Cross-reference of OIIM 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
Percent Moisture			X	X	

Notes:

- 1) Must include: OIIM sample ID, Lab ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limit, Method Detection Limit, Dilution Factor, comments, approval signature/date.
- 4) For petroleum fuels analyses chromatograms for samples with positive results only.

Method	Deliverable Requirement	Equivalent EPA Form	OIM Minimum Level	OIM Standard Level	OIM Maximum Level
Inorganic Chemistry (Note 2)	Case Narrative		X	X	X
	Corrective Action Report		X	X	X
	Cross-reference of OIM 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 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

Notes:

- 1) Must include: OIM sample ID, Lab ID, date/time sampled, date received, extracted/analyzed, Practical Quantitation Limit, Method Detection Limit, Dilution Factor, comments, approval signature/date
- 2) Deliverables depend on method's QC

Data Deliverables Package Requirements

Method	Deliverable Requirement	Equivalent EPA Form	OHM Minimum Level	OHM Standard Level	OHM Maximum Level
Organics by GC/MS	Case Narrative		X	X	X
	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
	Copies of Run Logs				X
Percent Moisture			X	X	
pH					X (Note 3)

Appendix D

Correspondence

- **Letter, Including Attachment, from LANTDIV Environmental Management to North Carolina Department of Environment, Health, and Natural Resources Dated 2/4/97**
- **OHM Documentation Memo Dated 7/18/97 Concerning Remediation Levels**



UNITED STATES MARINE CORPS

MARINE CORPS BASE
PSC BOX 20004
CAMP LEJEUNE, NORTH CAROLINA 28542-0004

IN REPLY REFER TO:

6286
BEMD
14 FEB 1997

Mr. Dave Lown
North Carolina Department of Environment,
Health, and Natural Resources
Superfund Section
Post Office Box 27687
Raleigh, North Carolina 27611-7687

OPTIONAL FORM 99 (7-90)

3/18/97

FAX TRANSMITTAL

of pages = 4

To	JIM DUNN	From	KATE
Dept./Agency		Phone #	
Fax #	770 453 7743	Fax #	

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Dear Mr. Lown:

The Environmental Management Department at Marine Corps Base (MCB), Camp Lejeune was notified of a potential Area of Concern (AOC) via the Resident Officer in Charge of Construction on February 7, 1997. After review of the enclosed analytics by our office, there appears to be a characteristic hazardous waste located at the Montford Point elevated water tower near SM-624. We would like to submit the following AOC in order to fulfill notification requirements outlined in Condition IV.D.1 of MCB, Camp Lejeune's Hazardous Waste Permit.

Our plan of action for this AOC is to sample and delineate area of contamination, excavate, and remove lead contaminated soil. As of this date we have initiated contractual actions to perform this work. It is further requested that the State Superfund and Hazardous Waste Sections provide guidance on soil clean up level.

If you have questions or comments, please contact Mr. Mick Senus, Installation Restoration Division, Environmental Management Department, at telephone (910) 451-5068.

Sincerely,

DOUG C. PINER
Acting Deputy Assistant Chief of Staff
Environmental Management
By direction of
the Commanding General

Enclosure: 1. Analytical Results

Copy to:
NCDEHNR, Hazardous Waste Section (Mr. James Carter)
EPA (Ms. Gena Townsend)
LANTDIV (Ms. Kate Landman)

Kate

2

2-1997 11:45
NOV-27-96 WED 14:18

RDIC/NEW RIVER MCRS

910 451 6403 P.02

RHEM INSULATION

PO Box 626
Jacksonville, NC 28541

910-347-1764
Fax 910-347-1078

November 27, 1996

Arnold Diamond, Inc.
333 Glen Head Rd., Suite 270
Glen Head, NY 11545

RE: Rep elevated Tank SM-624 CLWC
#N62470-93-C-0319
Soil samples

Gentlemen:

Please see attached Items #1 & #2. These samples represent soil samples taken from the above referenced project. This sample information is being provided to you prior to any lead removal on this project. These soil samples were collected from areas under the water tower and between the water tower and fencing. The results of this soil sampling are well above the EPA limit of 5.0 mg/L, thus deeming the soil in this area hazardous. Hence, we are seeking information & direction from you in regards to spec. 02091, para. 3.4.1.

Also, it should be noted that we will not begin lead removal (water tower demo.) until this matter is resolved. Specifically, we feel that lead removal on this project can not begin until Rhem Insulation is released from any liability or responsibility in regards to hazardous levels of lead in soil that exist prior to lead removal & water tower demo as the current contract exist for this project.

If there are any questions on this matter, please do not hesitate to call.

Sincerely,


Jay Scarborough
Vice President

Form #	Form Note	7671	Date	11/29/96
To	From	Jay		
Subject		Arnold Diamond		Rhem
Page #				
Page #				

M.D. Chemical and Testing, Inc.
 P.O. Box 19321, Forbes Field, Bldg 281, Topeka, KS 66619
 (913) 862-3500 FAX (913) 862-5132

Sample Collected By: Walter Skerski
 Date Collected:
 Received In Lab: 11/22/96 11:22
 Date Reported: 11/26/96
 Analyst: HK
 Project Name: Water Tower Demo
 Project Number:

Sample Number: 963087-01
 Client: Rock Environmental Services
 485 Western Blvd
 Jacksonville, NC 28546
 ATTN: Walter Skerski
 Sample Description: Grab/solid
 Sample ID: CJT-1 North S. of Tower

Analysis: TCLP EXTRACT ANALYSIS - METALS
EPA SW-846 METHOD

ANALYTES	TCLP EXTRACT RESULTS mg/L	DETECTION LIMIT mg/L	EPA TCLP LIMIT mg/L	EXTRACT ANALYSIS METHOD	DATE ANALYZED
Cadmium	Not Detected	0.05	1.0	1311/7130	11/25/96
Chromium	Not Detected	0.08	5.0	1311/7190	11/25/96
Lead	21.6	0.08	5.0	1311/7420	11/25/96
Mercury	Not Detected	0.005	0.2	1311/7470	11/26/96

1. Test Procedures as per EPA TCLP regulations in 40 CFR 261, Appendix 11, as amended.
2. mg/L = milligrams per liter

Approved By:

[Signature]
 Lab Manager

Item #1

M.D. Chemical and Testing, Inc.

P.O. Box 19321, Forbes Field, Bldg 281, Topeka, KS 66619
 (913) 862-3300 FAX (913) 862-3132

Sampled Collected By: Walter Skerski
 Date Collected:
 Received In lab: 11/22/96 11:22
 Date Reported: 11/26/96
 Analyst: HK
 Project Name: Water Tower Demo
 Project Number:

Sample Number: 963687-02
 Client: Rock Environmental Services
 485 Western Blvd
 Jacksonville, NC 28546
 ATTN: Walter Skerski
 Sample Description: Grab/solid
 Sample ID: CJT-2 S. side of tower

**Analysis: TCLP EXTRACT ANALYSIS - METALS
 EPA SW-846 METHOD**

ANALYTES	TCLP EXTRACT RESULTS mg/L	DETECTION LIMIT mg/L	EPA TCLP LIMIT mg/L	EXTRACT ANALYSIS METHOD	DATE ANALYZED
Cadmium	Not Detected	0.05	1.0	1311/7130	11/25/96
Chromium	0.19	0.08	5.0	1311/7190	11/25/96
X Lead	11.4	0.08	5.0	1311/7420	11/25/96
Mercury	Not Detected	0.005	0.2	1311/7470	11/26/96

1. Test Procedures as per EPA TCLP regulations in 40 CFR 261, Appendix 11, as amended.
2. mg/L = milligrams per liter

Approved By:

[Signature]
 Lab Manager

Item #2



DOCUMENTATION MEMO

Form No. 0066
Eng. Services
Rev. 07/89

OHM Corporation

Page _____ of _____

Date: 7/18/97 Time: 1105
Subject: Pb levels Had At Sals

Project Number: 19668
Project: DO 151

<input type="checkbox"/> Phone Call From	<input checked="" type="checkbox"/> Phone Call To
<u>DRUE LOWE</u>	
Name	
<u>NCDERRITZ</u>	
Company	
Phone Number	

<input type="checkbox"/> Meeting	Location _____
Attendee	Organization

Remarks:

REMEDIATION LEVELS

TCLP LEAD 5.0 ppm

TOTIC LEAD 400 ppm FOR NORMAL CONTACT

270 ppm FOR LEADING TO SW