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DRAFT FINAL WORK PLAN SOIL SEGREGATION AND ANALYSIS ABL ROCKET CENTER WV

2/5/1996

OHM REMEDIATION SERVICES CORP.

DRAFT

FINAL

WORK PLAN
SOIL SEGREGATION AND ANALYSIS
ALLEGANY BALLISTICS LABORATORY
ROCKET CENTER, WEST VIRGINIA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032
Delivery Order 0007

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OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

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OHM Project 15986WP

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LIST OF FIGURES

1.0 INTRODUCTION

OHM Remediation Services Corp. (OHM), a subsidiary of OHM Corporation is pleased to submit this Work Plan to the Department of the Navy, Atlantic Division Naval Facilities Engineering Command for the Modification to Statement of Work, Construction Investigation for Beryllium Landfill, Allegany Ballistics Laboratory (ABL), West Virginia. Preparation of this work plan is authorized under the LANTDIV Construction Contract Number N62470-93-D-3032, Delivery Order 0007.

The purpose of this plan is to define the scope of work and procedures for specific tasks to complete the segregation of excavated material into waste streams, sampling and analysis of waste streams and disposal of segregated materials from the ABL site. A site location map is enclosed as Figure 1.

1.1 PROJECT HISTORY

OHM, in accordance with the original scope of this delivery order, excavated approximately 36 cubic yards (CY) of material from the delineated area at Site 7, the Beryllium Landfill, in June of 1994. The soil material was placed into three roll-offs. Vials of beryllium compounds, mercury compounds, and other unknown materials including miscellaneous debris, were observed in the soil material. In October, 1994, one roll-off, with overburden soils was disposed of at a municipal landfill. Materials in the remaining two roll-offs include small vials of beryllium dust (hazardous waste code P015), small vials of mercury (hazardous waste code U151), and other unidentified containers. Additionally, a small piece of potentially explosive material, composed of approximately 40% nitroglycerin, was extracted from the excavated material.

As authorized by the U.S. Department of the Navy and WVDEP, the remaining two roll-off boxes were relocated to a more secure area on the ABL facility, adjacent to Site 5. The material is being temporarily stored at this location until work outlined within this Work Plan can be initiated.

1.2 PROJECT OBJECTIVES

The objective of this work phase is to visually screen, segregate, sample, characterize and dispose of materials contained within two existing roll-off containers. The soil itself has passed TCLP, but is known to contain a mix of at least three hazardous materials, beryllium contaminated vials, mercury contaminated vials and solid explosive materials. The quantity of the hazardous materials is unknown, but is suspected to be a very small percentage of the total volume. The segregated soil material, if determined to meet on-site disposal criteria as outlined in the Sampling and Analysis Plan, Appendix A, will be disposed of at ABL's closed solid waste landfill known as Site 5, Solid Waste Landfill.

1.3 SCOPE OF WORK

The scope of work for this project includes the following items:

- Prepare and Submit Work Plan -- The work plan provides a description of the field activities and the project organization.
- Site Mobilization -- Upon approval of the work plan, OHM will mobilize personnel and equipment to the site.
- Site Preparation -- This includes setting up the screening area, decontamination areas and disposal area.

- Visual Screening and Segregation -- Material will be removed from the roll-off boxes and screened to segregate vials, containers and other foreign objects.

- Characterization Sampling and Analysis -- Representative samples of each segregated waste stream will be taken and analyzed for TCLP, TAL/TCL, total beryllium and total mercury in accordance with SW-846 methods of waste characterization. OHM will perform hazcatting on all unknown samples. These procedures are discussed in the Sampling and Analysis Plan (SAP) contained in Appendix A.

- Transportation and Disposal (T&D) -- Segregated laboratory wastes and other wastes will be containerized and disposed of as required by CERCLA, RCRA and other applicable regulations. Segregated soil, if determined to meet on-site disposal criteria as indicated in the Sampling and Analysis Plan, Appendix A will be disposed of at the existing solid waste landfill on ABL's Site 5.

- Decontamination and Demobilization -- OHM will clean up the areas to preconstruction condition and demobilize personnel and equipment from the site.

- Weekly and Monthly Status Reports--These reports will include technical progress and cost performance.

- Project Close-out Report -- OHM will submit the close-out report within 30 days of the completion of field and disposal activities.

2.0 MOBILIZATION

OHM will mobilize the personnel, equipment and resources necessary to complete the project as defined in this work plan. The project resources will be coordinated from OHM's Trenton, New Jersey office and will include, but are not limited to, the following:

- Personnel:

  - Site Supervisor
  - Project Accountant
  - Site Safety Officer
  - Project Chemist
  - Sample Technician
  - Recovery technicians (four)
  - Equipment Operator
  - EOD Specialist

- Equipment:

  - Pollution control truck (PC truck) containing pollution control equipment and supplies
  - Backhoe
  - Fork lift attachment for backhoe loader bucket
  - Pickup truck
  - Van
  - Generator
  - Non-sparking hand tools
  - Compactor
  - Office/crew trailers
  - Decontamination trailer
  - H&S equipment
  - Water tank
  - Waste containers (wooden boxes, 55 gal. drums, 5 gal. pails)
  - Silt fence
  - High visibility fence
  - 40 mil HDPE
  - Polyethylene sheeting
  - Misc. equipment and facilities

3.0 PROJECT ORGANIZATION

This section describes the responsibilities of the OHM project team. The project organization is also discussed in the Sampling and Analysis Plan (SAP), Appendix A, and the Health and Safety Plan, Appendix C, as it pertains to those plans.

3.1 RESPONSIBILITIES OF THE OHM PROJECT TEAM

The work at the Allegany Ballistics Laboratory site will be led by a project-dedicated team responsible for the management and completion of the overall project. The Project Organization Chart illustrated on Figure 2 defines the primary "chain of command."

The project manager will have the overall responsibility for the project efforts including technical, schedule, and budget aspects. The project manager will be responsible for the day-to-day management and integration of all elements of the project and will be accountable for each activity. Supporting the project manager will be the sampling and analysis manager and the transportation and disposal coordinator. Supporting the project manager in the field will be the site supervisor, site safety officer, project accountant, project chemist, and other support personnel as needed.

Responsibilities and authority of the project manager and supporting field personnel fundamental to the project are discussed in the following sections.

An OHM Project Chemist will perform the quality control (QC) functions and will directly supervise all on-site sampling and analysis.

3.1.1 Project Manager

The project manager is the person in charge of the overall project and has full authority for coordination and direction of the project. The project manager will communicate directly with the U.S. Department of the Navy. Specific responsibilities of the project manager include:

- Interpret and plan overall work effort.
- Overall project preparation by defining resource needs and securing the commitments for staff and equipment.
- Develop, review, and meet work schedule and budget objectives.
- Prepare for and attend meetings with the U.S. Department of the Navy, as required.
- Document the need for contract modifications, if needed.
- Communicate with the site supervisor about day-to-day activities and alert the program manager of potential problems.
- Maintain OHM quality standards.

3.1.2 Site Supervisor

The site supervisor is the OHM contact at the site and is responsible for performing the remedial activities in accordance with the work plan and other project plans and specifications. The site supervisor's responsibilities include, but are not limited to:

- Implementing the day-to-day aspects of the HASP.
- Managing the day-to-day execution of the project at the site including administrative and procurement activities.

- Monitor work progress and schedule, and advise the project manager of variances.
- Compiling the daily logs into a weekly report which will be forwarded to the project manager.
- Attending work progress meeting.

3.1.3 Project Accountant

The responsibilities of the project accountant (PA) are:

- Assist the project manager in preparation of schedules, budgets, and invoices.
- Establish tracking system to track costs and budget variances.
- Provide weekly progress reports to the project manager on budget and schedule.
- Prepare daily reports.
- Audit weekly postings of charges to the work budgets.
- Assist the site supervisor in procurement activities.

3.1.4 Project Chemist

The responsibilities of the project chemist are to develop the SAP and to supervise field sampling activities. The project chemist is also responsible for the procurement of the testing laboratory and preparation of reports.

3.1.5 Transportation and Disposal Coordinator

The responsibility of the transportation and disposal (T&D) coordinator is to manage the transportation and disposal of the various wastes. The T&D coordinator will be responsible for preparing waste profiles and manifests, and for obtaining cost-effective transportation disposal options and disposal facility approval.

4.0 SITE PREPARATION

Upon arrival at the site, work will begin in order to secure the site for the activities to be performed.

4.1 WORK ZONE AND TEMPORARY FENCES

The work zone will be enclosed with orange high-visibility plastic fencing with metal support posts. Within the work zone, high-visibility fence will also be used to delineate the exclusion zone (EZ) from the contamination reduction zone (CRZ) and the support zone (SZ). The work zone is illustrated on Figure 3. Warning signs indicating "Hazardous Waste," "Explosives" and "Danger-Keep Out" will be placed along the fence. Access to this area will be restricted to authorized personnel with approved personal protective equipment (PPE) as specified in the Health and Safety Plan (HASP), Appendix C. Access to the exclusion zone will be through the decontamination trailer and decontamination pad. An emergency egress point will have caution tape to restrict egress except for during emergency situations. Caution tape, roping and other fencing devices will be used in accordance with Occupational Safety Health Administration (OSHA) guidelines and as specific project tasks require.

4.2 SEGREGATION AREA

A high density polyethylene (HDPE) lined containment area will be constructed adjacent to the existing roll-off containment area as indicated on Figure 3. This containment area will be constructed by grading approximately 4 inches of sand on which a 40 mil. HDPE liner will be placed. The sides of the containment area will consist of plywood which will be reinforced and overlapped with the HDPE liner.

The existing roll-off shelter will be modified by raising it a couple of feet to allow work activities under the shelter. The shelter will also be expanded to extend over the new containment area. The shelter will be formed with timber and covered with a tarp to prevent weather-related interruption of work. The side panels will be clear polyethylene sheeting to allow for light to enter and also act as a wind barrier. The segregation activities will be conducted within the modified shelter on both the existing roll-off containment area and the new containment area. A cross-section of the new containment area is included on Figure 3. An access-way will be established on the side of the segregation area facing the CRZ. A small CRZ will be set-up at the segregation area access location to remove gross contamination prior to exiting the segregation area.

Two tables or screening areas will be set up in the work zone where recovery technicians will screen the material being hand shoveled from the rolloffs. One cubic yd. wooden boxes and other containers will be placed behind each recovery technician, marked and ready to receive the segregated material as per waste stream. The description of the segregation activities will be discussed in Section 5.0.

4.3 TEMPORARY STORAGE AREA

The segregated and containerized wastes will be temporarily stored in the exclusion zone while awaiting waste characterization and disposal. The containers will be stored separately according to their expected waste stream. Proposed storage locations are shown on Figure 3, but the specific storage locations will be determined at the site when a better estimate can be made on the quantity of each waste stream. Section 5.0 describes the waste containment procedures.

The existing grade of the proposed EZ has a cover of gravel and is stable. In order to prevent cross contamination, in the unlikely event that the storage containers spill while in the storage area, the storage containers will be placed on polyethylene sheeting. The stored containers will also be covered with polyethylene sheeting at the end of each day and until the disposal activities are completed.

4.4 DECONTAMINATION PAD CONSTRUCTION

A decontamination pad will be supplied in order to decontaminate personnel and equipment on a daily basis, as needed, and at the end of the project.

The decontamination pad will be constructed in a similar manner as the segregation area containment. The decontamination pad will be constructed by grading approximately 4 inches of sand on which a 40 mil. HDPE liner will be placed. The sand will be graded toward one corner, to facilitate drainage, where a small depression will be made. The sides of the decontamination pad will consist of a sand berm, approximately 6 inches higher than the inside of the decontamination pad, and will be overlapped with the HDPE liner. Instead of constructing a decontamination pad at the site, OHM may mobilize a portable decontamination pad, as illustrated in Figure 4, which will serve the same function.

Non-potable water for decontamination of equipment and personnel will be supplied in a portable water tank. The decontamination pad will also be supplied with a small sump pump and 55 gallon drum to collect the decontamination water.

The above referenced water tank will also be used as a water supply for dust suppressing activities.

5.0 WASTE STREAM SEGREGATION AND CHARACTERIZATION

5.1 SEGREGATION

PPE required for this activity will be as indicated in the Health and Safety Plan (HASP), Appendix C. The roll-off gates facing the segregation area will be opened and the waste material allowed to fall onto the containment area. A recovery technician will shovel the waste material into 5 gallon plastic buckets and hand transport them to the segregation area. The waste will be placed into shallow plastic lined trays where vials, potentially explosive materials and other materials (other than soil) will be segregated by hand into approved containers.

Once all materials other than soil have been removed from the plastic lined trays, the remaining soil will be deposited into one-cubic-yard polyethylene lined double-wall wooden boxes with rigid lids. The soil will be transferred manually by lifting the plastic lined tray and pouring the soil into the wooden boxes. Soil surrounding broken vials and other stained soil will be segregated and placed in a 55-gallon drum dedicated for material encountered under these circumstances.

Materials will be screened and sorted into waste streams based on visual observation and best professional judgement. Waste will include soil, beryllium, mercury, propellant/explosives, miscellaneous laboratory debris and other unknown materials. The screening and segregation criteria for the different wastes are described in the Sampling and Analysis Plan (SAP), Appendix A and outlined on the flow chart on Figure 5 and below in Section 5.2.

As the removal of the material from the roll-offs progresses, the cover to the roll-offs will be folded or removed to facilitate work within the roll-offs. Because of the possibility that potentially explosive objects may be encountered, a plastic barn shovel will be used to move the waste material, in shallow lifts, toward the gate of the roll offs as the work progresses. While the shovel is in use, the work area will be cleared of all unnecessary personnel except for the recovery technicians, who don Level B protection.

After each container is filled, it will be sampled and labeled as indicated in the Sampling and Analysis Plan (SAP), Appendix A. The containers will then be transferred to their respective temporary storage areas where they will be placed on wooden pallets and covered for protection from the elements, pending analysis and disposal.

Dust which may be generated during the segregation activities will be suppressed with a water supply.

The material handling procedures will be evaluated on a continuous basis, in order to ensure operation quality, and to minimize the risks associated with working with potential explosives. Procedures will also be evaluated with respect to the condition of the waste vials. OHM may implement other work procedures, with the approval of the U.S. Department of the Navy and regulatory agencies, if they are deemed necessary. Only procedures which minimize the potential hazards and allow for the extraction of the intact vials will be utilized. All tools used to handle the waste directly will be of non-sparking material.

5.2 CHARACTERIZATION

Waste materials will be segregated into waste streams based on best professional judgement and observation of their physical properties, such as appearance and weight. Waste will include soil, beryllium, mercury, propellant/explosives, miscellaneous laboratory waste and other unknown materials. Following

segregation, samples will be collected for characterization as described in the Sampling and Analysis Plan (SAP), Appendix A. This section will summarize the characterization process as outlined on Figure 5 - Waste Stream Characterization Flow Chart and reference the Sampling and Analysis Plan (SAP), Appendix A, which details the characterization process.

Soil

The soil will be segregated as indicated on the previous section and placed in a one cubic yard wooden box. In the event that soil is stained due to broken vials or containers, this soil will be placed in a 55 gal. drum. All soil will be sampled and characterized in the same manner.

Samples will be collected and analyzed as indicated in the Sampling and Analysis Plan (SAP, Appendix A and are briefly discussed below.

- One representative composite sample per container, derived from four grab samples, will be collected from each container (1 CY boxes and 55 gal. drums). Each representative sample will be tested for:

  - Total beryllium
  - Total mercury
  - Explosives

- One composite sample will be generated for every four representative container samples indicated above. These samples will be analyzed for:

  - TAL-Metals
  - TCL-Organics
  - TCLP-Full

- One grab sample will be collected per soil container and analyzed for:

  - TCL-Organics/VOC

Based on the analysis results, the soil will be disposed of:

- by Alliant Techsystems at ABL, if it has explosive characteristics,
- at a Subtitle C landfill if it fails the Full TCLP analysis,
- as indicated in Section 6.2 if it fails the site specific criteria for mercury and beryllium (305 mg/kg and 13 mg/kg respectively),
- and at ABL's Site 5 Landfill if it passes the site specific criteria.

Propellant/Explosives Objects

Solid objects which appear to be explosive will be inspected by the Navy representative. If the objects are determined to be propellants or explosives, they will be segregated from the other materials and turned over to Alliant Techsystems at ABL for disposal.

Beryllium Containers

The beryllium containers will be segregated as indicated on Section 5.1 and based on visual observation of the physical properties of the material as indicated in the Sampling and Analysis Plan (SAP),

Appendix A. The material may also be segregated based on any description on labels attached to the containers. Beryllium containers will be further segregated into two groups. The segregation will be based on the confidence levels of the vials containing a high purity of beryllium. Samples will be collected and analyzed as indicated in the Sampling and Analysis Plan (SAP), Appendix A and are briefly discussed below.

- 10% of the containers will be collected and analyzed for:
  - Total beryllium

The analysis will be used to track and adjust the segregation process and to classify the material for disposal. Beryllium dust will be disposed of as P015 waste. Final acceptance by the disposal facility, indicated on Section 6.2 of this Work Plan, will be based on the purity level of beryllium.

If the sample analysis indicates that the material does not contain beryllium, vials with similar characteristics as that of the sample analyzed will be segregated as unknown materials.

Mercury Containers

The mercury containers will be segregated as indicated on the previous section and based on visual observation of the physical properties of the material as indicated in the Sampling and Analysis Plan (SAP), Appendix A. The material may also be segregated based on any description on labels attached to the containers. Samples will be collected and analyzed as indicated in the Sampling and Analysis Plan (SAP), Appendix A and are briefly discussed below.

- 10% of the containers will be collected and analyzed for:
  - Total mercury

The analysis will be used to track and adjust the segregation process and to classify the material for disposal. Mercury will be disposed of as U151 waste at the disposal facility indicated on Section 6.2 of this Work Plan.

As with the beryllium analysis, if the mercury sample analysis indicates that the material does not contain mercury, vials with similar characteristics as that of the sample analyzed will segregated as unknown materials.

Unknown Materials

Unknown containers are defined as those which are segregated directly from the initial roll-off segregation process and as a result of the beryllium and mercury characterization discussed above. These will include miscellaneous laboratory debris. The unknown material will be collected and analyzed as indicated in the Sampling and Analysis Plan (SAP), Appendix A and are briefly discussed below.

- Bench-scale testing (Hazcatting) will be performed on all unknown containers to determine waste stream classification as indicated in Section 2.5 and 8.3 of the Sampling and Analysis Plan (SAP), Appendix A. Upon completion of the hazcat testing, the material will be labpacked by waste stream.

- 10 % of the containers within each waste stream will be collected and analyzed for the disposal parameters of concern as follows:

- TAL-Inorganics
- TCL-Organics
- Ignitability
- Corrosivity
- Reactivity

The analytical results will be used by the OHM Transportation and Disposal Coordinator to assign proper waste codes to the labpacked material and determine the appropriate disposal facilities.

Contractor Generated Waste

The contractor generated waste, such as decontamination water and PPE, which is suspected of coming in contact with contaminants, will be segregated as the work progresses during the site activities. Based on the analytical results for the soil, beryllium, mercury, explosives, and unknown wastes, a determination will be made at the end of the project to either analyze the contractor generated waste and dispose of it per the analysis or dispose of the waste in a Subtitle D landfill and as indicated on Section 6.2 of this Work Plan.

- If the waste is to be analyzed, samples will be collected and analyzed for:

  - Total beryllium
  - Total mercury
  - Explosives
  - Full TCLP

Details of the waste characterization for all the wastes are presented in the Sampling and Analysis Plan (SAP), Appendix A.

6.0 DISPOSAL

6.1 DISPOSAL OF SEGREGATED SOIL

This section addresses the disposal of waste which may be found to meet the on-site disposal criteria as indicated in the Sampling and Analysis Plan (SAP), Appendix A. This waste will be disposed of at the Solid Waste Landfill - Site 5, within the ABL facility.

6.1.1 Disposal Area Preparation - Site 5

The disposal area location, delineated with respect to the existing solid waste landfill, Site 5, is depicted on Figure 6.

Once approval is given to begin disposal activities, the disposal area will be laid out in accordance with Figure 7, "Site Plan - Segregated Soil Disposal Area". Engineering controls will be installed and the disposal area will be cleared and grubbed. The cleared material will be stockpiled, covered with poly and surrounded with hay bales. The 25-by-25 feet disposal area to receive the segregated soil will be excavated approximately 2 feet. The excavated materials will also be stockpiled, covered with poly and surrounded with hay bales. A soil berm will be constructed to divert runoff around the disposal area as required.

6.1.2 Engineering Controls

6.1.2.1 Layout Control and Documentation

The disposal area will be approximately 25-by-25 feet in plan dimensions and 2 feet in depth. A control survey will be run onto the site and the corners of the excavation will be documented using the National Geodetic Survey coordinate system. Additionally, elevations of the four corners and center of the excavation will be measured and recorded. Concrete monuments will be set after final grading to physically mark the limits of the disposal area. Finally, OHM will produce a record drawing of the disposal location indicating coordinates of excavation, excavation invert elevations and finished grades.

6.1.2.2 Surface Water Control

OHM will construct an earth berm upgradient of the disposal area to divert runoff surface water around the excavation during site preparation and disposal. The final grading of the area will include a shallow swale to channel runoff around the disposal area.

6.1.2.3 Erosion and Sediment Control

Silt fence will be installed downgradient of the work area in order to capture any sediment carried by surface water runoff. After backfilling and grading, the disturbed area will be fertilized and seeded. Curlex erosion control matting will be installed to guard against erosion while the permanent vegetative cover develops.

6.1.2.4 Material Containment

The excavation bottom and walls will be lined with a single sheet of 40 mil high density polyethylene (HDPE) of sufficient size so that it may be folded partially over the top of the deposited soils. A second sheet of 40 mil HDPE will be placed directly on the newly deposited soils and overlapped with the lower sheet.

6.1.3 Soil Placement Procedures

After the disposal area has been excavated, approximately 4 inches of sand will be placed on the bottom of the area. Then the first 40-mil HDPE liner will be placed and secured.

Material will be removed from the containment soil boxes and distributed within the disposal area to an approximate material depth of 1.5 feet. The soil will be evenly deposited and compacted with a vibratory plate compactor. Once all segregated soil has been properly placed, the disposal area will be covered with a second 40 mil HDPE liner.

6.1.4 Site Restoration

After the top liner has been placed over the fill area, the previously excavated material will be used to cap the area. This material will also be evenly graded and compacted with the vibratory compactor. The disturbed areas will be fertilized and seeded. Curlex will also be placed for interim erosion protection.

6.2 DISPOSAL OF HAZARDOUS WASTES

After characterization, hazardous waste streams will be appropriately packaged and sent to hazardous waste facilities permitted to accept such materials. The known waste streams will be disposed of as follows:

- Hazardous soil: Dependent on analysis results
- Beryllium waste: Brush Wellman, Inc., Elmore, Ohio
- Mercury waste: Bethlehem Apparatus, Hellertown, Pennsylvania and/or Mercury Refining, Albany, New York
- Explosives: Alliant Techsystems Inc. Allegany Ballistics Laboratory
- Decon. Water: Clean Harbors Baltimore, MD

Wastes characterized as hazardous will be containerized in approved containers for shipment and disposed of in accordance with the hazardous waste regulations and the Land Disposal Restriction.

6.3 DISPOSAL OF NON-HAZARDOUS WASTES

Non-hazardous waste, such as support zone trash and material which does not come in contact with hazardous materials, will be disposed of off-site as construction debris.

7.0 DEMOBILIZATION

Once material disposal is complete and the site work has been approved by the U.S. Department of the Navy, OHM will clean up the work area and demobilize from the site. All equipment and supplies deemed to be reusable will be decontaminated and shipped off-site. Supplies which are not reusable will be removed and disposed of appropriately. All materials required to be turned over to LANTDIV will be turned over at this time.

7.1 DECONTAMINATION OPERATIONS

Decontamination of vehicles, equipment, and/or debris will be performed with a high pressure water wash. Decontamination procedures are addressed in the Health and Safety Plan (HASP), Appendix C.

7.2 RESTORATION

As the equipment and facilities are removed at the end of the project, the disturbed areas will be graded to approximate the pre-remediation conditions and seeded. The disposal area restoration is addressed in Section 6.0.

7.3 DEMOBILIZATION

All OHM equipment and personnel will demobilize from the site as the close-out tasks progress and the resources are no longer needed.

8.0 DOCUMENTATION

The following is a summary of the general documentation to be conducted for the project. Sampling and analysis documentation is addressed in the Sampling and Analysis Plan (SAP), Appendix A.

8.1 FIELD DOCUMENTATION

Daily activities will be documented as an internal OHM procedure in the Site OHM Daily Log Book.

8.2 WEEKLY AND MONTHLY STATUS REPORT

Reports will be submitted on a weekly basis (if requested) and on a monthly basis and will include the major tasks completed and scheduling status.

8.3 CLOSE-OUT REPORT

Within 30 days of the completion of field and disposal activities, a final report will be prepared and submitted. The final report will include a description of the work performed, analytical data, disposal activities, and as-built drawing of the disposal area.

FIGURES

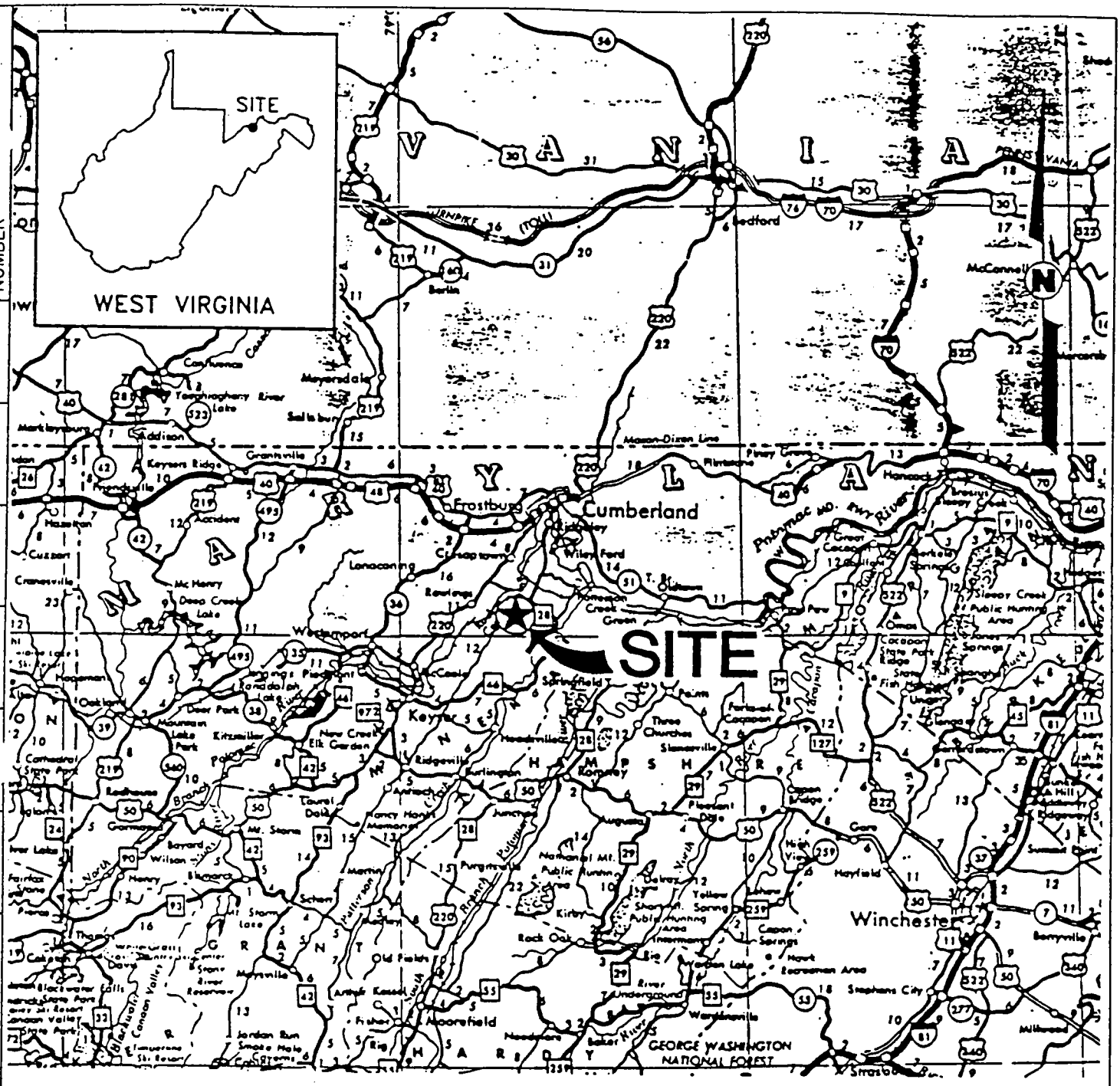

FIGURE 1

SITE LOCATION MAP
ALLEGANY BALLISTICS LABORATORY, WEST VIRGINIA
PREPARED FOR

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

SCALE
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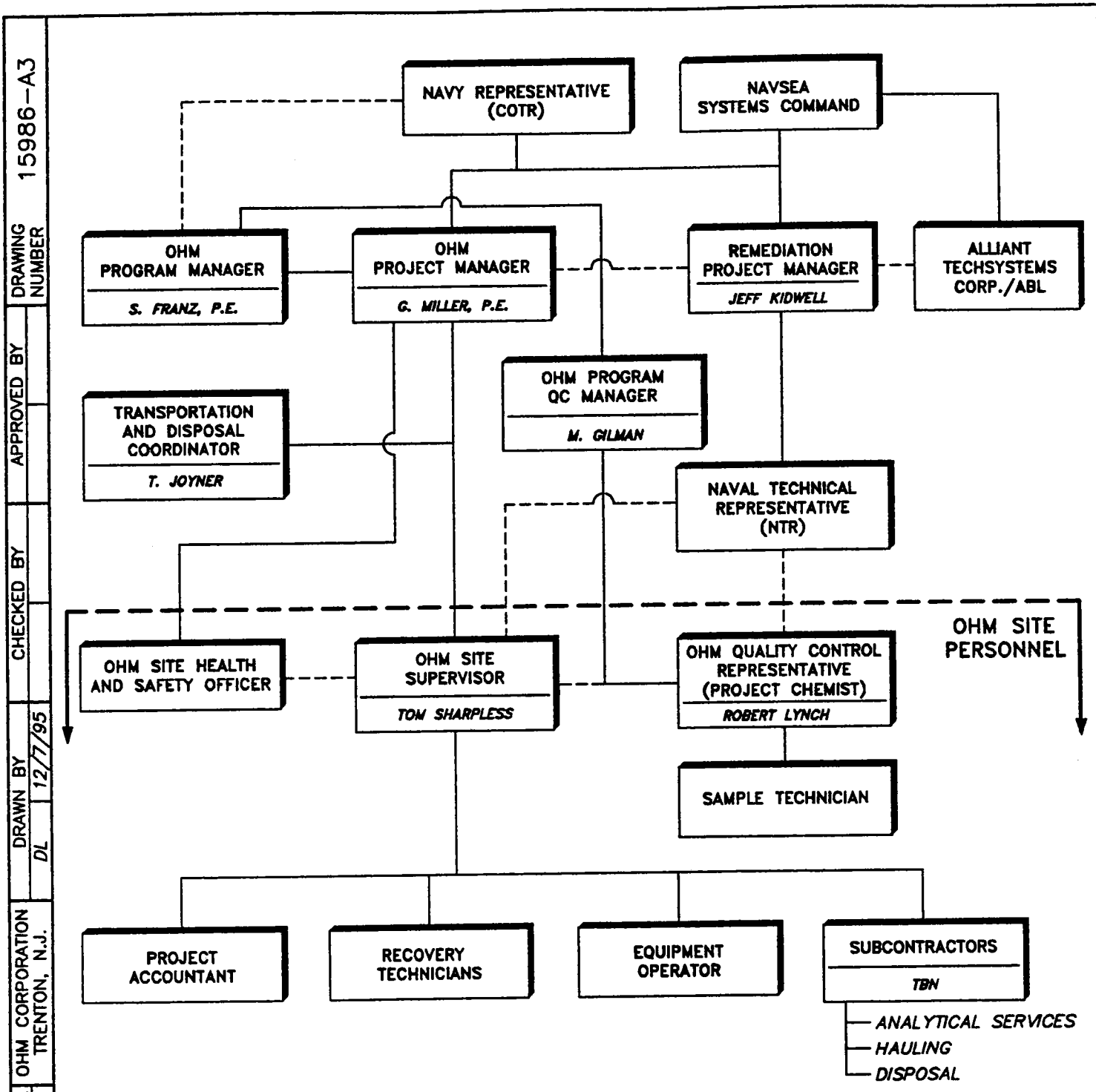
OHM Corporation



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OHM CORPORATION TRENTON, N.J.
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FIGURE 2

PROJECT ORGANIZATION CHART

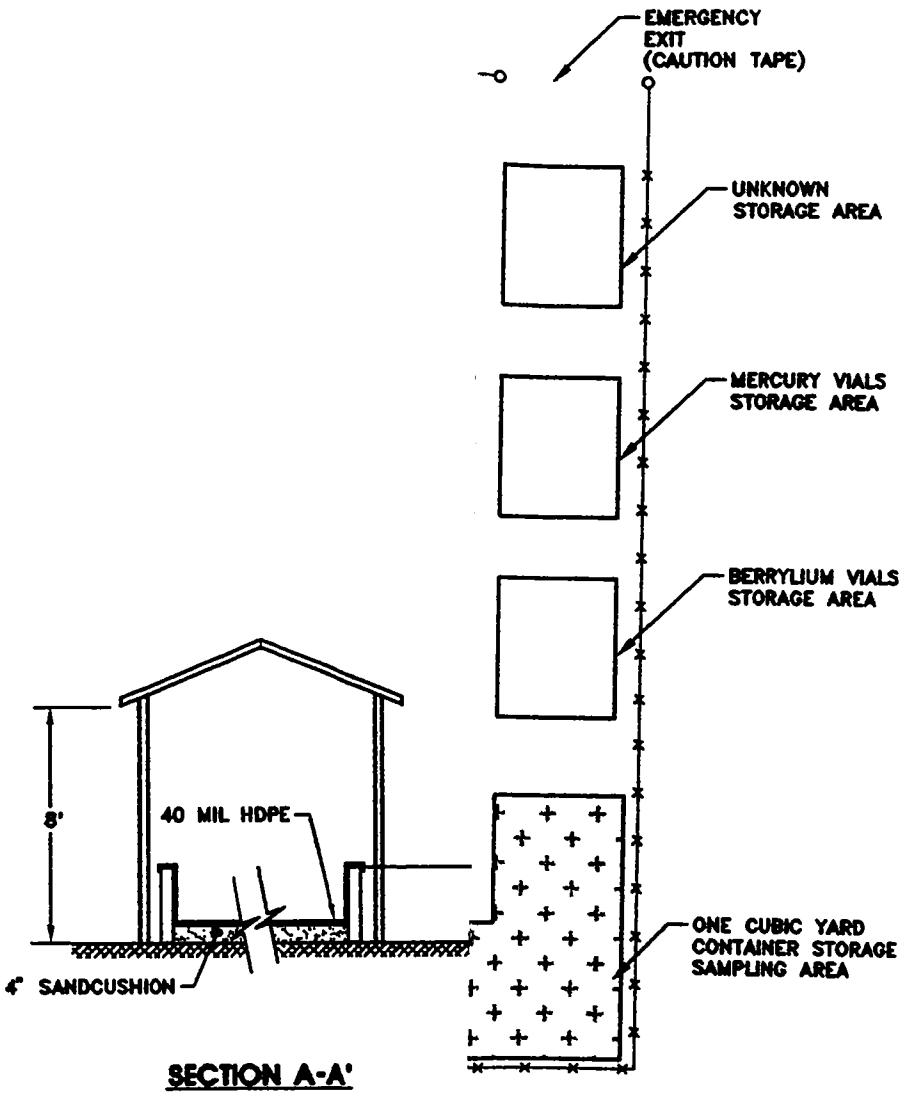
SOIL SEGREGATION AND ANALYSIS
ALLEGANY BALLISTICS LABORATORY, WEST VIRGINIA

PREPARED FOR

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

OHM Corporation

CBD File: 15986-B3

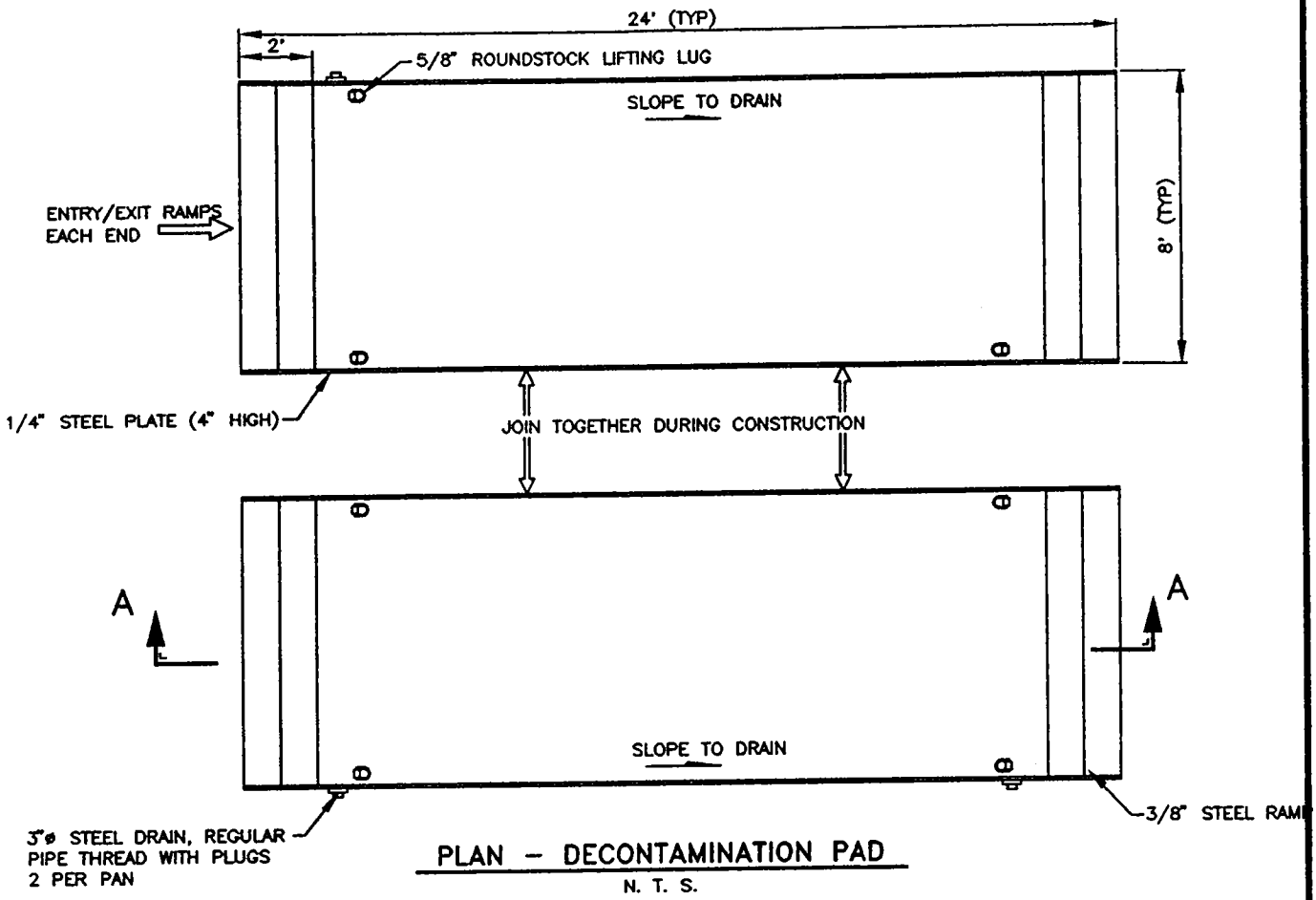


SECTION A-A'

Plot Scale: 1 = 20' 1/25/96

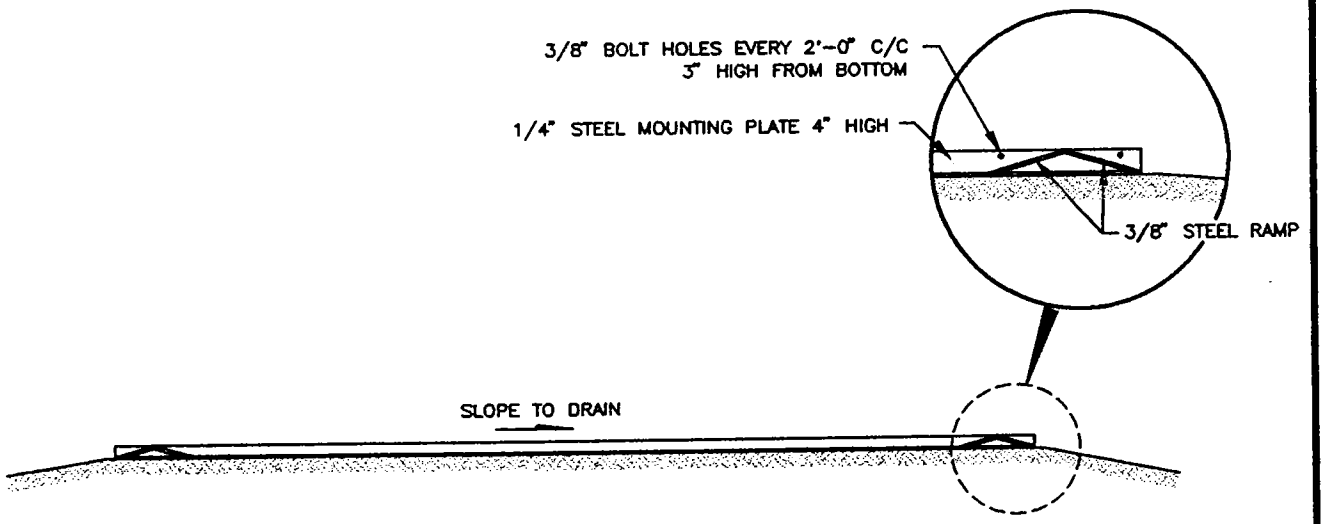
General Notes and Legend

FIGURE 3
SITE PLAN
SOIL SEGREGATION AND ANALYSIS
ALLEGANY BALLISTICS LABORATORY, WEST VIRGINIA
PREPARED FOR
DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA



PLAN – DECONTAMINATION PAD

N. T. S.



SECTION A–A

N. T. S.

CAD File: 15986-A13

Plot Scale: 1 = 1 revision 2

OHM Remediation Services Corp.

OHM Project No. 15986

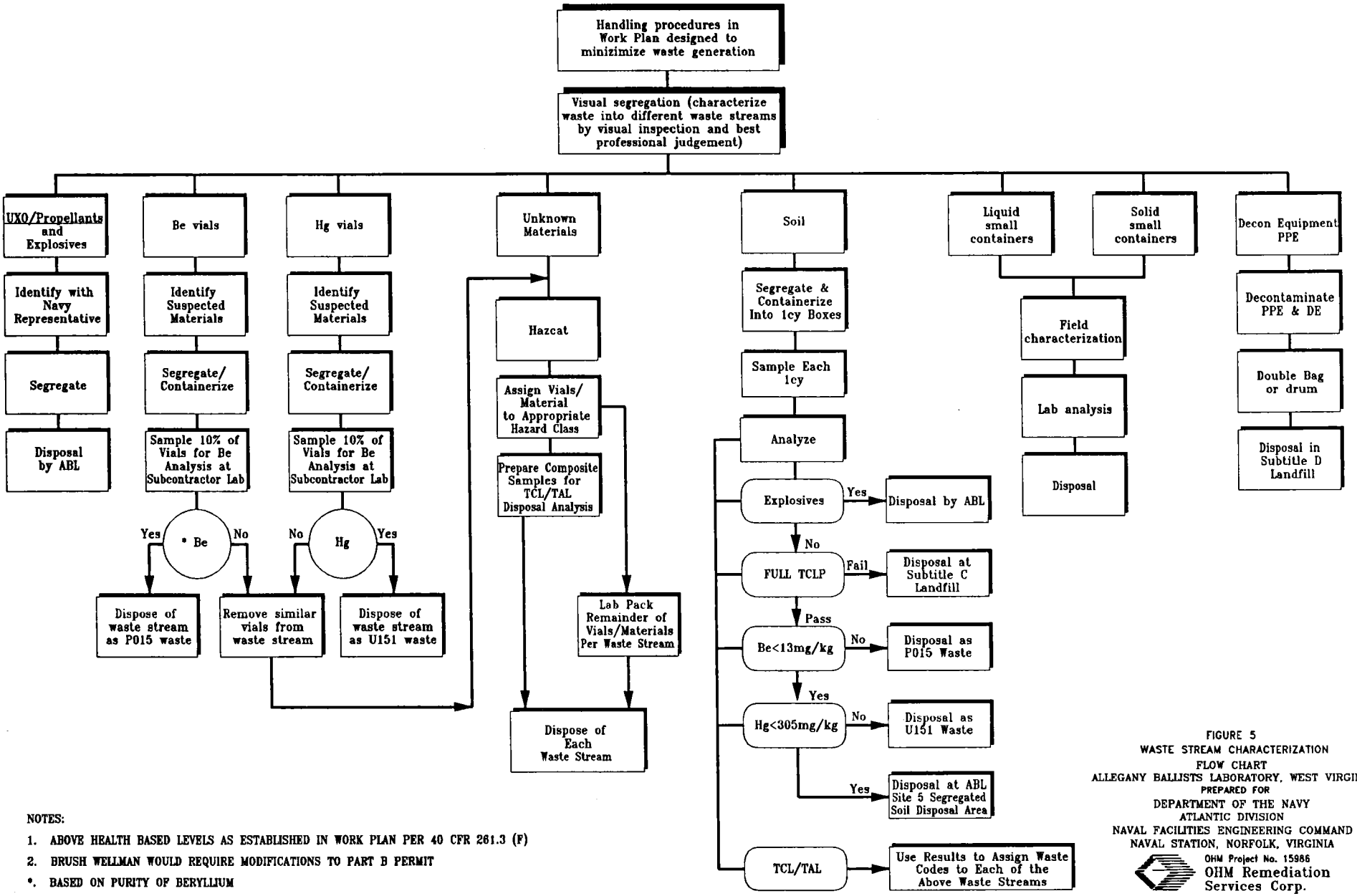
Drawn By:	Checked By:	Approved By:
D. Leech	E. Cintra	E. Cintra
Date:	Scale:	Drawing No.
11/30/95	NONE	15986-A13

FIGURE 4
PORTABLE DECON PAD
PLAN, SECTIONS AND DETAILS

SOIL SEGREGATION AND ANALYSIS
ALLEGANY BALLISTICS LABORATORY, WEST VIRGINIA

PREPARED FOR

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA



NOTES:

1. ABOVE HEALTH BASED LEVELS AS ESTABLISHED IN WORK PLAN PER 40 CFR 261.3 (F)
2. BRUSH WELLMAN WOULD REQUIRE MODIFICATIONS TO PART B PERMIT
*. BASED ON PURITY OF BERYLLIUM

FIGURE 5
WASTE STREAM CHARACTERIZATION
FLOW CHART
ALLEGANY BALLISTS LABORATORY, WEST VIRGINIA
PREPARED FOR
DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

OHM Project No. 15986
OHM Remediation Services Corp.

15986-B1 CAS 2/1/96

Plot Scale: 1 = 1 CAS 1/25/96

CAD File: 15986A11

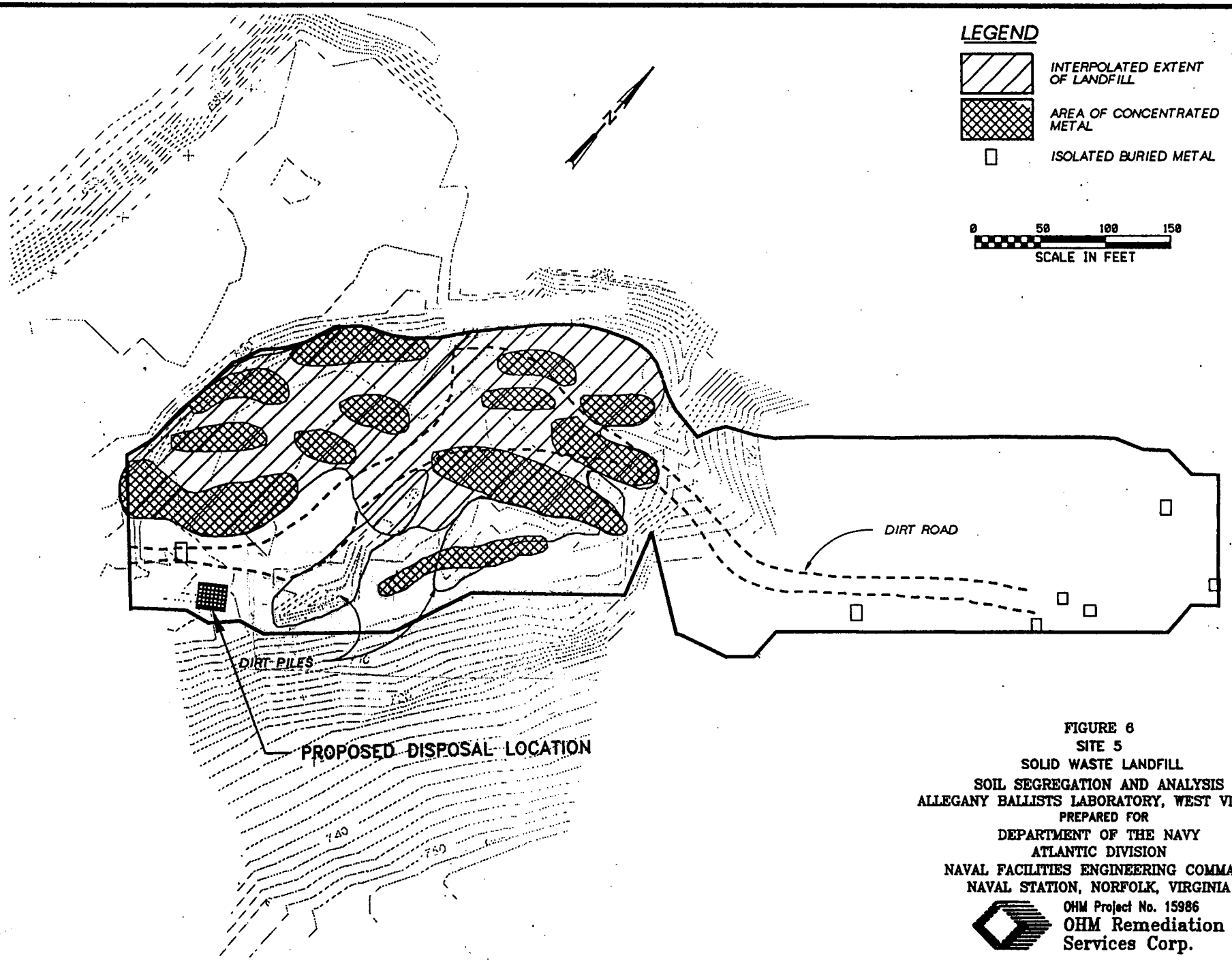


FIGURE 6
SITE 5
SOLID WASTE LANDFILL
SOIL SEGREGATION AND ANALYSIS
ALLEGANY BALLISTS LABORATORY, WEST VIRGINIA
PREPARED FOR
DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

OHM Project No. 15986
OHM Remediation Services Corp.

Plot Scale: 1 = 1 CAS 1/25/96

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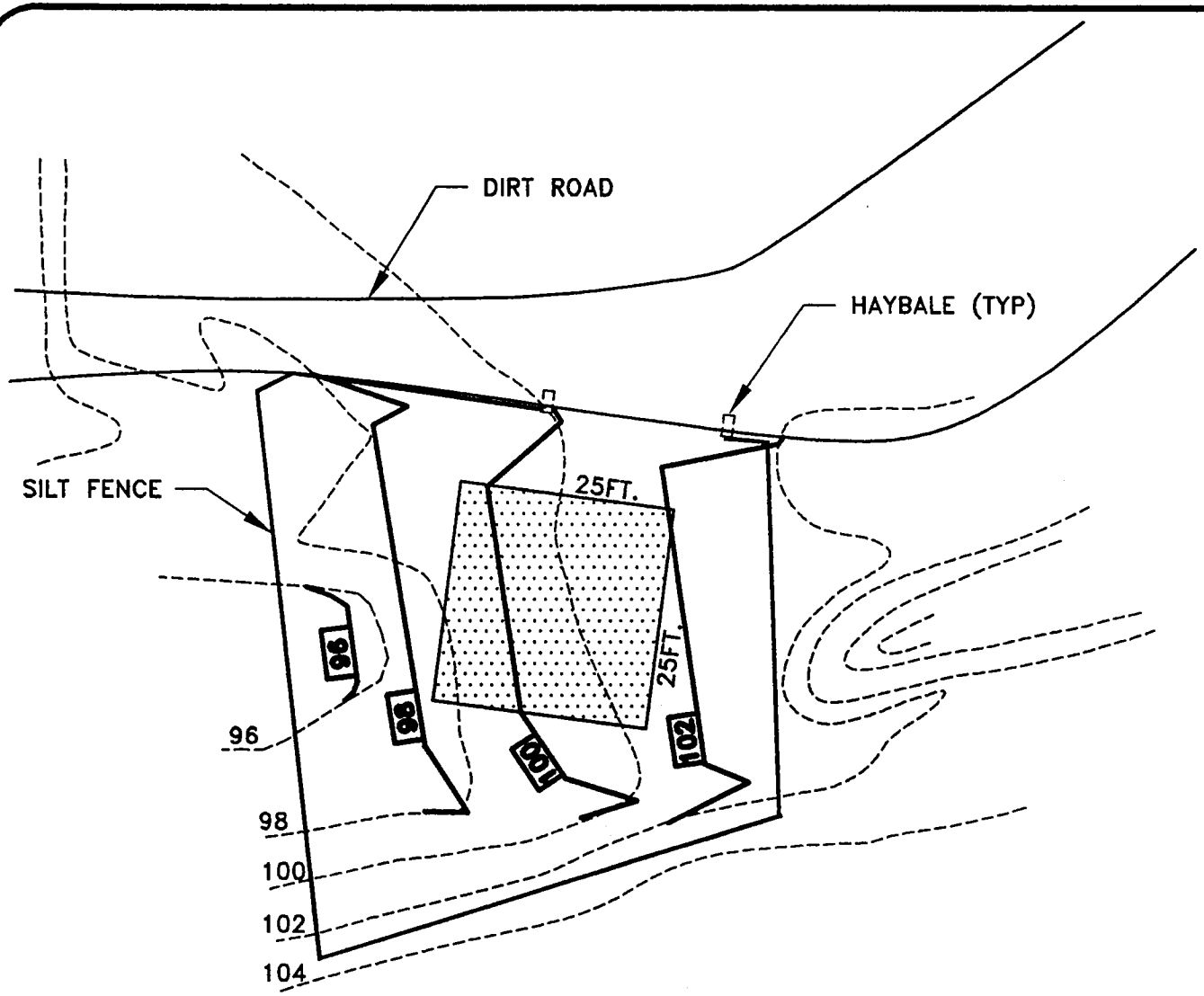
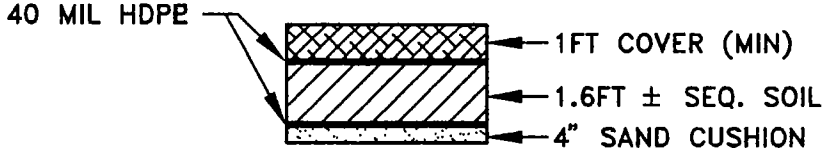
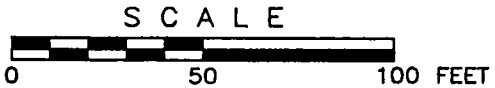




TYPICAL CROSS SECTION
DISPOSAL AREA
SCALE 1"=5'



LEGEND:

PROPOSED DISPOSAL AREA

NOTE:

FINAL GRADING CONTOURS DELINEATE APPROXIMATE AREA TO BE SEEDED.

FIGURE 7
SITE PLAN
SEGREGATION SOIL DISPOSAL AREA
PREPARED FOR
ALLEGANY BALLISTS LABORATORY
ALLEGANY, WV

OHM Proposal No. 15986
OHM Remediation Services Corp.

APPENDIX A
SAMPLING AND ANALYSIS PLAN

DRAFT
FINAL

SAMPLING AND ANALYSIS PLAN
FOR
SOIL SEGREGATION AND ANALYSIS
ALLEGANY BALLISTICS LABORATORY
ROCKET CENTER, WEST VIRGINIA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032
Delivery Order 0007

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OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

February 5, 1996
OHM Project 15986SAP

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1.0 INTRODUCTION

OHM Remediation Services Corporation, Inc. (OHM) is pleased to submit this Sampling and Analysis Plan (SAP) to the U.S. Department of the Navy, Atlantic Division Naval Facilities Engineering Command; as per LANTDIV Construction Contract No. N62470-93-D-3032, Delivery Order No. 007.

1.1 PROJECT HISTORY

Soil samples, collected and analyzed by other contractors, were obtained at a 0-3 feet and 3-6 feet depth and show beryllium at concentrations up to 2.3 mg/kg, and mercury at 28 mg/kg, for sample TP-1-2. EP toxicity (equivalent to TCLP) results show leachable mercury at 1.8 mg/kg, 0.26 mg/kg, and 0.22 mg/kg, for TP-1-2, TP-2-1, and TP-3-1. These levels are all hazardous for mercury (regulatory threshold of 0.20 mg/kg).

OHM, in accordance with the original scope of this delivery order, excavated approximately 36 cubic yards (CY) of material from the delineated area at Site 7, the Beryllium Landfill, in June of 1994. The soil material was placed into three roll-offs. Vials of beryllium compounds, mercury compounds, and other unknown materials, were observed in the soil material. In October, 1994, one roll-off, with non-hazardous material was disposed of at a municipal landfill. Materials in the remaining two roll-offs include small vials of beryllium dust (hazardous waste code P015), small vials of mercury (hazardous waste code U151), and other unidentified containers. Additionally, a small piece of potentially explosive material, composed of approximately 40% nitroglycerin, was extracted from the excavated material.

OHM performed post-excavation and disposal sampling at Site 7 on June 23, 1994. Post-excavation samples were obtained from the north wall (N-001), east wall (E-002), south wall (S-003), west wall (W-004), and the base (B-005), of the excavation. The post-excavation samples were analyzed for Target Compound List (TCL) - organics and Target Analyte List (TAL) - inorganics, by Analytical Services Corporation (ASC), a subsidiary of OHM.

The analytical results (in mg/kg), for beryllium and mercury, are as listed:

	Sample No.				
Analysis	N-001	E-002	S-003	W-004	B-005
Beryllium	1.4	1.19	1.06	0.962	6.26
Mercury	0.288	0.163	0.363	0.068	35.2

Disposal samples of two roll-offs of excavated soil (DA-001 and DA-002) and site wastewater (WW-001) were analyzed for RCRA characterization, to include Toxity Characterictic Leaching Parameter (TCLP-full). The analytical results showed that the excavated soils and the wastewater are non-hazardous.

The analytical results for TCLP-mercury were 0.425 ug/L, 19.3 ug/L, and 1.61 ug/L, for samples DA-001, DA-002, and Q-001 (duplicate to DA-001), respectively. The excavated soil is non-hazardous for mercury.

Sample DA-002 was analyzed for beryllium (as, total); the result was 33 mg/kg. This sample was obtained in a "hot spot" area of broken containers/spilled contents; thus the sample is not representative of the soil matrix.

1.2 SITE CHARACTERIZATION

The characterization of the roll-off materials will include the removal of the containers from the soil. The containers will be screened in order to segregate beryllium and mercury compounds into separate wastestreams. The material in the other (unknown) containers will be hazcatted, in order to identify the appropriate hazard class for each material.

A representative composite sample will be generated for each hazard class. The analytical results will be used for the classification of all waste, by the OHM T&D Coordinator. All beryllium, mercury, and all other materials will be disposed of properly, as per Federal, State, and local regulations.

All of the soil will be subdivided into approximately 36 one cubic yard (1 cy) portions. Stained soil will include soil contaminated from the containerized materials. Any stained soil will be segregated from non-stained soil. Stained soil will be hazcatted as unknown material, as deemed necessary by OHM.

The OHM procedures for the characterization of the roll-off materials are discussed in Section 2 of this SAP. Figure 5 of the Work Plan summarizes these procedures in a flow chart.

2.0 SAMPLING AND ANALYSIS ACTIVITIES

The primary sampling and analysis tasks for characterization of the excavated soil and associated materials will involve:

- Mobilization of OHM sample technicians and field chemist to the site.
- Removal of all vials, containers, and explosive materials from the 2 on-site roll-offs.
- Staging and segregation of all vials, containers, and explosives.
- Inventory and identification of all known materials contained in the vials and other containers.
- Field testing of all unknown materials for hazardous categorization.
- Assignment of each material to wastestreams.
- Preparation of a bulk composite sample for disposal analysis of each wastestream.
- Soil will be sampled for beryllium, mercury, explosives, TCL-organics/TAL-inorganics, and full TCLP.
- Soil analysis will be performed by the OHM sub-contract laboratory.

A flow chart of the waste characterization procedures is illustrated in Figure 5 of the Work Plan.

2.1 MATERIAL REMOVAL

The removal of all explosives, containers, vials, and excavated soil from the roll-offs is discussed in Section 5.0 of the OHM Work Plan (WP).

2.2 STAGING OF MATERIALS

Materials to be encountered will include explosives, vials, and containers. These materials will be transferred to the designated staging area.

Explosive materials will be handled in conjunction with a representative of the U.S. Department of the Navy. Explosive materials will be disposed of at a U.S. Department of the Navy facility.

All vials, and other containers will be treated as unknown materials, unless attached labels indicate otherwise. Each vial or container will be assigned a 4-digit sample number. The sample number will be written on the outside of each container (which for the remaining text, will include all vials).

2.3 SEGREGATION OF MATERIALS

All known materials, as identified by an attached label, will be assigned an appropriate wastestream. Commonly encountered wastestreams are discussed in Section 2.5 of this Sampling and Analysis Plan (SAP). All containers will be segregated into the appropriate wastestreams.

Unknown materials will require field testing for initial characterization of each sample by its hazardous properties. Hazardous categorization ("hazcatting") is described in Section 8.3 of this SAP.

2.4 EXCAVATED SOIL

The soil to be removed from the roll-offs will be stored in 1 cy lined wood containers. The stockpiled soil will be sampled by the procedures given in Section 5.3 of this SAP. The soil will be analyzed for beryllium, mercury, explosives, TCL-organics/TAL-inorganics, and full TCLP.

2.5 FIELD CHARACTERIZATION

Field characterization will be based on best professional judgement and observation of physical characteristics as indicated below.

2.5.1 Beryllium

Vials which are believed to contain beryllium will be segregated into two groups. The segregation will be based on the confidence level of the vials containing a high purity of beryllium. Descriptions of possible beryllium compounds to be encountered are listed below:

	Description
Beryllium, elemental	Greyish-white brittle metal (dust)

Beryllium Compounds	Description
Beryllium acetate	White crystals
Beryllium carbide	White crystals
Beryllium chloride	White or pale yellow crystals
Beryllium fluoride	Hygroscopic solid
Beryllium hydroxide	White powder
Beryllium metaphosphate	White porous or granular solid
Beryllium nitrate	White to pale yellow, hygroscopic
Beryllium oxide	White powder
Beryllium potassium fluoride	White crystal
Beryllium potassium sulfate	Shiny crystals
Beryllium sodium fluoride	White crystals
Beryllium sulfate	Colorless crystals

Ten percent of these samples will be submitted for analysis of beryllium (total). The results of beryllium analysis will be used to:

1. Quantitate the beryllium level of each sample submitted
2. Obtain an estimate of the total of beryllium-contaminated containers
3. Obtain a physical description of each beryllium compound
4. Aid in the completion of waste manifests for disposal
5. Provide the disposal facility with information to access treatment options

Samples of vials which were not tested can be further segregated by matching the physical description of those samples which tested positive for beryllium. Samples which showed 0% (no) beryllium, can be visually compared with like vials initially assigned to the beryllium wastestream. These vials will be considered unknown materials (Section 2.53).

Beryllium dust will be disposed as P015 waste. Final acceptance by the disposal facility will be based on the purity level of beryllium.

2.5.2 Mercury Compounds

The color of mercury compounds varies for each compound. The characteristic of mercury compounds are a much higher density (weight per unit volume). Thus, density will also be used in order to characterize mercury compounds. Vials which are believed to contain mercury will be segregated based on physical observation of color and density as listed below:

Compound	Density	Color
Elemental	13.6	Grey liquid
Mercuric acetate	3.25	White powder
Mercuric bromide	6.11	White crystal
Mercuric chloride	5.44	White crystal or powder
Mercuric cuprous iodide	6.12	Dark red powder
Mercuric cyanide	4.02	Colorless prism
Mercuric fluoride	8.95	Transparent crystal
Mercuric iodide	6.28	Red crystals
Mercuric oxide, red	11.0-11.3	Orange-red powder
Mercuric oxide, yellow	11.0	Yellow-orange powder
Mercuric-potassium iodide	4.29	Yellow crystals
Mercuric sulfate	6.47	White powder
Mercuric sulfide, black	7.6	Black powder
Mercuric sulfide, red	8.1	Red powder

In contrast, most beryllium compounds have an approximate density of 2.0.

Ten percent of these samples will be submitted for analysis of mercury (total). The results of mercury analysis will be used to:

1. Quantitate the mercury level of each sample submitted
2. Obtain an estimate of the total of mercury-contaminated containers
3. Obtain a physical description of each mercury compound
4. Aid in the completion of waste manifests for disposal
5. Provide the disposal facility with information to access treatment options

Samples of vials which were not tested can be further segregated by matching the physical description of those samples which tested positive for mercury. Samples which showed 0% (no) mercury, can be visually compared with like vials initially assigned to the mercury wastestream. These vials will be considered unknown materials (Section 2.53).

2.5.3 Other Unknown Materials

All miscellaneous laboratory debris and non-beryllium and non-mercury containers will be tested for compatibility parameters. This involves hazardous categorization, "hazcatting" on all unknown samples. Hazcatting involves bench-scale tests which are used to identify the hazard properties of an unknown sample. Hazcatting will classify the unknown sample in one of the following classes:

- Inorganic
- Organic
- Flammable organic
- Chlorinated organic
- Corrosive- acid
- Corrosive- base
- Oxidizer
- Peroxide
- Sulfide
- Cyanide.

Liquid and solid wastestreams are developed separately for each hazard class.

2.5.4 Explosive Compounds

OHM anticipates that explosive compounds may be encountered within the roll-offs. Explosive compounds include those chemicals which react and generate a large temperature increase and gas evolution over a short time period.

Explosive compounds will be identified by:

- Label information, which may include:
  - An "explosive" designation
  - A chemical name which is readily identifiable as an explosive compound
  - A "Class 1" DOT designation
- Visual observation of physical characteristics:
  - Solids on the outside of the container, generally around the cap, are indicative of "peroxide - forming" compounds.

All explosive and suspected explosive compounds will be segregated from the other materials. The LANTDIV contracting officer will be notified immediately of all explosive materials encountered.

OHM will not sample any explosive or suspected - explosive materials.

2.5.5 Labpacking

Upon completion of all hazcat testing, each sample will be labpacked into approved 5-gallon buckets. The samples will be packed by waste stream, that is, samples from the same waste stream will be lab packed into the same bucket.

Each labpack will be prepared by placing the compatible containers on a layer of vermiculite, or other absorbent solid. The labpack will consist of alternate rows of vermiculite and containers, until full. An inventory of the containers will be maintained for each labpack.

Sampling of labpack materials is discussed in Section 8.0 of this SAP.

The OHM Transportation and Disposal(T&D) Coordinator will procure the disposal facility for each labpack. The T&D Coordinator will secure the proper approvals, complete all manifests and other required paperwork.

3.0 DATA QUALITY OBJECTIVES

The data quality objectives which pertain to this sampling and analysis program are:

- The collection of a representative sample from the excavated soil, in order to assure that the soil is not hazardous, based upon Toxicity Characteristic Leaching Parameter (TCLP) criteria. Previous TCLP results (for the June 24, 1994 samples) show the soil to be non-hazardous.
- The collection of representative sample from the excavated soil, in order to classify the soil for beryllium and mercury (as totals).
- The removal of all vials containing mercury and beryllium and other containers, from the excavated soil.
- The segregation of mercury and beryllium contaminated soil from non-contaminated soil.
- The proper disposal of all vials, containers, and soil, based upon the analytical results , to include TAL/TCL.

3.1 SAMPLING STRATEGY

After segregation, OHM will transfer the soil into approximately thirty-six (36) 1 cy containers. Soil samples will be obtained from each of the containers.

3.1.1 Sample Quantity

One composite sample will be generated for each 1 CY container. Each composite sample will be analyzed for beryllium and mercury, (as totals). A total of 36 composite samples are anticipated for this project.

OHM proposes to further composite every four of these samples for TCLP analysis. Thus, representative portions of samples 1-4, 5-8, ... 33-36 will be combined into nine composite samples for TCLP (full) analysis.

3.1.2 Characterization of Excavated Soil

Upon analysis of the approximate 36 soil samples, for beryllium and mercury, the results for each 1 CY of soil will be compared to the site criteria of 13 mg/kg and 305 mg/kg, respectively, as indicated in Appendix A to this SAP.

The soil has already been shown to be non-hazardous, on the basis of the TCLP results for the June 24, 1994 sample. This result will be confirmed upon analysis of the 9 composite samples. Each composite sample will represent a smaller fraction of the total soil volume. Any "hot spots" of hazardous soil are more likely to be detected upon analysis of the 9 composite samples.

3.2 REPRESENTATIVENESS OF COMPOSITE SAMPLES

3.2.1 Composite Sample Development

As discussed in Section 3.1, a representative soil sample will be obtained from each 1 CY container upon obtaining four grab samples from each container. The location of each grab sample will be obtained at different locations within each container. One grab sample will be obtained from the top one foot, two grab samples from the middle one foot, and one grab from the bottom one foot of soil in each 1 CY container.

The four grab samples, after homogenization, will be combined into one composite sample for analysis. The analytical results obtained for the composite sample will represent the entire 1 CY container.

3.2.2 Precision

The precision of the analytical results is, in part, determined by the quantity of grab samples which were obtained per composite. This can be expressed in terms of the confidence interval of the analytical result.

The confidence interval (CI) is given by the following formula:

$$CI = \bar{x} \pm t.20\bar{Sx}$$

where:

$\bar{x}$ = the mean of the analytical results
t.20 = 2-tailed student "t" value for appropriate number of degrees of freedom
$\bar{Sx}$ = the standard error, $s/\sqrt{n}$

The values of t.20 are determined from Table 9-2 in "Test Methods for Evaluating Solid Waste"/EPA SW - 846. These values are for data which is represented within an 80% confidence level.

The regulatory threshold (RT = 13 mg/kg for beryllium, 305 mg/kg for mercury) will be greater than the upper limit of the CI. For the RT equal to the upper CI, there exists a 10% chance that the analytical results are equal to, or in excess of, the RT.

3.2.2.1 Relation Of The Number Of Samples To The CI

The size of the CI is reduced upon increasing the number of grab samples which are represented into each composite sample. As the number of degrees of freedom increases with an increase in the number of samples, n, used to characterize each composite, the t.20 value decreases, as does the relation of the standard error, $\bar{Sx}$, to the sample standard deviations. The relative magnitude of the CI for various sample sizes is tabulated:

N	$\bar{Sx} = s/\sqrt{n}$	t.20	$\bar{Sx}$ x t.20
1	s	3.078	3.078s
2	0.707s	1.886	1.333s
3	0.577s	1.638	0.945s
4	0.500s	1.533	0.767s
6	0.409s	1.440	0.589s
8	0.354s	1.397	0.495s
10	0.316s	1.372	0.434s

Thus, the size of the CI decreases with an increase in the number of samples. However, the rate of decrease in the CI, as compared to the rate of increase in the number of samples (n), does not justify a value of greater than 4.

Thus, four grab samples will be obtained for each 1 CY container.

3.2.2.2 Field QC

Precision of a sampling event is often evaluated on the basis of duplicate samples. Duplicate soil samples are obtained by splitting the composite sample between two sample containers, after thorough homogenization. This is best done by adding the soil in increments, when a portion of each soil increment is added to both containers. This minimizes differences in the soil material. Due to the heterogenous nature of soil material, significant variation is often found among soil samples.

The analytical results for the parameters of interest, for the duplicate samples, are compared to each other. These results are commonly expressed as a relative percentage difference (RPD). The magnitude of the RPD for each analyte is compared to existing QA/QC criteria; often 30% is used an acceptable RPD.

Duplicate samples are obtained at a 10% frequency, for NEESA Level C and D QA/QC requirements.

3.2.3 Accuracy

As the number of grab samples increases, and a more representative and precise sample is obtained, it can be assumed that a more accurate sample is also obtained. That is, the analytical results closely approximate the actual, true value for the excavated soil.

3.2.3.1 Field QC

The accuracy of sampling and analysis is commonly accessed by the use of matrix spike (MS) samples. A known quality of analyte is added to the sample. The "spiked" sample then analyzed for the analyte of concern. The analytical result is expressed as a percentage recovery:

$$\% \text{ recovery} = (\text{sample} + \text{MS}) - (\text{sample})/(\text{MS})$$

The % recoveries for each analyte are compared to acceptable ranges for each analyte.

The laboratory performs MS analysis at a frequency of 5% . That is, one sample per batch twenty is spiked, and a recovery is determined. The MS recovery results are used to represent all of the samples in that batch.

3.2.4 Variability

It is anticipated that there will exist some variation in the results among all soil samples. Some results may be at values less than the RT, as others may in at values greater that the RT.

It is expected in a heterogenous soil matrix to observe variation on the analytical results. But, by obtaining samples from 1 CY increments, the analytical results will be representative of each 1 CY of soil. Thus, some soil may be deemed hazardous, and other soil may be deemed non-hazardous.

Any statistical variation in the analytical results for each 1 CY soil sample has no applicability to the project objectives. The average concentrations, or standard deviations about the averages, for beryllium and mercury, for the 36 CY intervals of soil, is of no significance to this project.

3.3 TASK-RELATED QA/QC CRITERIA

The data quality levels for the project are described by NEESA Level C QA/QC criteria, which provides an intermediate level of data quality and is used for site characterization engineering analyses. It includes mobile laboratory generated data and some analytical laboratory methods for field screening characterization with a rapid turnaround time, and minimal QA/QC requirements.

NEESA Level C is appropriate for all fields hazcatting and waste blending of unknown materials.

The sampling and analysis activities which relate to disposal do not require any special QA/QC considerations. The QA objectives listed above will be attained by:

- Accurate documentation of all materials encountered
- Completion of hazcat testing for all unknown samples, with re-checks of approximately 5% of the field tests.
- Review of all hazcat results prior to test bulking.
- Laboratory adherence to standard QA/QC procedures.

Disposal analysis of the composite wastestream samples by the laboratory will be performed with typical laboratory batch QA/QC procedures, in place. Batch QA/QC includes the use of duplicate and MS/MSD samples. The results of disposal analysis will be submitted with the batch QC results attached with the hard copy results 28 days after sample shipment.

Laboratory QA/QC is discussed in greater detail in Section 10.0 of this SAP.

4.0 PROJECT ORGANIZATION

4.1 OHM FIELD ANALYTICAL SERVICES

OHM provides sampling services through the Eastern Region Field Analytical Services (FAS) Group. The FAS group consists of five sample technicians, three field chemists, three project chemists, and a senior project chemist. These individuals are capable of providing a quality sampling effort, from the initial site characterization, through the sampling event.

Sample Technician

An OHM sample technician or field chemist will perform all site sampling activities. OHM sample technicians are trained in the accurate and complete documentation of the sampling event, and are familiar with all sampling procedures for various matrices.

OHM has two sample technicians and three field chemists who are based out of the Trenton, New Jersey Regional office; they will be utilized, if available. Otherwise, a sample technician or a field chemist will be mobilized from the Glen Allen, Virginia or the Hopkinton, Massachusetts Divisional office.

Project Chemist

Bob Lynch will be the project chemist for this project. As project chemist, he will be able to provide support for the sample technician from the Trenton office. This may be in the form of technical assistance, or for the procurement of sampling materials required.

The sample technician consults with the project chemist, as needed, for assistance with sampling protocols. The project chemist serves as the liaison between the project manager, the sample technician, and the laboratory.

Senior Project Chemist

Ron Kenyon is the senior project chemist and the QC manager of the FAS group. He is routinely in communication, often on a daily basis, with the on-site sample technician and project chemist.

4.2 PROJECT MANAGEMENT

Site Supervisor

All on-site activities are coordinated by the OHM site supervisor. The sample technician will coordinate and communicate all sampling efforts with the site supervisor.

Project Manager

The OHM Project Manager will serve to coordinate all project related decisions. The project chemist acts as a liaison between the laboratory and the project manager. The project manager will be consulted immediately if any sampling and analysis problems occur, and the corrective action taken.

QC Officer

The project chemist or senior project chemist will act as the QC officer. Responsibilities include:

- Review of all sampling documentation, to include chain-of-custody forms.
- Communication with laboratory to assure proper laboratory procedures and QC protocols are adhered to.

5.0 SAMPLING PROCEDURES

Sampling of all containers for this project involve transfer of unknown samples to test tubes for hazcatting, soil sampling, and labpack sampling.

5.1 LIQUID SAMPLES

Liquids will be sampled with a disposable polypropylene transfer pipette. Each pipette will be used for only one sample; the pipette will be discarded after each use.

5.2 SOLID SAMPLES

Solids will be sampled with a wooden tongue depressors. Solid material will be transferred to each test tube for hazcat testing.

5.3 CONTAINERIZED SOIL SAMPLING

5.3.1 Sampling Procedure

Each sample will consist of, at minimum, four grab samples, from each container. The grab samples will be obtained with the use of a stainless steel trowel or a disposable polypropylene scoop. Soil samples will be obtained from points at the top (0-1 ft.), middle (1-2 ft.), and bottom (2-3 ft.) of each container.

The soil will be transferred to a stainless steel bowl. All rocks, stones, twigs, vegetation, and all non-soil debris, will be manually removed from the soil and returned to the container. The soil is then thoroughly mixed, so that the soil is homogenous. The soil is then "quartered" and transferred to an "EPA-clean" 1-Liter glass containers.

For TCL-organics/VOC analysis a separate grab sample will be collected from the approximate center of each box and directly placed in a 4 oz. glass container. The container will be completely filled, to allow for no head space.

The containers will be supplied by the laboratory, prior to the sampling event.

5.4 STAINED SOIL

All soil which is stained from spilled contents from the vials/containers within the roll-offs, will be segregated from the non-stained soil. This material will be analyzed in the same manner as the non-stained soil discussed above.

6.0 *DOCUMENT QA/QC, SAMPLE MANAGEMENT, AND FIELD QC PROCEDURES*

Sample integrity is a key element in any project. Sample integrity strengthens the validity of the analytical data, and can be used for legal documentation if needed. Sample integrity is maintained by OHM through proper sample collection, documentation, and sampling equipment maintenance.

6.1 SAMPLE LABELS

Correct sample labeling and the corresponding notation of the sample ID numbers in the field logbook are necessary to prevent misidentification of samples and their eventual results. All sample labels will be filled out legibly and with indelible ink. They will be affixed to the sample container and covered with clear tape. The following presents an example of a sample label.

LABEL SAMPLE	
PROJECT NO.: 15986	DATE:
SAMPLE:	
TAKEN BY:	TIME:
WITNESS:	

The following information is recorded on the label using indelible ink:

- Project number — 15986
- Date — month, day, and year
- Time — Military hours (e.g., 1000, 1400, 2320) for Eastern Standard Time
- Samples — Description of sample
- Analyte — Analysis which will be performed, if more than one analysis is being done on samples from that project
- Preservative — If used
- Taken By — Initials of person taking sample
- Witness — Initials of person witnessing or assisting in taking sample
- Sample Number — Assigned from laboratory log book. Write number in blank corners of label. Sample numbers will be assigned numerically starting with 001. The OHM project number (15986) will be used as prefix

  Example: 15986-001

- Number of Jars — When more than one jar is used for one sample.

Every sample collected will be labeled in the above manner. Information will be printed neatly, except for initials which can be written. After the sample is collected and the label is securely attached, the sample is logged into the sample log book with the sample number written on the sample label.

6.2 SAMPLE CUSTODY AND HANDLING

An important consideration for the collection of environmental data is the ability to demonstrate that analytical samples have been obtained from predetermined locations and that they have reached the laboratory without alteration. Evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal must be documented to accomplish this. Documentation is accomplished through an Analysis Request and Chain-of-Custody Record that records each sample and the individuals responsible for sample collection, shipment, and receipt. A sample is considered in custody if it is:

- In a person's actual possession
- In view after being in physical possession
- Sealed so that no one can tamper with it after having been in physical custody
- In a secured area, restricted to authorized personnel

Overall, chain-of-custody documentation will begin when laboratory personnel record bottle lot numbers during the transfer of bottles to field personnel. Field personnel will then maintain custody of the bottles until sample collection, at which time they will record in their field notes the lot numbers of all bottles used for each sample. A copy of the lot number information will accompany the samples to the laboratory and will be included in the data packages.

Sample custody will be initiated by field personnel upon collection of samples. Labels and log information will be checked to verify that identification is correct. Samples will be packaged to prevent breakage or leakage during transport. Chain-of-custody information will be supplied with the samples and shipped by commercial carriers. The standard OHM Chain-of-Custody is presented in Appendix B.

6.3 FIELD DOCUMENTATION

Several types of documentation will be prepared in the field by the project chemist in order to record the sampling activities and observations.

6.3.1 Field Notebooks

Field notes regarding all sampling and field activities will be kept in a bound notebook with pre-numbered pages. Indelible ink will be used for all entries. It will include among other things:

- Field parameter observations
- Locations of sampling points and corresponding sample numbers
- Documentation of individual samples comprising the composite samples
- Descriptions of deviations from sampling plan
- Signatures of personnel responsible for observations.

6.4 FIELD MANAGEMENT AND SHIPMENT

Upon collection in the field, samples will be properly labeled as discussed and stored in a cool place away from sunlight. Field sample technicians will tighten all container lids, place each sample container in a sealed polyethylene bag, and store the samples in insulated containers, which will be used to transport

samples to the laboratory. The containers, preservative, and holding times for this project are presented in Table 6.1. Sufficient incombustible, absorbent, cushioning material will be packed in the shipping container to minimize the possibility of sample container breakage. The insulated containers will be secured using nylon strapping tape and custody seals to ensure that samples have not been disturbed during transport. Samples for chemical analysis will be promptly shipped to the laboratory so that they arrive within 24 hours of collection. Transportation of samples must be accomplished not only in a manner designed to protect the integrity of the sample, but also to prevent any detrimental effects from the potentially hazardous nature of the samples.

Regulations for packaging, marking, labeling, and shipping of hazardous materials, substances and wastes are promulgated by the U.S. Department of Transportation (DOT) and described in the 49 CFR 171 through 177. In general, these regulations were not intended to cover the shipment of environmental samples collected at hazardous waste sites. Environmental samples usually contain low concentrations of hazardous substances when compared with most of the concentrated materials regulated by the DOT. However, the U.S. EPA has deemed it prudent to package, mark, label, and ship samples observing these DOT procedures, as appropriate.

6.5 FIELD SAMPLING QUALITY CONTROL

Adherence to rigid quality control/quality assurance (QA/QC) protocols is a necessary component of sampling and analysis activities is support of this project.

Sampling QA/QC is assured by the performance of the following tasks:

- Adequate planning of the sampling event, to include the choice of sample locations.
- Accurate documentation of the sampling event, as described in Section 6.3 of this SAP.
- Decontamination of sampling apparatus prior to each location.
- The use of QA/QC samples: duplicates, matrix spike, matrix spike duplicate, equipment rinsates, and trip blanks, as necessary.

NEESA Level E and Level C QA/QC criteria require the following QC samples to be obtained.

6.6 QA/QC SAMPLES

The following QA/QC samples are anticipated for this removal action:

- *Duplicates*. Field duplicates will be generated to access the precision of the sampling and analysis results. The percentage difference between analysis of duplicate samples is a measure of precision; the results of analysis of duplicate samples should not vary outside of accepted criteria. Duplicate samples will be obtained at a frequency of 10% for post-excavation activities. Four (4) soil duplicate samples are is anticipated for this removal action.

- *Equipment rinsates*. A field equipment rinsate will be performed, once a day, for all non-disposable sampling equipment (e.g. stainless steel sampling trowels). After decontaminating the sampling apparatus, distilled/de-ionized (DI) water will be passed over the apparatus; the water will be collected into an EPA-clean glass container. Analysis of the rinsate water should indicate that beryllium and mercury are not transferred from the sampling apparatus, i.e., cross-contamination between sampling points does not occur. Equipment rinsates are not required if disposable polypropylene scoops are used for sampling.

6.7 DECONTAMINATION PROCEDURES

All non-disposable sampling equipment (e.g. stainless steel trowels) will be decontaminated prior to each sample point. The following procedures will be used:

- Detergent (non-phosphate) and water wash
- Tap water rinse
- DI-water rinse
- Isopropanol, (pesticide grade) rinse repeat
- Rinse with steam-distilled water
- Air dry.

All disposable sampling equipment (e.g. polypropylene scoops) will be discarded, immediately, after each sampling event.

All decontamination fluids will be collected and stored on-site. The decontamination fluids will be sampled by OHM, for analysis of disposable parameters, as indicated in Section 8.0.

TABLE 6.1
CONTAINER AND PRESERVATION REQUIREMENTS
FOR REMEDIAL CONSTRUCTION ACTIVITIES
ALLEGANY BALLISTICS LABORATORY
ROCKET CENTER, WEST VIRGINIA

Parameter	Matrix	Sample Container	Container Volume	Preservation	Maximum Holding Time
Beryllium	Soil	Glass w/Teflon-lined cap	1-L	4°C	6 months
Mercury	Soil	Glass w/Teflon-lined cap	1-L	4°C	6 months
Explosives	Soil	Glass w/Teflon-lined cap	1-L	N/A	14 days to extraction 90 days to analysis
TCLP-Full	Disposal	Glass w/Teflon-lined cap	1-L	4°C	N/A
Beryllium	Disposal	Glass w/Teflon-lined cap	16 oz.	4°C	6 months
Mercury	Disposal	Glass w/Teflon-lined cap	16 oz.	4°C	6 months
Explosives	Disposal	Glass w/Teflon-lined cap	1-L	4°C	14 days to extraction 90 days to analysis
TAL - Metals	Soil	Glass w/Teflon-lined cap	1-L	4°C	6 months
TCL - Organics	Soil/ Disposal	Glass w/Teflon-lined cap	4 oz. and 16 oz.	4°C	14 days * 7 days to extraction 40 days to analysis

*Volatiles (8240) analysis

7.0 CALIBRATION PROCEDURES AND FREQUENCY

All field instruments will be calibrated according to the manufacturers specifications. The hazcat procedures will be checked with laboratory standards.

7.1 HAZCAT PROCEDURES

The hazcatting of unkown samples will be QC checked by use of the following procedures:

- All standard solutions will be prepared on-site prior to the initial hazcat tests.
- Standard solutions and test strips will be checked with known standards. For example, the glacial acetic acid and the oxidizer test strip will be checked with a 1% chloramine-T solution. A rapid color change to blue indicates that the oxidizer test is operating properly.

8.0 ANALYTICAL PROCEDURES

The analytical procedures that are applicable to this remedial project include:

- TAL/TCL and Full TCLP analysis of soil
- Analysis of soil for organic and inorganic compounds, to include beryllium, mercury, and explosives
- Field hazcatting of unknown samples.
- Assignment of samples to wastestreams based upon hazcat results
- Test bulking of compatible samples
- Generation of composite samples for each wastestream
- Analysis of composite samples for disposal parameters

8.1 SOIL ANALYSIS

The containerized soil will be analyzed by the OHM subcontract laboratory for:

Analyte	EPA/SW-846 Method	Est. Quantity
TAL-Inorganics*	6010/7000/9010	36
TCL-Organics	8270/8080	36
TCL-Organics/VOC	8240	36
Explosives	8330	36
TCLP-Full	1311	9

* TAL-Inorganics include analysis for beryllium and mercury:
- Beryllium will be determined at an approximate detection limit of 0.3 µg/L using Method 6010.
- Mercury will be determined at an approximate detection limit of 0.2 µg/L using Method 7471.

The analytical results will be used by the OHM transportation and disposal (T&D) coordinator, in order to access disposal options.

8.1.1 Turn-Around-Time

The analytical results will be made available within a 7-day, or other turn-around-time (TAT) designated by the U.S. Department of the Navy Contracting Officer.

8.2 CONTRACTOR GENERATED WASTE

All contractor-generated waste, to include decontamination water, will be analyzed for:

- Beryllium, mercury, explosives, and
- TCLP-Full

8.3 HAZCAT TESTING

Hazcatting is used to identify hazardous chemicals/waste, which require special handling in order to segregate incompatible materials (e.g., oxidizers from organics, acids from bases, cyanides from non-cyanide materials, etc.). Incompatible materials are placed (bulked) in separate wastestreams to reduce transportation and disposal (T&D) costs.

Hazcat testing typically involves the qualitative determination of the following parameters in an unknown drum sample:

- pH
- Air reactivity
- Water solubility/reactivity
- Hexane solubility
- The presence of:
  - Oxidizers
  - Peroxides
  - Sulfides
  - Cyanides
  - Chlorides (halogens)
- Flammables

Air reactivity is determined upon opening the sample container. The sample will smoke, boil, or heat up if it is air reactive. If reactivity with air is determined at the time of sampling, further hazcatting is not necessary. Samples that show air reactivity are classified "air reactive."

Water reactivity/solubility. Reactivity and solubility in water are determined simultaneously by the addition of 1 ml water, slowly, to 1 ml of the unknown sample. This experiment, like most Hazcat experiments, is performed in a test tube or on a watch glass. Samples that show reactivity with water (smoke, heat, etc.) are classified as "water reactive"; samples that dissolve in water are classified as "water soluble."

pH of a water soluble sample is measured within ± 2 units with pH paper. The unknown sample is categorized as an acid or base, if the pH is less than 4 or greater than 10, respectively.

Hexane solubility of an unknown sample is determined by adding 1 ml of hexane/dichloromethane (50/50 solution). If the unknown is soluble in hexane/DCM, the drum contents are classified as "organic".

Haiogens are determined by a Beilstein flame test. Sample is placed within the loop of the sterilized copper wire, then placed within a Bunsen burner generated flame. A green flame indicates the presence of chlorine in the sample; a blue flame indicates the presence of bromine. Samples which show a positive Beilstein test are classified as "chloride", and/or "bromide". **Halogen testing will not be performed due to the potential explosive nature of the unknown materials.**

Flash point is determined for samples which are classified as organic. A Seta-flash appartus is set-up for the qualitative determination flash point for temperatures less than, or equal to, 60°C (140°F). Samples which test positive are classified as "flammable". **Flash point testing will not be performed due to the potential explosive nature of the unknown materials.**

Oxidizers are determined by an iodimetric reaction. Glacial acetic acid is added to 1 ml sample to acidify the sample. Potassium iodide and starch solution are added. A blue color which results is a positive test for oxidizing material. The drum contents are classified as "oxidizer" for samples that give a positive test.

Peroxides are determined by a spot test. Peroxide test paper turns black in the presence of peroxide-containing samples. Peroxide materials are considered "explosive"; if the peroxide level is greater than 5,000 ppm, the material is classified as "shock sensitive".

Cyanides are determined by the reaction of cyanide-containing samples with a chloramine-T reagent in the presence of a barbituric acid buffer. A distinctive red-purple color is a positive test for cyanides. Cyanide test hits are commercially available.

Sulfides are tested for by a spot test with lead acetate. Reaction with sulfides produces a black color which easily observed on lead acetate test strips.

PCBs can be determined using gas chromatography. Samples are screened for PCBs by initial extraction with hexane/DCM (50/50), solvent exchanged, cleaned up via acid hydrolysis, then injected into the GC. PCB levels above 25 ppm are determined with an ECD or Hall detector. **Unless requested, PCB will not be determined for this project.**

8.4 CLASSIFICATION OF HAZARDOUS MATERIAL

Upon completion of hazcat testing, the materials are classified into compatibility categories. OHM has a software program which is designed to improve data management. Each containerized material or layer within each container, is assigned a wastestream by the project chemist with the aid of the T&D coordinator.

Classifications of wastestreams include:

- Radioactive
- Air reactive
- Water reactive
- Biological hazard
- Shock sensitive
- Explosive
- Oxidizer
- Cyanide
- Sulfide
- Acid
- Base
- Organic
- Liquid
- Solid

A material may belong to a wastestream which consists of more than one hazards class (i.e., flammable chlorinated organic liquid, cyanide base liquid, or oxidizer acid solid).

8.5 MOBILE LABORATORY CAPABILITIES

OHM has a fleet of mobile trailers from which chemists are able to perform hazcat analysis on-site. Drum samples will be brought to the trailer and the samples will be analyzed within a much shorter turn-around-time than is possible analysis at an off-site laboratory.

Approximately two batches of samples (24 samples per batch) per analyst, can be analyzed in a full 8-hour shift, when utilizing one chemist in a mobile laboratory. The actual daily throughput depends on the number of samples available for analysis and the ease of sample handling.

8.6 DISPOSAL ANALYSIS

Upon completion of hazcat testing of all unknown containers, OHM will generate composite samples for each applicable waste stream.

Anticipated waste streams include:

WASTESTREAM	ANALYSIS	CONTAINER	PRESERVATION
Organic Liquid[1]	TCL - Volatiles - Semi-Volatiles/ - Pest/PCB:	40 ml 1-L	pH<2w/HCl —
Organic Solid[1]	TCL - Volatiles - Semi-Volatiles/ - Pest/PCB	250 ml 500 ml	— —
Aqueous Liquid[2]	TAL - Metals - Cyanide	1-L 500 ml	pH<2 w/HCl pH>12 w/NaOH
Inorganic Solids[2]	TAL - Metals, Cyanide	250 ml	—

[1] To include flammable, chlorinated, non-flammable, and non-chlorinated material.
[2] To include acidic, neutral, and basic materials

These composite samples will be analyzed for TCL-organics or TAL - metals, as appropriate. The analytical results will be used by the OHM T&D Coordinator to assign proper waste codes to the lab packed material.

8.7 SUMMARY

The project analytical requirements are summarized in Table 8.1.

TABLE 8.1
ANALYTICAL REQUIREMENTS

Matrix	Qty.	Type	Volume	Analytical Parameters	EPA/SW-846 Method	Regulatory Threshold
Soil	One per soil box (36 est.)	4 grab samples per 1 composite	0.5-L	Beryllium	7091	13 mg/kg
				Mercury	7471	305 mg/kg
				Explosives	8330	
	One per soil box (36 est.)	1 per grab box	4 oz.	TCL-Organics/VOC	8240	
	One per four soil boxes (9 est.)	composite every 4-1 CY samples	1-L	TAL-Metals	6010/7000	40 CFR 261
				TCL-Organics	8270,8080	
				TCLP-Full	1311	
Beryllium	100 [a] (est.)	Verification @10%	as is	Beryllium	7091	
Mercury	100 [a] (est.)	Verification @10%	as is	Mercury	7471	
Unknown	1,000 (est.)	Hazcat	N/A	[b] Water Solubility pH Organic solubility Oxidizer Peroxide Sulfide Cyanide	N/A	
	100 (est.) 10% of unknown total	Disposal analysis	1-L	TAL-Inorganics TCL-Organics Ignitability Corrosivity Reactivity		
Contractor Generated Waste	2 (est.)	Disposal analysis	1-L	Beryllium Mercury Explosives TCLP-Full	7091 7471 8330 1311	

(a) Volume based upon an estimate of 1,000 containers
(b) Field characterization

9.0 DATA REDUCTION, VALIDATION AND REPORTING

9.1 DATA REDUCTION AND TABULATION

Data generated from the site activities can be grouped into two broad categories:

- Field data, such as data collected during VOC screening; and
- Chemical data for environmental samples generated by the project laboratory and accompanying QA/QC data package deliverables as required for DQO Level II and Level III;

These data will be compiled and managed using a central project filing system. The field and laboratory data filing system will be a manual storage system established at the Contractor's field office at the Site. Field and laboratory data will be filed chronologically. Field log books, sample logs, sample data sheets, chain-of-custody records, laboratory log books, and laboratory calculation sheets shall be labeled with a task number and date.

Chemical data shall be stored in a spread-sheet based system (e.g., LOTUS 123, EXCEL), with separate files maintained according to sample medium and validation status. The project laboratory shall provide the Project Coordinator and Contractor with computer diskette files containing the analytical data.

9.2 GENERAL PROCEDURES FOR DATA REVIEW/VALIDATION

9.2.1 Level I Data

Level I data (e.g., screening for VOCs) will be validated by reviewing calibration and maintenance records for field instruments and field logbook information associated with individual data sets to ensure that appropriate SOPs were followed. Data validation, therefore, will be qualitative, and will focus on whether field screening data are of acceptable quality based upon supporting documentation. Acceptance or rejection of data will be determined by the judgement of experienced field personnel familiar with the SOPs.

9.2.2 Level II Data

Level II data will undergo qualitative and semi-quantitative review based on the standards or performance of the equipment in use. Acceptance or rejection of Level II data will be based on the judgement of qualified personnel. Level II review would include activities similar to Level I, i.e., review of instrument calibration concentrations.

9.2.3 Level III Data

Generation of the Level III data will include the analysis of QA/QC samples, including blanks, calibration and reference standards, and possibly spiked samples in some instances; however, a complete CLP QA/QC analysis program will not be performed for these samples. Items that will be reviewed to validate the data include:

1. Integrity and completeness of the data package,
2. Holding times from sample receipt at the laboratory to sample extraction and analysis or holding times from sample receipt to analysis, as appropriate,

3. Trip blank and laboratory method blank sample results,

4. Matrix spike, matrix spike duplicate, and replicate analyses,

5. Surrogate recoveries,

6. Field blank sample results, and

7. Field duplicate results.

Data validation will be a qualitative process. Review of precision, accuracy, representativeness, completeness and comparability criteria will be included whenever measurement data are reviewed. The analytical laboratory will provide numerical precision and accuracy data that will be compared to the acceptance criteria. Precision and accuracy values for project data sets that are within the ranges for the type of sample and analytical method used will be considered acceptable. In some cases, data of apparently poor precision and/or accuracy may be somewhat useful. The judgement to accept such data, with appropriate qualifications, will be made by a data validator with appropriate technical expertise.

9.3 DATA REPORTING

The project laboratory will report the data in a certificate of analysis format, except for analyses requiring NEESA Level C deliverables. NEESA Level C deliverables are summarized in Table 9.1. Sample analytical results and accompanying QA/QC sample results will be reported to the Project Coordinator on computer diskette files suitable for transfer to the spreadsheet data base.

Analytical data will be identified according to the project laboratory's procedures for establishing sample lots, so that sample analysis data can be matched to corresponding QA/QC samples, control charts, and calibration data.

9.4 DELIVERABLES

OHM will generate the following reports to the LANTDIV Contracting Officer:

- Weekly reports will be submitted, as requested by LANTDIV. The weekly reports will include all sampling and analysis data obtained.

- Monthly reports will be submitted, as requested by LANTDIV. The monthly reports will summarize all sampling and analysis data.

- Final Report. A Final Sampling and Analysis Report will be prepared upon completion of all sampling and analysis activities. The FSAP will be submitted as either a stand-alone document, or as part of the Site Final Report.

Sampling and analysis reports will be prepared by the OHM project chemist.

TABLE 9.1
NEESA LEVEL C DATA DELIVERIES

Parameter	Method Requirements	Deliverables
Organics	Method blank spikes with results and control charts. Run with each batch of samples processed.	Control chart
	Results to be reported on CLP Form 1 or spreadsheet per Sect. 9. Sample results using CLP data flags.	Form 1 or Sect. 9 1/Sample chromatograms/ and mass spectra
	Surrogate recovery from samples reported on CLP Form 2. Surrogates to be used in volatiles, semivolatiles, pesticides/ PCB. For volatiles by GC, the names of surrogates should be changed to reflect the surrogate used.	Form 2
	Matrix spike/spike duplicate -1 spike and spike duplicate per 20 samples of similar matrix reported on Form 2.	Form 3
	Method blank reported on CLP Form 4.	Form 4 or Sect. 9
	For volatiles by GC, a similar format will be used as CLP Form 4 for blanks.	
	GC/MS tuning for volatiles/semi-volatiles. Report results on Form 5.	Form 5
	Initial calibration data reported on Form 6.	Form 6
	For volatiles by GC, the initial calibration data with response factors must be reported.	No Form
	For pesticide/PCB data Form 9 must be used for calibration data.	Form 9
	Continuing calibration GC/MS data reported on Form 7.	Form 7
	For volatiles GC data, the response factors and their percent differences from the initial must be reported.	No Form
	Internal Standard Area for Volatiles and Semivolatiles.	Form 8
	For pesticides/PCB data, the CLP Form 9 must be presented.	Form 9
	No chromatograms or mass spectra are presented for calibration. These data should be filed in the laboratory and available if problems arise in reviewing/validating the data. The calibration information should be available for checking during on-site audits.	
	Internal standard are for GC/MS analyses CLP Form VIII shall be supplied.	Form VIII
	Second column confirmation shall be done for all GC work when compounds are detected above reporting limits. Chromatograms of confirmation must be provided.	Chromatograms

TABLE 9.1
NEESA LEVEL C DATA DELIVERIES

Parameter	Method Requirements	Deliverables
Metals	Sample results with CLP flagging system.	CLP Form 1 or Sect. 9
	Initial and continuing calibration.	CLP Form 2, Part 1 only
	Blanks 10% frequency.	Form 3
	Method blank taken through digestion (1/20 samples of same matrix).	Form 3 or Sect. 9
	ICP interference check sample.	Form 4
	Matrix spike recovery (1 per 20 samples of similar matrix).	Form 5, Part 1
	Postdigestion spike sample recovery for ICP metals. Only done if predigest spike recovery exceed CLP limits.	Form 5, Part 2 (never used for GFAA work)
	Postdigest spike for GFAA.	Recovery will be noted on raw data
	Duplicates (1 per 20 samples will be split and digested as separate.	Form 6 samples
	Method blank spike information will be plotted on control chart, one per batch of samples processed.	Control chart
	Standard addition. The decision process outlined in CLP page E-3 will be used to determine when standard additions are required.	Form 8
	Holding times.	Form 1
Wet Chemistry	Blank spike/1 batch.	Control chart
	Method Blank 1/batch.	Report result No format
	Sample results.	Report result No format
	Matrix spike/spike duplicate or calibration information.	Report result if applicable
	Calibration check- report percent RSD or percent difference from initial calibration.	No format

10.0 QUALITY CONTROL

The degree of quality control necessary for a sampling and analysis event is influenced by the data quality objectives (as discussed in Section 3 of this SAP).

The quality of the sampling event is, in part, assured by the accurate and complete documentation of all sampling and related activities, by the OHM sampling technician. The use of sample gloves, which are frequently changed out, and the proper decontamination of sampling equipment between sample points, contribute to a successful sampling event. Disposable equipment are used at one sample location only.

Disposal sampling does not require any special QA/QC considerations. Generally, laboratory batch QC results are sufficient for assuring quality of the disposal analysis.

10.1 QA/QC SAMPLES

Quality control for post-excavation monitoring can be accessed by the use of QA/QC samples.

10.1.1 Duplicate Samples

As indicated in Section 3.0, the precision of the sampling event is accessed by the use of duplicate samples. The precision of the sampling event is expressed as a RPD between duplicate determinations.

Duplicate samples are obtained by simultaneously filling two containers from the same sample source. The duplicate samples are given unique sample numbers, avoiding any indication to the laboratory that the sample material is the same, eliminating bias.

10.1.2 Matrix Spike (MS) Samples

The accuracy of the sampling and analysis is accessed by the use of matrix spike (MS) samples. The % recovery is indicative of the accuracy of the results.

The MS sample will consist of additional sample provided to the laboratory. The laboratory will spike the sample with mixtures of standardized analytes.

10.1.3 Matrix Spike Duplicate (MSD)

MS analysis is performed an a duplicate sample. The results can be expressed as a % recovery to access accuracy, as for the original MS results; in addition, the RPD between the original MS and the MSD is used to access precision.

10.1.4 Equipment Rinsates

The equipment rinsate samples are used to assure that contamination is not transferred between sample points, e.g., cross-contamination does not occur. Cross-contamination between sampling points is minimized by decontamination of non-disposable sampling equipment between sample points. Equipment rinsates, therefore, are not required when disposable sampling equipment is utilized.

10.1.5 Trip Blank

A trip blank is used, generally, only for aqueous volatile samples. For the decontamination water disposal samples, one (1) trip blank will be submitted with each sample batch shipment to the laboratory. The trip blank consist of analyte-free water stored in a 40-ml vial, with no headspace, which is shipped from the laboratory to the site, prior to sampling. The vial is unopened, and is shipped with the samples back to the laboratory. The trip blank is analyzed for volatiles (8010 and 8020). The laboratory results should indicate that no volatile contamination results from handling and shipping of the samples.

10.2 LABORATORY QA/QC

Laboratory QA/QC analysis includes the preparation of calibration curves, the use of check samples, method blanks, duplicate analysis, and MS/MSD analysis. Commonly, batch QC involves testing of one sample per batch (of 20 samples). One sample (5% QC level) is re-analyzed. Another sample might be spiked then analyzed in duplicate. The results for these analysis apply to all of the samples in the batch.

The standard operating procedures for the laboratory are given in the Laboratory QA/QC Manual.

11.0 PERFORMANCE AND SYSTEM AUDITS

QA audits are performed to ensure and document that required procedures and QA/QC measures are being used by field, laboratory, and office personnel to provide data of acceptable quality, and that subsequent calculations, interpretation, and other project outputs are checked and validated. Both scheduled and unscheduled audits are included in the QA program. In addition, project technical and peer reviews will be conducted by designated project personnel and senior managers during all phases of project work, from initial scoping and development of work plans through preparation of final project reports.

System and performance audits may be conducted by the Contractor's QA/QC Officer or his designated representative, and may include audits of calculations, interpretations, and reports, as well as field and laboratory activities. The designated QA Manager of the subcontractor laboratory involved in Facilities RA activities at the site will conduct system, method, and performance audits of laboratory activities. These audits will be performed in accordance with the subcontractor laboratory QA/QC plan. If the audits identify issues affecting the reliability of data reported by the laboratory, the QA Manager will take appropriate corrective action. In addition, the Contractor's QA/QC Officer may perform independent system and performance audits of this laboratory.

11.1 SYSTEM AUDITS

A system audit is conducted to ensure that the mechanisms or structures that are in place for a selected project activity contain the necessary components to meet overall project requirements, and to assess whether project personnel in field, laboratory, and office settings are adhering to established project-specific procedures and QA/QC requirements. Examples of project activities that could be audited include laboratory analysis and sample tracking programs, data management systems, and field sampling and analysis programs. A system audit of a sample tracking program may include an evaluation of the methods used to ensure that appropriate sample custody is maintained throughout the receipt, preparation, extraction, and analysis steps within the laboratory, and that laboratory personnel are familiar with and use the sample tracking system effectively. The overall objective of a system audit is to assure that the QA/QC framework that has been developed for the project is adequate to maintain acceptable data quality in all project tasks, and is being followed by project personnel.

System audits may include the assessments of:

- Field and laboratory analytical programs, including equipment calibration, use of QC samples (e.g., blanks, spikes, reference standards, and duplicates), and documentation regarding solvents and reagents used in sample preparation.
- Field sampling (including sample collection and labeling) equipment decontamination, on-site sample storage, and chain-of-custody and shipping procedures.
- Sample tracking systems, preventive maintenance programs, and data storage and reporting systems for subcontractor laboratories involved in chemical and physical testing.
- Data validation procedures and in-house management and statistical evaluation of validated data.
- Systems for management of field-generated analytical data, and for accompanying QA data and other supporting documentation for this information.

The exact number and types of system audits that will be performed will be at the discretion of the Contractor's QA/QC Officer, however, at least one audit of field sampling, and on-site analytical procedures at the Site will be conducted. A typical field audit will address:

- Project organization and responsibility
- Sample collection
- Chain-of-custody
- Operational procedures
- Equipment
- Training
- Records
- Corrective action, as warranted

Audit results will be discussed with the Contractor's Project Manager and the Project Coordinator, as appropriate, and corrective action will be taken, if warranted. Audit reports will be prepared by the Contractor for system audits and submitted to the U.S. Department of the Navy QA/QC office.

11.2 PERFORMANCE AUDITS

A performance audit, based upon a quantitative review of QC samples (including blanks, reference and calibration standards, and duplicates as applicable) is considered appropriate for the project for Level II and III data. Performance audits of Level I analyses will be qualitative and focused on adherence to calibration and screening protocols.

The performance audit of Level III analyses will focus on the precision and accuracy of on-site measurements through quantitative evaluations of reproducibility, and will also include assessment of blanks and matrix spikes to deter nine whether cross-contamination or matrix interferences are occurring. Sampling decontamination procedures will be evaluated through review of data from rinse blanks and duplicate samples. The performance audit for Level II data will include review of maintenance and calibration records.

The required data levels and anticipated end uses for the specific types of information being gathered will affect the level of detail required for performance audits, e.g., evaluating the quality of data from headspace screening (Level I data) requires only an assessment of sample handling techniques, site conditions, and instrument calibration, whereas more sophisticated sampling that includes spikes, duplicates, and blank samples requires a more rigorous QA review. Details regarding the specific types and frequency of collection of QC samples to be included in various data collection activities are provided in Sections 4 and 8 of this plan.

11.3 PROJECT TECHNICAL AND PEER REVIEWS

Project documents and deliverables will be reviewed by designated project personnel, the Contractor and the Contractor's QA/QC Officer prior to submittal to the U.S. Department of the Navy QA/QC office. The review shall address whether:

- The report satisfies the scope of work.
- Assumptions are clearly stated, justified, and documented.
- References are cited for information utilized in report preparation that originated outside the document.
- The report correctly and accurately presents the results obtained by the project work.

- The tables and figures presented in the report are prepared, checked, and approved according to project QA/QC protocol.
- The figures presented in the report are dated and carry the initials of the appropriate project personnel and Contractor's Project Manager.
- The bases for recommendations and conclusions presented in the report are clearly documented.
- The report has been reviewed for correct punctuation, grammar, capitalization, and spelling.

Completion of technical and QA/QC reviews will be documented by the signature or initials of the reviewer.

In addition to technical and peer review of documents, project review meetings will be scheduled periodically by the Contractor's Project Manager. The intent of these project reviews is to assure scope compliance and overall technical quality of the contracted services. Project reviews may be scheduled for key junctures in the project schedule that precede deliverables, such as initial scoping meetings, prior to finalization of work plans, immediately following completion of field programs, or during development of conclusions and recommendations. Documentation of the project review, especially regarding identified action items and their follow-up, is essential to maximizing the utility of these reviews.

12.0 PREVENTIVE MAINTENANCE

Preventive maintenance, as needed, will be provided in a timely manner. All field-related problems will be remediated on a site level. Supplies will be order from the site, as possible.

The OHM Regional Office will be contacted, as necessary. Support of equipment and/or additional personnel will be provided by the OHM Regional Shop in Windsor, New Jersey and the Divisional Office in Hopkinton, Massachusetts.

13.0 CORRECTIVE ACTION

Corrective Action is required if:

1. Any QC data is outside of the acceptable precision and/or accuracy
2. Blanks or laboratory control samples contain contaminants above acceptable limit
3. Undesirable trends are detected in spike or surrogate recoveries or RPD between duplicates
4. There are unusual changes in method detection limits
5. Deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation samples
6. Inquiries concerning data quality are received from the Contracting Officer

13.1 CORRECTIVE ACTION PROCEDURES

Corrective actions/procedures for out of control events in the following areas shall be found in the contract laboratory's Quality Assurance Plan. The laboratory QA/QC plan will include standard operating procedures for:

1. Incoming samples
2. Sample holding times
3. Instrument calibrations
4. Practical quantitation limits
5. Method QC
6. Calculation errors
7. On-site audits

14.0 REFERENCES

The following references were used in the preparation of this SAP:

- Sampling and Chemical Analysis Quality Assurance Requirements for the U.S. Department of the Navy Installation Restoration Program, NEESA 20.2-047B, June 1988, Naval Energy and Environmental Support Activity.

- OHM Field Sampling Manual; March 1989.

- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed., Sept. 1986 and Update #1, July, 1992

- Bid Specifications for Allegany Ballistics Laboratory, Rocket Center, West Virginia, Delivery Order 007.

APPENDIX A
MEMORANDUM - DETERMINATION OF SOIL CONTAMINANT CONCENTRATIONS

Memorandum

Date: 6 Nov 95

From: Code 18238 (Jeff Kidwell)
804-322-4795, DSN 262-4795

To: File, DO #0007 "Construction Investigation for Site 7, Beryllium Landfill", Allegany Ballistics Laboratory, Rocket Center, WV

Subj: DETERMINATION OF SOIL CONTAMINANT CONCENTRATIONS

Ref:
(a) LANTNAVFACENGCOM (J. Kidwell)/State of West Virginia, Division of Environmental Protection (T. Bass) ltr 5090 Ser 1823:JJS:cag of 16 May 1995
(b) State of West Virginia, Division of Environmental Protection (T. Bass)/LANTNAVFACENGCOM (J. Szykman) ltr of October 20, 1995
(b) State of West Virginia, Division of Environmental Protection (T.Bass)/LANTNAVFACENGCOM (J. Kidwell) ltr of May 31, 1995

1. Ref (a) provides the basis for the Navy's decision and recommendation to use health-based concentrations of the inorganic contaminants of concern (beryllium and mercury) at Site 7. The Navy's recommendations were established at 13 mg/kg for beryllium and 305 mg/kg for mercury.

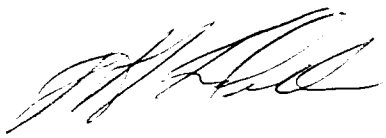
2. The values cited above were derived by using the U.S. Environmental Protection Agency Region III Risk Based Concentration Table (RBCs) for a commercial/industrial exposure scenario. The beryllium concentrations equates to an excess cancer risk of 1×10^{-5} and, for mercury, a hazard quotient of 0.5. The combined risk posed by these concentrations is within the excess upper bound lifetime cancer risk established under CERCLA by 40 CFR Part 300 of 10^{-4} to 10^{-6} and the target hazard quotient for non-carcinogens of 1.

3. Ref (a) further states that should the concentration of the beryllium and the mercury in the segregated soils be below these values, the Navy will consider the soil non-hazardous, consolidate and place them in the former solid waste landfill (Site 5). The exact location to emplace these soils would be determined, based on the results of the Remedial Investigation for Site 5 and, along with the appropriate engineering controls, and presented to the State for their review and concurrence.

4. The Navy made the forgoing recommendations after evaluating other options to deal with the waste contained in the intermodal containers. The Navy contends that soil washing, option 1, was not feasible due to the unavailability of a surfactant which could remove both the beryllium and mercury and the risk of vial breakage due to agitation. The Navy also evaluated, as a second option, the possibility of obtaining a treatability variance. A variance would not remove the requirement to treat the restricted soils and debris, and, moreover, alternate treatment levels based

on data from actual treatment would become the treatment standard that must be met. Since Ref (b) denied the Navy's request for a variance, this option was not viable.

5. The Navy received the State's concurrence, Ref (c), with the use of the proposed health-based levels and with the Navy's conclusions. Copies of all cited references were sent to EPA R-III.



APPENDIX B
CHAIN-OF-CUSTODY RECORD

OHM Corporation

CHAIN-OF-CUSTODY RECORD

Form 0019
Field Technical Services
Rev. 08/89

№ 109384

O.H. MATERIALS CORP. • P.O. BOX 551 • FINDLAY, OH 45839-0551 • 419-423-3526

PROJECT NAME	PROJECT LOCATION	
PROJ. NO.	PROJECT CONTACT	PROJECT TELEPHONE NO.
CLIENT'S REPRESENTATIVE	PROJECT MANAGER/SUPERVISOR	

ITEM NO.	SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	ANALYSIS DESIRED (INDICATE SEPARATE CONTAINERS)	REMARKS
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1					
2					
3					
4					

REMARKS

SAMPLER'S SIGNATURE

LAB COPY

APPENDIX B
QUALITY CONTROL PLAN

DRAFT
FINAL

QUALITY CONTROL PLAN
FOR
SOIL SEGREGATION AND ANALYSIS
ALLEGANY BALLISTICS LABORATORY
ROCKET CENTER, WEST VIRGINIA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032
Delivery Order 0007

Prepared by:

OHM Remediation Services Corp.
Trenton, New Jersey

Michael I. Gilman
Program QC Manager

Reviewed by:

Gordon Miller
Project Manager

John Franz, P.E.
Program Manager

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

February 5, 1996
OHM Project 15986QC

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1.0 STATEMENT OF QC PROGRAM

OHM Remediation Services Corp. (OHM), a subsidiary of OHM Corporation, will provide and maintain an effective Contractor Quality Control (QC) Program as required by contract clauses. This program will be performed in conjunction with the Program Quality Control Plan (OHM, 1994) 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 inspections and tests required to ensure that materials, workmanship, and construction conform to the drawings, specifications, and contract requirements. OHM will perform the test or inspection specified, unless the required inspection and/or test is specifically designated to be performed by the Government.

2.0 PROGRAM ORGANIZATION AND PERSONNEL RESPONSIBILITIES

OHM will implement the Contractor Quality Control Program (CQCP) by establishing a QC organization which works directly with the Navy's on-site representative and reports to the OHM Team program QC Manager, The QC organization will consist of a QC person who will verify compliance with the contract requirements. The QC organization will be supplemented by additional QC personnel as may be necessary.

The NTR will be notified in writing prior to proposed changes to the CQCP, and the proposed changes will be subject to the NTR's approval prior to implementation.

OHM's QC organization chart for Delivery Order 0007 is included as Figure 2-1. OHM's Program Management team are provided in the Program QC Plan. The responsibilities of each person identified in the QC organization is shown in the Program QC Plan and the Work Plan. Personnel Experience forms for QC personnel are provided as an attachment to this QC plan.

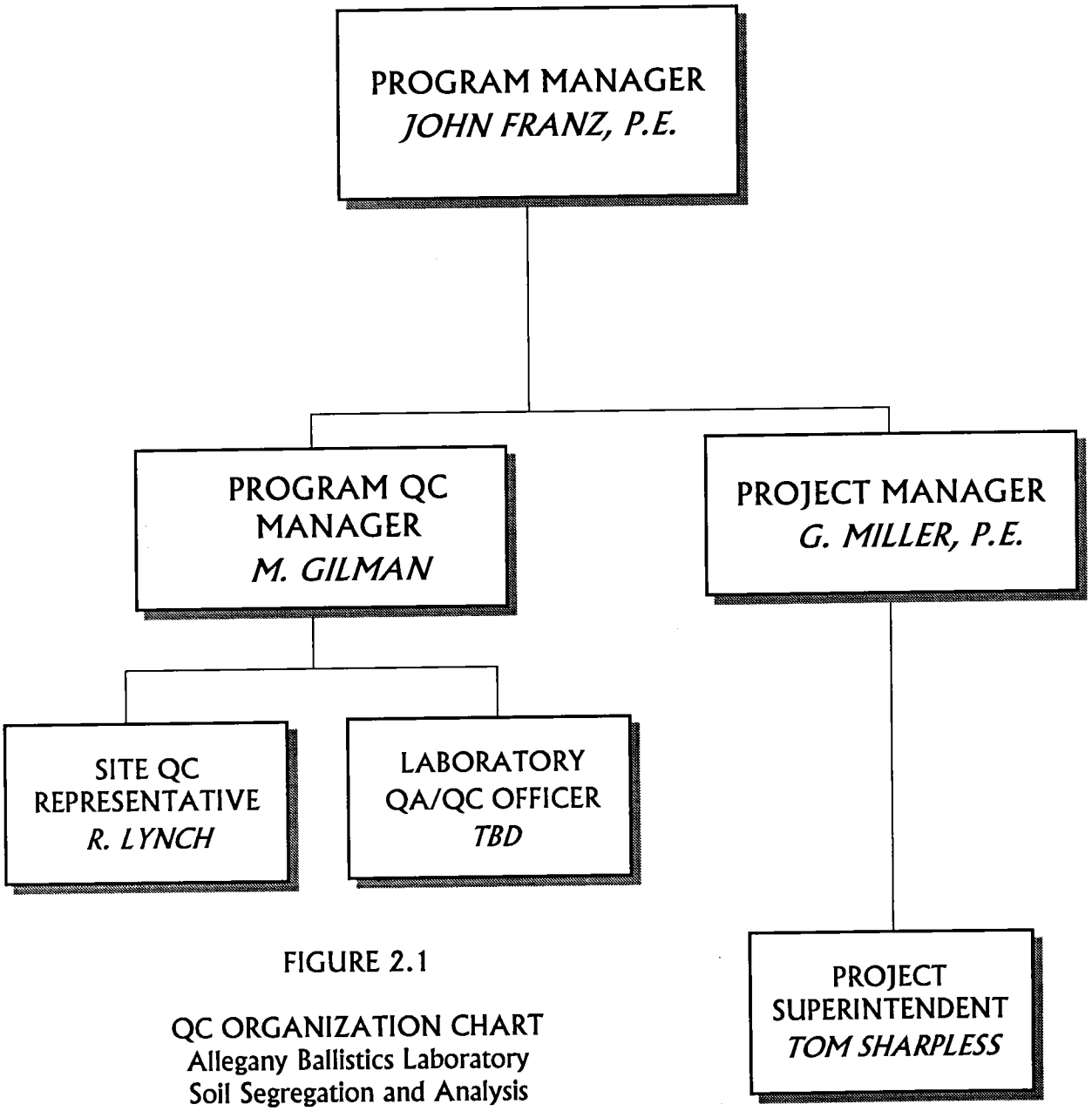

FIGURE 2.1

QC ORGANIZATION CHART
Allegany Ballistics Laboratory
Soil Segregation and Analysis
Delivery Order 0007
OHM Project 15986

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

3.0 *FIELD VERIFICATION TESTING*

The Inspection/Testing as outlined in Table 3-1 will be performed by the OHM QC representative during the performance of his/her duties to verify compliance with the contract requirements. Additions or modifications to these requirements may be necessary to address changing circumstances. The responsibilities of the QC representative are described in Section 2.0 and the Program QC Plan.

3.1 FIELD SAMPLING

Samples of materials will be obtained in the field for verification testing. The site technician will collect the specified samples, as appropriate, as soon as areas are deemed clean or a portion of the work is completed to obtain results as promptly as possible. See Table 3-1.

TABLE 3-1
INSPECTION SCHEDULE
SOIL SEGREGATION AND ANALYSIS
ALLEGANY BALLISTICS LABORATORY
ROCKET CENTER, WEST VIRGINIA
Delivery Order 0007
OHM Project 15986

ACTIVITY	PREPARATORY	DONE	INITIAL	DONE	FOLLOWUP	DONE
Decontamination Area (PAD)	Material meets requirements		Proper installation Proper grades		Decontamination liquids recovered Area restored	
Soil Screening and Segregation	Procedures established		Shallow (4" to 6") lifts		Hazardous Materials Removed from soils Soils containerized	
Sampling Control	Sampling locations established Sampling procedures established Wastestreams identified and established Labeling of samples per procedures		QA/QC samples and frequency established Hazcatting of unknown samples per procedures Chain of custody and handling		Sampling equipment decontaminated after each use Decontamination liquids recovered and stored Labpacking of samples as required	
Analysis/Data Evaluation Control	Field instrument calibration per manufacturer Hazcat procedures established Subcontract laboratory selected		Testing/evaluation per standards/criteria Hazardous materials classified Test results reviewed, analyzed, and data reported		Data validation, certification as required Contractor generated waste analyzed and characterized	
Transportation of Contaminated Material	Proper packaging Specified trucks being utilized Permits obtained as required		Monitoring for spillage during loading and transportation		Roadway spillage and condition at completion Records of manifests maintained	

4.0 INSPECTION AND TESTING DOCUMENTATION

Daily records of inspections and tests performed for each shift or subcontractor operation will be signed by the QC representative and the original and one copy provided to the Government no later than the next working day. Samples of reports and forms to be utilized are included in the Program QC Plan.

All documentation required for submittal to the Navy is listed in the Submittal Register Table 4-1 (attached).

SUBMITTAL REGISTER
Soil Segregation and Analysis
Allegany Ballistics Laboratory
Rocket Center, West Virginia

Delivery Order 0007 Project Numb15986QC Location: West Virginia Contractor: OHM Remediation Services Corp.
Contract No. N62470-93-D-3032 Project Title: Soil Segregation and Analysis

		SD No., and type of Submittal						Contractor Action			Approving Authority Action				Contractor	
Submittal No.	Spec Section No.	Material or Product	Spec Para No.	Classification Approval by Contracting Officer *	Government or A/E Reviewer	Transportation Control No.	Planned Submittal Date	Action Code	Date of Action	Date Foward to Approved Authority/ Date Received From Contractor	Date Forwarded to other Reviewer	Date Received from other Reviewer	Action Code	Date of Action	Mailed to Contractor/ Received from Approved Authority	Remarks
(a)	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
1)		SD-18 As-Built Records														
2)		Environmental Condition Report														
3)		QC Meeting Minutes														
4)		Test Results Summary Report														
5)		Contractor Production Report														
6)		QC Report														
7)		Rework Item List														
8)		Permits (solid waste, hazardous waste, etc)														
9)		Contractor's Closeout Report														
10)		Waste Material Disposal Certificates														
11)		QC Summary Report														

*Navy Notes:
Approved By:
G: Contracting Officer
Blank: CQC Manager

*NASA Notes:
Approved By:
Blank: Contracting Officer

*Army Notes:
Classification:
GA: Government Approval
FIO: For Information Only

Action Codes:
NR: Not Reviewed
A: Approved
AN: Approved as Noted
RR: Disapproved; Revise and Resubmit

Date:

TABLE 4-1

ROBERT V. LYNCH

Mr. Lynch joined OHM in 1991 with 9 years previous experience in environmental/industrial chemistry. He has his master's degree in Chemistry and extensive field experience in the sampling, hazcatting, and analysis of hazardous materials. Mr. Lynch's duties have included sampling, report writing, field sampling, and compatibility testing.

Experience

- Project Chemist responsible for quality control of sampling and analysis of wastewater treatment at Charles George Landfill site, USACE, Tyngsboro, Massachusetts. Maintained daily contact with site and laboratory to ensure adherence to sampling and analysis QA/QC protocols. Interpreted data, wrote weekly reports, and a comprehensive final report to the USACE.

- Project Chemist at Frontier Chemical, USEPA Region II, ERCS site, Niagara Falls, New York. Responsible for preparing sampling grid for PCB-screen. Approximately 280 samples were initially hazcatted. Composite samples were prepared among compatible samples. Analysis of three 10 x 10 grids showed no PCB-contamination.

- Project Chemist at Naval Weapons Station, U.S. Navy, Yorkstown, Virginia. Obtained over 100 surface, sub-surface, and quality control samples. Additional responsibilities included field testing for explosives, data review, and preparation of a comprehensive final report.

- Mr. Lynch was the project chemist at the Ann Street USEPA Region II ERCS site in Clifton, New Jersey. He was the lead member of the sampling and field analysis team for the sampling and analysis of approximately 350 drums. Responsibilities including hazardous categorization ("hazcatting"), sampling data review, quality control, test bulking, and preparation of composite samples for disposal analysis. Mr. Lynch's hazcatting and tests bulking enabled analytical costs to be reduced approximately 95%, due to reduced number of samples requiring analyses.
- Mr. Lynch was project chemist at an industrial site in Perth Amboy, New Jersey. He was responsible for sampling, hazardous categorization ("hazcatting"), and quality control of approximately 250 drums/containers. Based upon the hazcat results, those samples that were compatible were test bulked. Composite samples were prepared for disposal analysis. Composting of compatible samples reduced transportation and disposal costs over 90 percent.

- As a project chemist, Mr. Lynch conducted soil pile sampling for arsenic. Composite samples were obtained from an established sample grid. Responsibilities included project management/site supervision.

- Mr. Lynch conducted wipe sampling of water treatment unit operations for site demobilization at the Du Pont Gill Creek project site in Niagara Falls, New York. Surfaces were independently wiped for volatiles, semi-volatiles, metals, PCBs, and cyanides, using various wetting agents.

- In October 1992, he performed on-site mobile laboratory gas chromatography analysis of soil and surface water samples for PCBs at the Michigan State University campus in Lansing, Michigan. His project responsibilities involved sample preparation and subsequent injection of samples into Tracer GC. Extent of soil remediation was determined on the basis of GC results.

- As a project chemist, Mr. Lynch assisted in the decommissioning of lead and arsenic contaminated building and material, on site at a plant in Bennington, Vermont. Responsibilities included site sample coordination, interpretation and documentation of analytical data, atomic absorption analysis of wastewater for lead, and the transportation and disposal (T&D) coordination of over 50 drums. Sampling included soil, scrap, debris, chip, and aqueous matrices.

On-site materials were disposed as hazardous or non-hazardous, based on the analytical results. Wastewater from the on-site treatment plant was discharged after lead AA analysis. T&D involved the coordination of over 50 trucks to ship waste to off site landfill disposal areas.

- As a Project Chemist at the USEPA White Chemical Site in Newark, New Jersey, Mr. Lynch was responsible for mobile laboratory analysis and bulk and compatibility testing for disposal of over 60 drums.
- Performed hazcat, bulking of 160 samples at the USEPA ERCS Region I Cabin Realty Trust site, Tauton, Massachusetts.
- Took 225 samples at the USEPA ERCS Region II Friedrichson Cooperage site, Waterford, New York.
- Took 225 samples at a site in Newark, New Jersey.
- Took 150 samples at the USEPA ERCS Region II Phelps Petroleum site, Windsor, New Jersey.
- Performed chip sampling at the NJDEPE Syncon Resins Superfund site in Kearny, New Jersey.
- Performed drum sampling on over 12 drums for a confidential client site in Secaucus, New Jersey.
- Sampled over 60 drums at a confidential client site in Secaucus, New Jersey.

Prior to joining OHM, Mr. Lynch's previous responsibilities for other firms included:

- Preparing Preliminary Assessments (PA) and Site Investigations (SI) of potential hazardous waste sites for Superfund determination. Sites were scored on the nature and degree of contamination. Assignment of sites to the National Priorities List, by the EPA, are based on scores of the SI. Mr. Lynch's responsibilities as site manager also included the preparation of work plans and health and safety plans, and the supervision of field exercises.
- Serving as an environmental consultant for small/mid-size companies in the Northern New Jersey/Metropolitan New York City area. Familiar with EPA, OSHA, DOT, New Jersey, New York State, and New York City regulations, including Right-to-Know, Toxic Chemical Release, hazardous waste, UST, air and water pollution regulations. Environmental compliance/emergency procedures manuals were prepared, which were presented as classroom instruction to the client company. He interacted with Federal, State, and local officials, for over 30 clients.
- Responsible for the research and development of filtration products. Projects involved the development of resin systems for glass fiber media.

Academic Background

M.S., Chemistry, State University of New York at Oswego, 1981
B.S., Chemistry, State University of New York at Oswego, 1978
Environmental Chemistry, Environmental Risk Assessment, New Jersey Institute of Technology, 1989-1990
Solid Waste Management, State University of New York at Stony Brook, 1989
Material Science, Fluid Mechanics, Heat Transfer, New York Institute of Technology, 1984-1985
Polymer Chemistry, Brooklyn Polytechnic Institute, 1985

Specialized Training

OSHA 40-hour Training, 1990
OSHA 8-hour Refresher Training, 1994
Corporate Environmental Chemistry Training, July 1992

APPENDIX C
SITE SPECIFIC HEALTH AND SAFETY PLAN

DRAFT

HEALTH AND SAFETY PLAN
FOR
SOIL SEGREGATION AND ANALYSIS
ALLEGANY BALLISTICS LABORATORY
ROCKET CENTER, WEST VIRGINIA

Prepared for:

DEPARTMENT OF THE NAVY
Contract No. N62470-93-D-3032
Delivery Order 0007

Prepared by:

OHM Remediation Services Corp.
Trenton, New Jersey

Robert A. Brooks, BS, CSP
District Health and Safety Manager

Reviewed by:

Gordon Miller, P.E.
Project Manager

Kevin J. McMahon, M.S., CIH
Northeast Region
Health and Safety Director

John P. Franz, P.E.
Program Manager

January 25, 1996
OHM Project 15986HS

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been developed for United States Navy, LANTDIV, Delivery Order entitled, Soil Segregation and Analysis, Allegany Ballistic Laboratory. The Delivery Order will be executed per the requirements stated in the Final Statement of Work (SOW) for Service Delivery Order per Contract No. N62470-93-D-3032, Delivery Order 0007, in cooperation with the Navy. This Delivery Order will also be executed in accordance with Naval Facilities Engineering Command (NAVFAC).

This HASP documents the policies and procedures which protect workers and the public from potential hazards posed by work at this site. OHM considers safety the highest priority during work at a site containing potentially hazardous materials and has established a goal of zero accidents for all projects. All projects will be conducted in a manner which minimizes the probability of injury, accident, or incident occurrence. This HASP is a key element in the proper planning of project work which is necessary to assure the goal of zero accidents. The HASP Certification (Appendix A) will be signed by all who actively participate at this project.

Although this plan focuses on the specific work activities planned for this site, it must remain flexible because of the nature of this work. Conditions may change and unforeseen situations may arise that require deviations from the original plan. This flexibility allows modification by the OHM supervisors and health and safety officials with approval from the project Certified Industrial Hygienist (CIH).

1.1 SITE HISTORY

OHM, in accordance with the original scope of this delivery order, excavated approximately 36 cubic yards (CY) of material from the delineated area at Site 7, the Beryllium Landfill, in June of 1994. The soil material was placed into three roll-offs. Vials of beryllium compounds, mercury compounds, and other unknown materials, were observed in the soil material. In October, 1994, one roll-off, with non-hazardous material was disposed of at a municipal landfill. Materials in the remaining two roll-offs include small vials of beryllium dust (hazardous waste code P015), small vials of mercury (hazardous waste code U151), and other unidentified containers. Additionally, a small piece of potentially explosive material, composed of approximately 40% nitroglycerin, was extracted from the excavated material.

As authorized by the Navy and WVDEP, the remaining roll-off boxes were relocated to a more secure area on the ABL facility, adjacent to Site 5. The material is being temporarily stored at this location until work outlined in the Work Plan can be initiated.

1.2 SCOPE OF WORK

The scope of work includes the following activities:

- Site mobilization/preparation
- Visual screening and segregation of waste material
- Waste sampling for characterization
- Equipment decontamination
- Site restoration/demobilization

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

2.0 KEY PERSONNEL AND MANAGEMENT

The Project Manager (PM), Site Supervisor (SS), Program Certified Industrial Hygienist (CIH) and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the Health and Safety Plan (HASP). Reporting relationships are shown in Figure 2.1

2.1 PROJECT MANAGER(PM)

The PM has the overall responsibility for the project and to assure that the goals of the construction remedial action are attained in a manner consistent with the HASP requirements. The PM will coordinate with the SS and the SSO to assure that the remedial action goals are completed in a manner consistent with the HASP. The PM will conduct a monthly health and safety audit of the project using the Management Safety Improvement Report Form. Specific Key Requirement Areas (KRA's) for safety performance include:

- Implement Safety Awareness/ Recognition programs on project if over $200,000
- Conduct monthly site audits of project (Management Safety Improvement Report)
- Implement Safety Improvement Teams if project $\geq$ 20 employees and 1 month or longer duration
- Investigate and report findings for all OSHA recordable cases; assure corrective actions are taken

2.2 SITE SUPERVISOR (SS)

The SS is responsible for field implementation of the HASP. The SS will be the main contact in any on-site emergency situation. The SS will act as the SSO if one is not assigned. The SS will conduct periodic inspections (at least weekly) of the work site to confirm compliance with all health and safety requirements. The Project Safety Improvement Checklist shall be used to document inspections. The SS is also responsible for coordinating remedial actions for all deficiencies and for enforcing the OHM "Cardinal Safety Rules". Specific Key Requirement Areas (KRA's) for safety performance include:

- Complete Job Safety Analyses for all principle tasks
- Implement Safety Awareness/ Recognition program if project is over $200,000
- Conduct weekly safety inspections of job sites
- Implement Safety Improvement Team if project $\geq$ 20 employees and 1 month or longer duration
- Correct all deficiencies as noted on Management Safety Improvement Reports and safety department audits, within recommended time frames
- Investigate and report findings for all OSHA recordable cases; assure corrective actions are taken

2.3 SITE SAFETY OFFICER (SSO)

The SSO has responsibility for administering the HASP relative to site activities, and will be in the field full-time while site activities are in progress. The SSO's primary operational responsibilities include personal and environmental monitoring, coordination of job safety analyses, selection and care of personal protective equipment, assignment of protection levels and review of work permits. The SSO will monitor all field activities involved with safety and is authorized to stop work when an imminent health or safety risk exists. The SSO is responsible for informing all on-site personnel of essential safety requirements and facilitating the daily safety meetings. Specific Key Requirement Areas (KRA's) for safety performance include:

- Monitor workers for signs of stress, such as cold exposure, heat stress, and fatigue
- Reevaluate site conditions on an on-going basis. Coordinate protective measures including engineering controls, work practices and personal protective equipment
- Assist the SS in the preparation, presentation and documentation of daily safety meetings
- Conduct and prepare reports of daily safety inspections of work processes, site conditions, equipment conditions and submit to SS. Discuss any necessary corrective actions with the SS and review new procedures
- Initiate revisions of the HASP as necessary for new tasks or modifications of existing operations and submit to the Program CIH for approval
- Perform air monitoring as required
- Assist the PM and SS in accident investigations
- Prepare permits for special operations, e.g., hot work, confined spaces, line breaking, etc.
- Maintain site safety records
- Conduct weekly inspections of all fire extinguishers, supplied air respirators, first-aid kits, and eye washes/emergency showers
- Ensure that project management/purchasing has pre-qualified sub contractors. Inform subcontractors of the elements of the HASP/contractor pre-job checklist
- Coordinate the preparation of Job Safety Analyses with the SS, team leader, and work crew
- Coordinate the daily Safety Observer Program
- Coordinate the Safety and Health Awareness and Recognition Program (SHARP) with Project Manager and Supervisor
- Coordinate the Site Safety Improvement Team on an as-necessary basis

2.4 DISTRICT HEALTH AND SAFETY MANAGER (DHSM)

The DHSM is responsible for staffing health and safety personnel and monitoring projects for compliance with regulatory and OHM health and safety policies and procedures. This position reports to the District Manager (DM) and will audit the site periodically to ensure compliance with this HASP.

2.5 PROGRAM CERTIFIED INDUSTRIAL HYGIENIST (CIH)

The Program CIH is responsible for overseeing development of the HASP and ensures that the HASP complies with all federal, state and local health and safety requirements. The Program CIH provides technical and administrative support for the LANTDIV Health and Safety Program. If necessary, the CIH can modify specific aspects of the HASP to adjust for on-site changes that affect safety. The CIH will coordinate with the DHSM and SSO on all modifications to the HASP and will be available for consultation when required. The CIH will not necessarily be on site during OHM activities but may make periodic site visits to determine compliance. The CIH reports to the Regional Vice President/General Manager.

2.6 EMPLOYEE SAFETY RESPONSIBILITY

Each employee is responsible for personal safety as well as the safety of others in the area. The employee will use all equipment provided in a safe and responsible manner as directed by the SS. All OHM personnel will follow the policies set forth in OHM's Health and Safety Procedures Manual, with particular emphasis on the OHM "Cardinal Safety Rules." Employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions.

2.7 KEY SAFETY PERSONNEL

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

Project Manager	Gordon Miller, P.E. 609-584-6392 (office)
Site Supervisor	Tom Sharpless 609-869-8964 (pager) To be determined(site phone)
Site Safety Officer	Darryl Mike, ASP 609-869-8972 (pager) To be determined(site phone)
Program Manager for LANTDIV	John Franz, P.E. 609-588-6477 (office)
Southern District Health and Safety Manager	Robert Brooks, BS, CSP 609-588-6423 (office) 800-818-2185 (pager)
Northeast Region Health and Safety Director/Program CIH	Kevin McMahon, M.S., CIH 609-588-6375 (office) 609-421-7523 (pager)
Vice President, Health and Safety	Fred Halvorsen, Ph.D., PE, CIH 800-231-7031

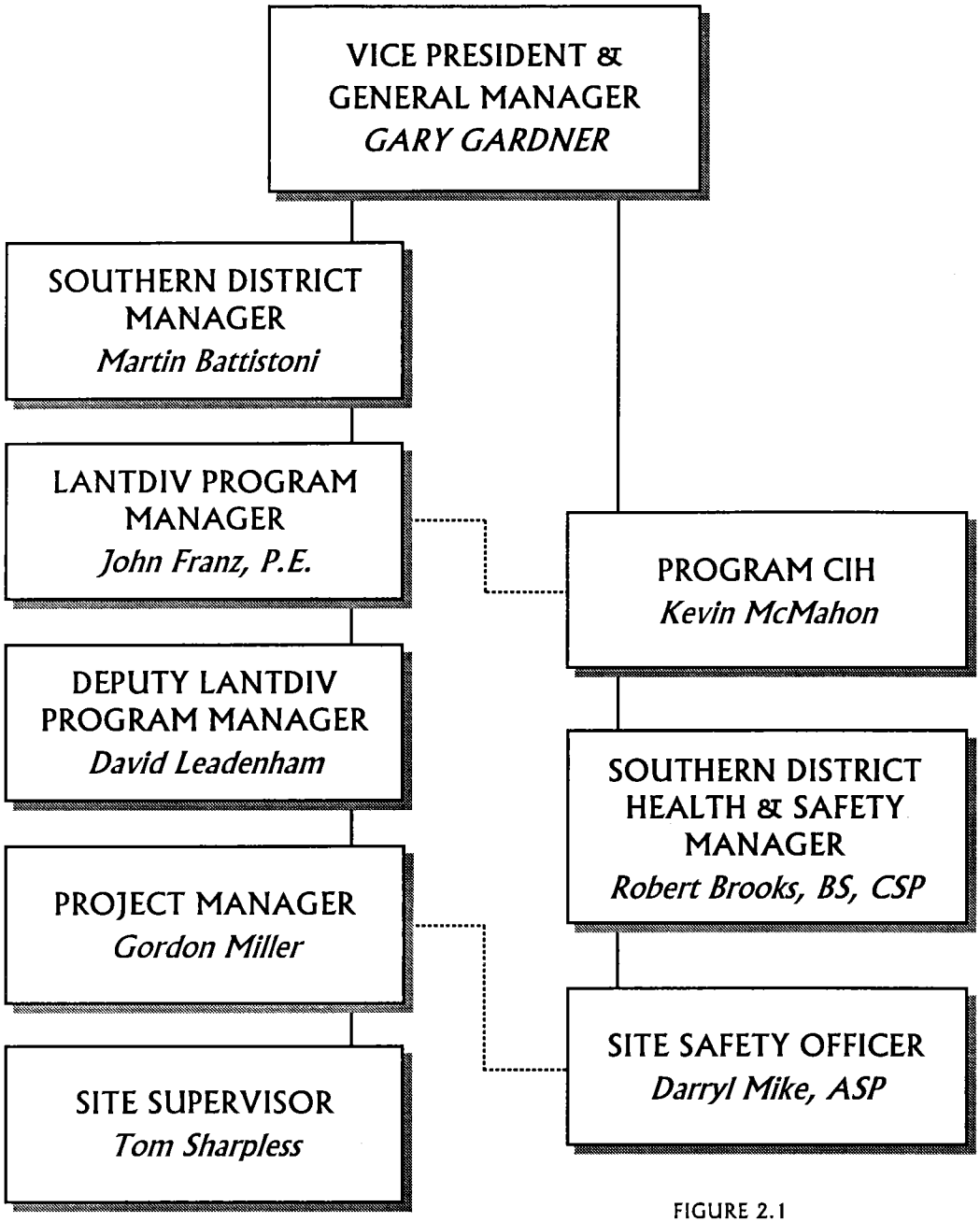


FIGURE 2.1

HEALTH & SAFETY ORGANIZATION
Remedial Action
Soil Segregation Analysis
Allegany Ballistics Laboratory
Rocket Center, West Virginia
Delivery Order 0007
OHM Project 15986

Prepared for

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA

3.0 JOB SAFETY ANALYSES

This section outlines the potential chemical and physical hazards which workers may be exposed to during work on this project. Section 3.1 lists significant contaminant identified at the site. A Material Safety Data Sheet (MSDS) list is included in Appendix C.

3.1 CHEMICAL HAZARDS

TABLE 3.1
CHEMICAL HAZARDS

CHEMICAL	EXPOSURE ROUTES	PEL/TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
Beryllium	Inhalation	0.002 mg/m^3 (TLV)	Is highly toxic by inhalation of fume or dust. Prolonged or repeated skin contact can cause skin irritation or dermatitis. Eye contact can produce conjunctivitis (Carcinogen)
			Non-combustible solid in bulk form, but a slight explosion hazard in the form of powder or dust.
Mercury	Eye, skin, inhalation, ingestion	0.05 mg/m^3 (TLV) (Skin)	Is a slowly cumulative poison that concentrates in the brain, kidneys, and liver. Causes erosions of the respiratory/GI tracts, nausea, vomiting, bloody diarrhea, headache, metallic taste, also can cause tremors, emotional problems, loss of concentration, depression, drowsiness, fatigue, insomnia, loss of memory, kidney problems, eye lesions, vision disturbances, sore mouth and throat problems with sense of taste or smell, nose bleeds, nasal inflammation, loss of weight or appetite, poor hand-eye coordination, awkwardness, unsteadiness, as well as dermatitis.
Nitroglycerine	Absorption, Inhalation, Ingestion	0.1 mg/m^3 PEL (Skin)	A human poison by an unspecified route. Acute symptoms of poisoning are headaches, nausea, vomiting, abdominal cramps, convulsions, circulatory collapse, reduced blood pressure, excitement, respiratory rales, and cyanosis.
			A dangerous fire hazard when exposed to heat, flame, or chemical reaction. A severe explosion hazard when exposed to shock, heat, or UV radiation.

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

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

3.2 PHYSICAL HAZARDS

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

The Site Supervisor (SS) and Site Safety Officer (SSO) will observe the general work practices of each crew member and equipment operator, and enforce safe procedures to minimize physical hazards. Hard hats, safety glasses, and steel-toe safety boots are required in all areas of the site. Site-specific hazards and all necessary precautions will be discussed at the daily safety meetings. The Health and Safety Procedures Manual for LANTDIV will be maintained at the project site as a reference document.

3.3 ENVIRONMENTAL HAZARDS

Environmental factors such as weather, wild animals, insects, and irritant plants pose a hazard when performing outdoor work. The SSO and SS will take all necessary measures to alleviate these hazards should they arise.

3.3.1 Heat Stress

The combination of warm ambient temperature and protective clothing result in the potential for heat stress. Heat stress disorders include:

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

Heat stress prevention is outlined in procedure No. 22 of the OHM Corp. LANTDIV Health and Safety Procedures manual. This information will be reviewed during safety meetings. Workers will be encouraged to increase consumption of water and electrolyte-containing beverages (e.g., Gatorade).

It is recommended that workers break approximately every 2 hours for 10 to 15 minute rest periods when temperatures rise above 72.5 degrees Fahrenheit and protective clothing is worn. In addition, workers are encouraged to take rests whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased upon worker recommendation to the SSO and SS. Heat stress can be prevented by assuring an adequate work/rest schedule; guidelines are printed below.

AMBIENT TEMPERATURE	NO CHEMICAL PROTECTIVE CLOTHING (LEVEL D PPE)	CHEMICAL PROTECTIVE CLOTHING (D+/C/B/A)
90° F or above	After 45 minutes of work	After 15 minutes of work
87.5° - 90° F	After 60 minutes of work	After 30 minutes of work
82.5° - 87.5° F	After 90 minutes of work	After 60 minutes of work
77.5° - 82.5° F	After 120 minutes of work	After 90 minutes of work
72.5° - 77.5° F	After 150 minutes of work	After 120 minutes of work

The work/rest schedule can be calculated based on heat stress monitoring results. Monitoring consists of taking the radial pulse of a worker for 30 seconds immediately after exiting the work area. The frequency of monitoring is provided herein.

If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by ⅓ and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, increase the following rest period by ⅓. The initial rest period should be at least 10 minutes.

Monitoring for heat stress will begin when the ambient temperature reaches or exceeds 70 degrees Fahrenheit when wearing chemical protective clothing, or 80 degrees Fahrenheit for site activities performed with no chemical protective clothing (Level D). Monitoring will include pulse rate, weight, oral temperature and signs and symptoms of heat stress. See Procedure 22 LANTDIV Health and Safety Procedures Manual.

3.3.2 Exposure to Cold

With outdoor work in the winter months, the potential exists for hypothermia and frostbite.

Protective clothing greatly reduces the possibility of hypothermia in workers. However, personnel will be instructed to wear warm clothing and to stop work to obtain more clothing if they become too cold. Employees will also be advised to change into dry clothes if their clothing becomes wet from perspiration or from exposure to precipitation.

In cold weather, the potential for frostbite exists, especially in body extremities. Personnel will be instructed to pay particular attention to hands, feet, and any exposed skin when dressing. Personnel will be advised to obtain more clothing if they begin to experience loss of sensation due to cold exposure.

Employees will be encouraged to use the heated shelters on site at regular intervals depending upon the severity of ambient temperatures. Symptoms of cold stress, including heavy shivering, excessive fatigue, drowsiness, irritability, or euphoria necessitate immediate return to the shelter.

3.3.3 Biological Hazards

- POISON IVY (*Rhus Radicans*)

  Poison Ivy may be found at the site. It is highly recommended that all personnel entering into an area with poison ivy wear a minimum of a tyvek coverall, to avoid skin contact.

  The majority of skin reactions following contact with offending plants are allergic in nature and characterized by:

  - General symptoms of headache and fever
  - Itching
  - Redness
  - A rash

  Some of the most common and most severe allergic reactions result from contact with plants of the poison ivy group, including poison oak and poison sumac. Such plants produce severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim may develop a high fever and feel very ill. Ordinarily, the rash begins within a few hours after exposure, but may be delayed 24 to 48 hours.

Distinguishing Features of Poison Ivy Group Plants

The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each. Both plants have greenish-white flowers and berries that grow in clusters. (See Figure 3.1.)

First Aid

a. Remove contaminated clothing; wash all exposed areas thoroughly with soap and water, followed by rubbing alcohol.

b. Apply calamine or other soothing lotion if rash is mild.

c. Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity.

- TICKS

Heavily vegetated areas of a site may have ticks. It is highly recommended that all personnel walking through such areas wear a tyvek coverall and latex boot covers taped at all joints. The ticks will stand out against the light colors. A tick or insect repellent containing DEET is recommended.

Ticks can transmit several diseases, including Rocky Mountain spotted fever, a disease that occurs in the eastern portion of the United States as well as the western portion, and Lyme disease. Ticks adhere tenaciously to the skin or scalp . There is some evidence that the longer an infected tick remains attached, the greater is the chance that it will transmit disease.

First Aid

a. Carefully (slowly and gently) remove the tick with tweezers, taking care that all parts are removed.

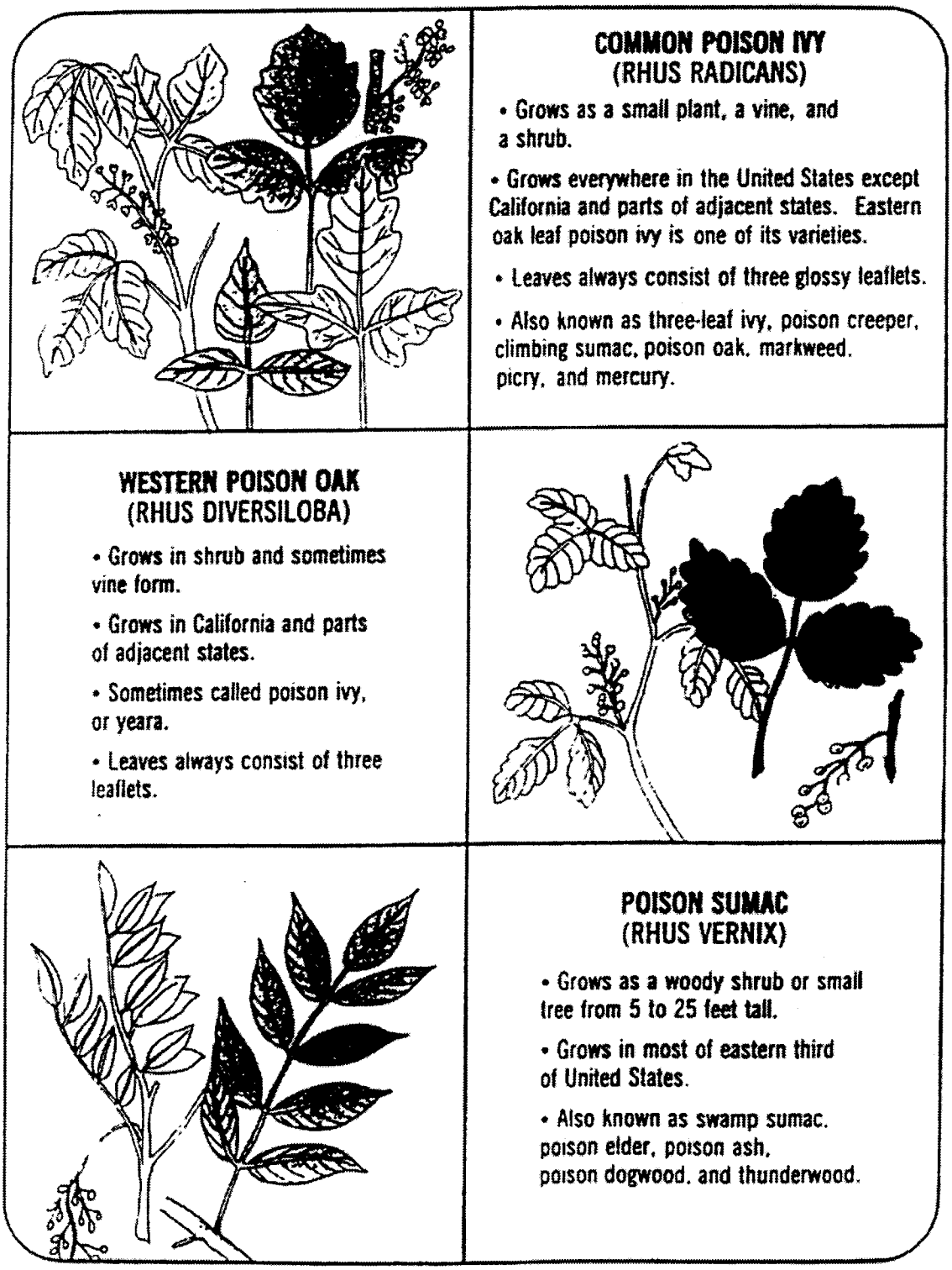
b. With soap and water, thoroughly, but gently, scrub the area from which the tick has been removed, because disease germs may be present on the skin; also wipe the bite area with an antiseptic.

c. If you have been bitten, place the tick in a jar labeled with the date, location of the bite, and the location acquired. If any symptom appears, such as an expanding red rash, contact a physician immediately.

- LYME DISEASE

Lyme disease may cause a number of medical conditions, including arthritis, that can be treated if you recognize the symptoms early and see your doctor. Early signs may include a flu-like illness, an expanding skin rash and joint pain. If left untreated, Lyme disease can cause serious nerve and heart problems as well as a disabling type of arthritis.

FIGURE 3.1
POISONOUS PLANTS



You are more likely to spot early signs of Lyme disease rather than see the tick or its bite. This is because the tick is so small (about the size of the head of a common pin or a period on this page and a little larger after they fill with blood), you may miss it or signs of a bite. However, it is also easy to miss the early symptoms of Lyme disease.

In its early stage, Lyme disease may be a mild illness with symptoms like the flu. It can include a stiff neck, chills, fever, sore throat, headache, fatigue, and joint pain. But this flu-like illness is usually out of season, commonly happening between May and October when ticks bite.

Most people develop a large, expanding skin rash around the area of the bite. Some people may get more than one rash. The rash may feel hot to the touch and may be painful. Rashes vary in size, shape, and color, but often look like a red ring with a clear center. The outer edges expand in size. Its easy to miss the rash and the connection between the rash and the tick bite. The rash develops from three days to as long as a month after the tick bite. Almost one third of those with Lyme disease never get the rash.

Joint or muscle pain may be another early sign of Lime disease. These aches and pains may be easy to confuse with the pain that comes from other types of arthritis. However, unlike many other types of arthritis, this pain seems to move or travel from joint to joint.

In later stages, Lyme disease may be confused with other medical problems. These problems can develop months to years after the first tick bite.

Early treatment of Lyme disease symptoms with antibiotics can prevent the more serious medical problems of later stages. If you suspect that you have symptoms of Lime disease, contact your doctor.

Lyme disease can cause problems with the nervous system that look like other diseases. These include symptoms of stiff neck, severe headache, and fatigue usually linked to meningitis. They may also include pain and drooping of the muscles on the face, called Bell's Palsy. Lyme disease can also mimic symptoms of multiple sclerosis or other types of paralysis.

Lyme disease can also cause serious but reversible heart problems, such as irregular heart beat. Finally, Lyme disease can result in a disabling, chronic type of arthritis that most often affects the knees. Treatment is more difficult and less successful in later stages. Researchers think these more serious problems may be linked to how the body's defense or immune system responds to the infection.

3.3.4 Noise

Hearing protection is required for workers operating or working near heavy equipment, where the noise level is greater than 85 dbA (TWA) as well as personnel working around heavy equipment. The SSO will determine the need for and appropriate testing procedures, i.e., sound level meter and/or dosimeter for noise measurement.

3.4 JOB SAFETY ANALYSIS

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

3.4.1	JOB SAFETY ANALYSIS FOR SITE PREPARATION	
TASK BREAKDOWN	**POTENTIAL HAZARDS**	**HAZARD CONTROL MEASURES**
Equipment/ Facility Set-up	Slips, Trips, Falls	• Clear walkways work areas of equipment, tools, vegetation, excavated material and debris • Mark, identify, or barricade other obstructions
	Electrical Shock	• De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Maintain tools in a safe condition • 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 and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout-Tagout procedures in accordance with OHM Health and Safety Procedures #38
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use

3.4.1	JOB SAFETY ANALYSIS FOR SITE PREPARATION	
TASK BREAKDOWN	**POTENTIAL HAZARDS**	**HAZARD CONTROL MEASURES**
Equipment/ Facility Set-up (Continued)	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 22, 23

3.4.2 JOB SAFETY ANALYSIS FOR SCREENING AND SEGREGATION OF WASTE MATERIAL		
TASK BREAKDOWN	**POTENTIAL HAZARDS**	**HAZARD CONTROL MEASURES**
Screening and Segregation of Waste Material	Struck by/Against Heavy Equipment, Flying Debris, Protruding Objects • Forklift • Backhoe	• 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 • Understand and review posted hand signals
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	High Noise Levels • Backhoe	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	Handling Heavy Objects • Waste Material • Containers	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Slips, Trips, Falls • Debris Material • Roll-offs •Uneven terrain	• Maintain good housekeeping • Clear, walkways of equipment, construction debris, & other materials • Mark, identify, or barricade other obstructions • Use approved ladders in accordance with OHM Health & Safety Procedures Manual
	Inhalation and Contact with Hazardous Substances • Beryllium • Mercury • Nitroglycerin	• Provide workers proper skin, eye and respiratory protection as indicated in Sections 5 and 7 • Review hazardous properties of site contaminants with workers before operations begin

3.4.2 JOB SAFETY ANALYSIS FOR SCREENING AND SEGREGATION OF WASTE MATERIAL

TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Screening and Segregation of Waste Material (Continued)	Fire/ Explosion • Nitroglycerin containing materials	• Use remote operations at all times while segregating the waste material containing nitroglycerin • Eliminate sources of ignition from the work area • Prohibit smoking • Provide ABC (or equivalent) fire extinguishers in all work areas, flammable storage areas, generator and compressor locations • Store flammable liquids in well ventilated areas • Post "NO SMOKING" and hazardous waste, explosives, danger keep out 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 • Technical representative from Alliant Techsystems and an OHM EOD specialist must be on standby to identify possible explosive materials
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures 22 and 23

3.4.3	JOB SAFETY ANALYSIS FOR WASTE STREAM SAMPLING	
TASK BREAKDOWN	**POTENTIAL HAZARDS**	**HAZARD CONTROL MEASURES**
Waste Stream Sampling	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Slips, Trips, Falls	• Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris • Mark, identify, or barricade other obstructions
	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present (see Section 5.0 HASP) • Review hazardous properties of site contaminants with workers before operations begin
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures #22, 23

3.4.4 JOB SAFETY ANALYSIS FOR EQUIPMENT DECONTAMINATION

TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Heavy Equipment & Vehicles	Slips, Trips, Falls	• Clear, walkways of equipment, construction debris, & other materials • Mark, identify, or barricade other obstructions
	Struck by/Against Heavy Equipment, Protruding Objects	• 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 • Understand and review posted hand signals
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb. maximum per person manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Sharp Objects	• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures 22 and 23
	Slips, Trips, Falls	• Clear, walkways of equipment, construction debris, & other materials • Mark, identify, or barricade other obstructions
	Flammable, Toxic, Oxygen deficient Atmospheres	• Test vessel atmosphere for flammable/toxic vapors, and oxygen deficiency • Wear proper level of PPE for the type of atmospheric contaminants • Use body harness, safety belt with tripod wench for possible rescue • Obtain Confined Space Entry Permit signed by Supervisor/Safety Officer • De-energize, lock-out and tag all energized equipment • Provide safety observer outside vessel • Provide written rescue plan • Review emergency procedures before work commences

3.4.4 JOB SAFETY ANALYSIS FOR EQUIPMENT DECONTAMINATION

TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Heavy Equipment & Vehicles (Continued)	Inhalation and Contact with Hazardous Substances	• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present (See Sections 5.0 and 7.0) • Review hazardous properties of site contaminants with workers before operations begin • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times • 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)
	Slips, Trips, Falls	• Clear, walkways of equipment, construction debris, & other materials • Mark, identify, or barricade other obstructions

3.4.5	JOB SAFETY ANALYSIS FOR SITE RESTORATION	
TASK BREAKDOWN	**POTENTIAL HAZARDS**	**HAZARD CONTROL MEASURES**
Site Restoration	Struck by, Against Heavy Equipment, Protruding Objects	• Use reflective warning vests when exposed to vehicular traffic • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times • Understand and review hand signals
	Slips, Trips, Falls	• Clear, walkways of equipment, tools, debris, other materials • Mark, identify, or barricade other obstructions
	High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	Handling Heavy Objects	• Observe proper lifting techniques • Obey sensible lifting limits (60 lb per person for manual lifting) • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Contact Dermatitis	• Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants (See Section 5.0 HASP) • Identify and review poisonous plants with workers
	High/Low Ambient Temperature	• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 22, 23

3.5 ACCIDENT PREVENTION

This Site Specific Health and Safety Plan has been developed with accident Prevention as the primary goal. Details are discussed throughout this HASP. This section will outline the accident prevention plan developed for this project.

3.5.1 Administrative Responsibilities

The Project Manager (PM) is ultimately responsible for the safety and health of site personnel. The PM is to provide the materials and maintenance of equipment necessary to enhance and maintain safe working conditions.

The SS has the responsibility and the authority to control the day to day remediation activities in the field. The SS reports directly to the Project Manager. He is to watch employees for signs of heat stress, excessive fatigue, and obvious outward signs of chemical exposure. In addition, he is to ensure that equipment brought to the site is in proper working condition and inspected regularly.

The Site Safety Officer reports to the Project Manager and the District Health and Safety Manager and is responsible to point out unsafe conditions that may pose a hazard to site personnel or the public. The SSO is required to conduct regular safety inspections. In the event of an accident, the accident investigation will be initiated by the SS and the SSO.

3.5.2 Phase Safety Plan

A Phase Safety Plan (Appendix F) will be developed for each contract activity and operation occurring in each major phase of work: The phase safety plans will be developed from the Activity Hazard Analyses presented in Section 3.4. The Phase Safety Plan will be job specific and will address the following points.

- Sequence of work
- Hazards to be controlled in each activity
- Measures to control hazards

The Phase Safety Plan will be discussed with the Client Representative and with site personnel. Work activities will not proceed until the Phase Safety Plan has been accepted by the client representative.

3.5.3 Site Specific Training

All field employees have received at least 40 hours of OSHA Hazardous Waste Operations training. Prior to working on site, all site personnel will undergo a safety and health orientation where the HASP and site conditions will be discussed. Prior to each shift, a daily safety meeting will be held discussing the previous day's and the current days's health and safety issues.

In addition, when a new task or phase of the project is begun, OHM will prepare a Phase Safety Plan (Activity Hazard Analysis) for that task or phase. The analysis will address the hazards for each activity performed in that phase and will present the procedures and safeguards necessary to eliminate the hazards or reduce the risk. The analysis will be discussed with site personnel that will perform the work and attendance will be documented.

3.5.4 Subcontractors

All subcontractors are subject to the same training requirements as other field personnel. Subcontractors will be required to sign in daily and be required to attend a daily meeting discussing operations and safety issues. The subcontractor reports directly to the OHM Project Manager.

3.5.5 Local Requirements

OHM will comply with any applicable local requirements such as noise control and traffic rules at the Allegany Ballistics Laboratory. Traffic control will be developed as is needed for specific tasks.

3.5.7 Housekeeping

The project site will be kept in a neat and orderly fashion to prevent common injuries due to slips, trips, and falls, accumulation of trash to keep insects away, and to maintain a professional work site. Personnel shall not leave a work area in a disorderly condition. The SS is responsible for maintaining continued job cleanup and safety access and egress.

3.5.8 Emergency and Contingency Plan

Fire extinguishers (ABC type) in ready condition and with a current inspection record are to be placed in every work area on the job site. OHM has developed an emergency contingency plan provided in Section 8.0 of this HASP.

3.5.9 Safety Inspections

The SSO and SS will perform regular safety inspections. A report, including results of the inspection and any corrective actions taken will be maintained in the project files. A copy will be provided to the client representative.

3.5.10 Accident Investigation

All injuries or occupational illnesses must be investigated and the Accident/Injury Report Form completed. In the case of an injury to an employee that requires medical treatment, the following steps will be followed:

- Procure medical treatment for employee as described in Section 8.0 of this HASP
- The SSO and SS will investigate the incident and fill out Accident/Injury Report Form
- Employer's Report of Injury will be filled out and sent to the Worker's Compensation Insurance company within 48 hours of an injury or within 24 hours of a lost time injury or death. A claim for worker's compensation benefits must also be submitted.
- Notify the Client Representative within 24 hours of the injury
- OSHA Form 200 Log will be updated if the injury is recordable under 29 CFR 1904
- A report must be obtained from the physician clearing the employee to resume regular duties, describing modified work acceptable, or removing the employee from work duty.

4.0 WORK AND SUPPORT AREAS

To prevent migration of contamination caused through tracking by personnel or equipment, work areas and personal protective equipment will be clearly specified prior to beginning operations. OHM has designated work areas or zones as suggested by the NIOSH/OSHA/USCG/EPA'S document, titled "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities." The site will be divided into three zones as follows:

- An Exclusion or "hot" Zone (EZ)
- A Contamination Reduction Zone (CRZ)
- A Support Zone (SZ)

4.1 EXCLUSION ZONE

The EZ is the area suspected of having contamination and presents the greatest potential for worker exposure. Personnel entering the area must wear the mandated level of protection for that area. In certain instances, different levels of protection will be required depending on the tasks and monitoring performed within that zone. The EZ for this project will be the roll-off area set aside for screening and segregation of the waste, material.

4.2 CONTAMINATION REDUCTION ZONE

The CRZ or transition zone will be established between the EZ and SZ. In this area, personnel will begin the sequential decontamination process required to exit the EZ. To prevent off-site migration of contamination and for personnel accountability, all personnel will enter and exit the EZ through the CRZ. The CRZ for this project will be immediately adjacent to the EZ.

4.3 SUPPORT ZONE

The SZ serves as a clean, control area. Operational support facilities are located within the SZ. Normal work clothing and support equipment are appropriate in this zone. Contaminated equipment, or clothing will not be allowed in the SZ. The support facilities should be located upwind of site activities. There will be a clearly marked controlled access point from the SZ into the CRZ and EZ that is monitored closely by the Site Safety Office (SSO) and the Site Supervisor (SS) to ensure proper safety protocols are followed. The office trailer will be located in the support zone.

4.4 SITE CONTROL LOG

A log of all personnel visiting, entering or working on the site will be maintained in the main office trailer location. The log will record the date, name, company or agency, and time entering or exiting the site.

No visitor will be allowed in the EZ without showing proof of training and medical certification as 29 CFR 1910.120 (e)(f). Visitors will supply their own boots and respiratory equipment, if required. Visitors will attend a site orientation given by the SSO and sign the HASP Certification (Appendix A).

4.5 GENERAL

The following items are requirements to protect the health and safety of workers and will be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and ingestion of contamination is prohibited in the EZ and CRZs.

- Hands, arms, neck and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco and smoking or other activities which may result in ingestion of contamination.

- A buddy system will be used. Hand signals will be established to maintain communication.

- During site operations, each worker will consider himself as a safety backup to his partner. Off-site personnel provide emergency assistance. All personnel will be aware of dangerous situations that may develop.

- Visual contact will be maintained between buddies on site when performing hazardous duties.

- No personnel will be admitted to the site without the proper safety equipment, training, and medical surveillance certification.

- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SSO or the SS, will be immediately dismissed from the site.

- Proper decontamination procedures must be followed before leaving the site.

- All employees and visitors must sign in and out of the site.

5.0 PROTECTIVE EQUIPMENT

This section addresses the various levels of personal protective equipment (PPE) which are or may be required at this job site. OHM personnel are trained in the use of all PPE utilized.

5.1 ANTICIPATED PROTECTION LEVELS

TASK	PROTECTION LEVEL	COMMENTS/MODIFICATIONS
Site Mobilization/Set-up	D	Hardhat, steel-toe work boots, safety eye wear (safety glasses with side shields or goggles and face shield if splash or flying particles are likely) and hearing protection >85 dBA
Screening and Segregation of Waste Material	B	Tyvek suit, PVC/latex boots, airline respirator, hard hat, steel toe boots, surgical and leather gloves
Equipment Decontamination, CRZ Workers	C/Modified D	Based on air monitoring results. Equipment will include that listed in Sections 5.2.2 (Mod. D) or 5.2.3 (Level C). Along with rain gear and splash shields for pressure washing.
Site Restoration	D	Hardhat, steel-toe work boots, safety eye wear (safety glasses with side shields or goggles and face shield if splash or flying particles are likely) and hearing protection >85 dBA
SZ Workers	D	

5.2 PROTECTION LEVEL DESCRIPTIONS

This sections lists the minimum requirements for each protection level. Modification to these requirements will be as noted above.

5.2.1 Level D

Level D consists of the following:

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

5.2.2 Modified Level D

Modified Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots

- Neoprene, latex or PVC overboots
- Outer leather or PVC gloves over latex sample gloves (2 pair)
- Face shield (when projectiles or splashes pose a hazard)
- Tyvek coverall [Polyethylene-coated Tyveks required when workers have a potential to be exposed to contaminated liquids or sludges.]

5.2.3 Level C

Level C consists of the following:

- Full-face, air-purifying respirator with appropriate cartridges, MSA Mersorb-H
- Hooded Tyvek Coveralls
- Hard hat
- Steel-toed work boots
- Neoprene, latex or PVC overboots
- Leather or PVC gloves over latex sample gloves (2 pair)
- Face shield (when projectiles or splashes pose a hazard)

5.2.4 Level B

Level B protection consists of the items required for Level C protection with the exception that an air-supplied respirator is used in place of the air-purifying respirator. Level B protection will be used during the screening and segregation process until air monitoring can justify downgrading to Level C

5.2.5 Level A

Level A protection consists of the items required for Level B protection with the addition of a fully-encapsulating, vapor-proof suit capable of maintaining positive pressure. Level A is not expected to be utilized during the project.

5.3 SUPPLIED-AIR RESPIRATORS

OHM personnel will wear Survivair 9881-02 Hippack Airline respirators with 5-minute egress bottles. Personnel requiring Level "B" protection and high mobility will wear Survivair Mark 2 SCBA units.

5.4 BREATHING-AIR QUALITY

Code of Federal Regulations 29 CFR 1910.134 states breathing air will meet the requirement of the specificatior for Grade D breathing air as described in the ANSI/CGA Specification G-7.1-1989. OHM requires a certificate of analysis from vendors of breathing air in order to show that the air meets this standard. Breathing air will be obtained in cylinders exclusively and will be stationed in the exclusion zone (EZ).

5.5 AIR-PURIFYING RESPIRATORS

A NIOSH approved full face respirator with appropriate air purifying cartridges will be used for level C work.

5.6 RESPIRATOR CARTRIDGES

The crew members working in Level C will wear respirators equipped with Mersorb-H cartridges approved for the following contaminants.

- Metallic mercury vapor and chlorine
- Dusts, fumes and mists with a TWA <0.05 mg/m^3
- Asbestos-containing dusts and mists
- Radionuclides

5.7 CARTRIDGE CHANGES

All cartridges will be changed a minimum of once per week, or more frequently if personnel begin to experience increased inhalation resistance or when the end of life indicator appears. Cartridges will be labeled with the date service began.

5.8 INSPECTION AND CLEANING

Respirators are checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after each use.

5.9 FIT TESTING

Annual respirator fit tests are required of all personnel wearing negative-pressure respirators. The test will use isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used.

5.10 FACIAL HAIR

No personnel who have facial hair which interferes with the respirator's sealing surface will be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

5.11 CORRECTIVE LENSES

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.12 CONTACT LENSES

Contact lenses will not be worn with any type of respirator.

5.13 MEDICAL CERTIFICATION

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees must have a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

5.14 SITE SPECIFIC PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM

The primary objective of the PPE program is to ensure employee protection and to prevent employee exposure to site contaminants during operations. Engineering controls are not feasible for many tasks and, therefore, require the use of PPE.

The site supervisor will be responsible for implementing all aspects of the PPE program. This includes donning and doffing, temperature related stress monitoring, inspection, and decontamination (see Section 6.0). PPE selection is identified in Section 5.1 for each specified task. The SS, in consultation with the SSO, if assigned, District Health and Safety Manager and project CIH will direct changes in PPE based on changing conditions. The site specific HASP will served as written certification that the workplace was evaluated concerning PPE requirements. OHM Corporation's comprehensive PPE Program is described in Appendix D.

5.14.1 Site-specific Respiratory Protection Program

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

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

6.0 DECONTAMINATION PROCEDURES

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

6.1 PERSONNEL DECONTAMINATION

Decontamination procedures will ensure that material which workers may have contacted in the EZ does not result in personal exposure and is not spread to clean areas of the site. The specific stages for levels C and B Decontamination are listed below:

Level C Decontamination

1. Go to end of EZ
2. a. Wash outer boots (Tingley or Robars) and stage to let dry; or
   b. Remove and discard latex booties
3. Remove outer gloves and discard (Leather gloves may be reused, but will remain in the dirty side of the decontamination).
4. Remove outer suit (Tyvek)
5. Remove outer sample gloves and discard
6. Cross into CRZ (dirty side of respirator wash area)
7. Remove inner suit and discard, if applicable
8. Remove and wash respirator (4 stages)
   a. Soap and water solution
   b. First rinse
   c. Disinfect respirator (1 cap full of bleach to 1 gallon of water)
   d. Final rinse
9. Hang respirator to dry
10. Remove inner sample gloves and discard
11. Wash face and hands

Level B Decontamination

1. Go to end of EZ
2. a. Wash outer boots (Tingley or Robars) and stage to let dry; or
   b: Remove and discard latex booties
3. Remove outer gloves and discard
4. Cross into CRZ
5. Disconnect airline, remove egress system, and disconnect egress from mask
6. Stage egress bottle for cleaning
7. Remove outer suit
8. Remove outer sample gloves and discard
9. Move to respirator wash area, and wash egress mask and related hose line
   a. Soap and water solution
   b. First rinse
   c. Disinfect respirator (1 cap full of bleach to 1 gallon of water)
   d. Final rinse
10. Hang egress mask (upside down) and line to dry
11. Remove inner sample gloves and discard
12. Wash face and hands

6.1.1 Suspected Contamination

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

6.1.2 Personal Hygiene

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

6.2 EQUIPMENT DECONTAMINATION

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

6.3 DISPOSAL

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

7.0 AIR MONITORING

Air monitoring will be conducted in order to determine airborne contamination levels. This ensures that respiratory protection is adequate to protect personnel against the chemicals that are encountered. The following air monitoring efforts will be used at this site. Additional air monitoring may be conducted at the discretion of the Site Safety Officer (SSO).

The following chart describes the air monitoring required and appropriate action levels.

Monitoring Device	Action Level	PPE	Action
LEL/O_2	>10% LEL <20.8% O_2		Evacuate area, ventilate, upgrade to Level B if necessary, continue to monitor
Mercury Vapor Sniffer	0- 0.05 mg/m^3	Level C with MSA Mersorb-H cartridges	
	>0.05 mg/m^3	Level B	
Mini-Ram (total dust)	<1.0 mg/m^3	Level D	
	≥1.0 mg/m^3 - ≤10.0 mg/m^3	Level C	
	>10.0 mg/m^3	Level B	
Beryllium Personal Air Sampling Pump	0 - 1 $\mu g/m^3$	Level C	Control dust levels with water spray
	>1 $\mu g/m^3$	Level B	

7.1 LOWER EXPLOSIVE LIMIT/OXYGEN (LEL/O_2) METER

Prior to entering a confined-space area or hot work involving welding, cutting, or other high heat-producing operations where flammable or combustible vapors may be present, LEL/O_2 measurements will be taken.

7.2 MERCURY VAPOR SNIFFER

A Mercury Vapor Sniffer will be used to monitor elemental mercury in air. The mercury vapor sniffer is useful as a direct reading instrument to aid in determining if respiratory protection needs to be upgraded and if the EZ needs to be redefined.

7.3 PORTABLE DUST MONITOR

A mini-ram will be used to monitor the general respirable dust levels on this site. The air sampling will be performed at designated locations at the site perimeter, upwind of the active work areas in the EZ. Site conditions will determine the frequency and duration of dust monitoring. Mini-ram readings will trigger dust abatement actions and PPE upgrades.

7.3.1 Type and Operational Aspects

- Real-Time Aerosol Monitor (Mini Ram model PDM-3)
  - Principles of Operation
    - Detection of light in the near infrared region back-scattered to a sensor (photovoltaic detector) by airborne particulate in a sensing volume
    - The higher the dust concentration, the more backscattering of light to the sensor, resulting in increased readings
    - Device calibrated at the factory against an air sampling filter/gravimetric analysis reference method

7.3.2 Calibration Methods/Frequencies

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

7.3.3 Preventative Maintenance

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

7.4 INTEGRATED AIR MONITORING PROGRAM

Air samples will be collected at all active work zones in the exclusion zone to detect for beryllium. Monitoring will determine if the level of protection is adequate for employees and to document that off-site migration of contaminants will not occur. The concentration will be evaluated based on OSHA permissible exposure limits.

TWA sampling will be performed at each active work location. At least one (1) TWA sample will be taken at each location. One (1) sample will be obtained from a personal sampling pump carried by the most "at risk" individual.

7.4.1 Type and Operational Aspects

- Gilian Air Sampling Pump (or equivalent)
  - Principle of Operation
    - Air sampling pump is calibrated to draw a specified air flow rate (liters per minute) for a designated period of time (usually 8 hours).
    - Volume of air sampled is then calculated as follows:

      Flow rate (liter/min.) X sample time (min.) = sample volume (liters)

- Use a bubble meter to calibrate air sampling pump; pump equipped with a rotameter that shows the flow rate during the sampling period.

- Equipped with a rechargeable battery for 8-hour sampling times; must be recharges for at least 16 hours.

  - NIOSH Method 7300/7102 (Beryllium)

  - Filter cassettes

- Connect collection media/holder to air sampling using Tygon tubing; comprises the sampling train that must be assembled to calibrate the pump.

7.4.2 Calibration Methods/Frequencies

Flow rate calibration can be accomplished by using primary standard soap and the Gilibrator Calibrator (or equivalent). The Gilibrator calibrator allows rapid flow rate determination with direct read-out on the built-in display.

Simply connect the sampler to the calibrator, press the ON push button, and then push the plunger to start a bubble up the flow cell. The flow rate is automatically calculated and shown on the display. Subsequent readings are averaged with the previous readings. It is recommended that calibration of the sampler be checked prior to the start of and after each sampling period.

7.4.3 Preventative Maintenance

The Gilian Air Sampling Pump was designed for both mechanical and electronic reliability. The sampling pump should not require special maintenance or adjustments under normal conditions. However, as with all instruments, the sampling pump does require some basic care. Basic maintenance consists of filter replacement, installing and removing battery packs, maintaining good storage conditions, and care of the electronic control assembly.

7.5 AIR MONITORING LOG

The SSO will ensure that all air-monitoring data is logged into a monitoring notebook. Data will include all information identified in Procedure 12 of the Health and Safety Procedures Manual. The Program CIH will periodically review this data.

7.6 CALIBRATION REQUIREMENTS

The LEL/O_2 meter and sampling pumps required with fixed-media air sampling will be calibrated daily prior to use. A separate log will be kept detailing date, time, span gas, or other standard, and name of person performing the calibration.

7.7 AIR MONITORING RESULTS

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

8.0 EMERGENCY RESPONSE & CONTINGENCY PLAN

8.1 PRE-EMERGENCY PLANNING

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

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

Fire/Explosion	• The potential for human injury exists. • Toxic fumes or vapors are released. • The fire could spread on-site or off-site and possibly ignite other flammable materials or cause heat-induced explosions. • The use of water and/or chemical fire suppressants could result in contaminated run-off. • An imminent danger of explosion exists.
Spill or Release of Hazardous Materials	• The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard. • The spill could cause the release of toxic liquids or fumes in sufficient quantities or in a manner that is hazardous to, or could endanger human health.
Natural Disaster	• A rain storm exceeding the flash flood level. • The facility is in a projected tornado path or a tornado has damaged facility property. • Severe wind gusts are forecasted or have occurred and have caused damage to the facility.
Medical Emergency	• Overexposure to hazardous materials. • Trauma injuries (broken bones, severe lacerations/bleeding, burns). • Eye/skin contact with hazardous materials. • Loss of consciousness. • Heat stress (Heat stroke). • Cold stress (Hypothermia). • Heart attack. • Respiratory failure. • Allergic reaction.

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

- Sufficient equipment and materials will be kept on site and dedicated for emergencies only. The inventory will be replenished after each use.

- On-site emergency responders will be current in regards to training and medical surveillance programs. Copies of all applicable certificates will be kept on file for on-site personnel required to respond.

- It will be the responsibility of the emergency coordinator (Site Supervisor) to brief the on-site response team on anticipated hazards at the site. The emergency coordinator shall also be responsible for anticipating and requesting equipment that will be needed for response activities.

- Emergency response activities will be coordinated with the Local Emergency Planning Committee (LEPC) in compliance with SARA Title III requirements.

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

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

8.2 EMERGENCY RECOGNITION AND PREVENTION

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

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

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

- Daily safety meeting
- Task-specific training prior to commencement of activity
- Lock-out/tag-out

- Personal Protective Equipment (PPE) selection/use
- Written and approved permits for hot work, confined space
- Trenching/shoring procedure
- Air monitoring
- Following all OHM standard operating procedures
- Practice drills for fire, medical emergency, and hazardous substances spills

8.3 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS

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

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

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

8.3.1 Responsibilities and Duties

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

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

8.3.2 On-site Emergency Coordinator Duties

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

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

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

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

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

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

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

- Notify LANTDIV ROICC

- Notify OHM Project Manager

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

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

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

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

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

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

- Waste is collected and contained.

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

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

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

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

- Notify the USEPA Regional Administrator that cleanup procedures have been completed and that all emergency equipment is fit for its intended use before resuming operations in the affected area of the facility. The USEPA Regional Branch Response Center telephone number is included in Figure 8.1.

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

TABLE 8.1
EMERGENCY TELEPHONE NUMBERS

Local Agencies - Short Gap, WV	
Fire Department	911
Police	911
Hospital	301-759-4200
Regional Poison Control Center	800-552-6337
Federal Agencies	
EPA Region Branch Response Center	215-597-9800
Agency for Toxic Substances and Disease Registry	404-639-0615 (24 HR)
LANTDIV	
James Szykman	804-322-4811
National Response Center	800-424-8802
OHM	
Project Manager - Gordon Miller	609-588-6392
District Health and Safety Manager - Robert Brooks	609-588-6423
Director, Health and Safety - Kevin McMahon	609-588-6375
OHM Corporation (24 hour)	800-537-9540

Additional Phone #'s in Section 2 this HASP

8.4 SAFE DISTANCES AND PLACES OF REFUGE

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

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

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

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

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

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

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

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

8.5 EVACUATION ROUTES AND PROCEDURES

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

8.5.1 Evacuation Signals and Routes

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

8.5.2 Evacuation Procedures

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

- The emergency signal will be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site will cease in order to allow safe exit of personnel and movement of emergency equipment.

- Shut off all machinery if safe to do so.
- ALL on-site personnel, visitors, and contractors in the support zone will assemble at the entrance to the site for a head count and await further instruction from the emergency coordinator.
- ALL persons in the exclusion zone and contamination reduction zone will be accounted for by their immediate crew leaders (e.g., foreman). Leaders will determine the safest exits for employees and will also choose an alternate exit if the first choice is inaccessible.
- During exit, the crew leader should try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the emergency coordinator.
- Contract personnel and visitors will also be accounted for.
- The names of emergency response team members involved will be reported to the emergency spill control coordinator.
- A final tally of persons will be made by the emergency coordinator or designee. No attempt to find persons not accounted for will involve endangering lives of OHM or other employees by re-entry into emergency areas.
- In all questions of accountability, immediate crew leaders will be held responsible for those persons reporting to them. Visitors will be the responsibility of those employees they are seeing. Contractors and truck drivers are the responsibility of the Site Supervisor. The security guard will aid in accounting for visitors, contractors, and truckers by reference to sign-in sheets available from the guard shack.
- Personnel will be assigned by the emergency coordinator to be available at the main gate to direct and brief emergency responders.
- Re-entry into the site will be made only after clearance is given by the emergency coordinator. At his direction, a signal or other notification will be given for re-entry into the facility.
- Drills will be held periodically to practice all of these procedures and will be treated with the same seriousness as an actual emergency.

8.6 EMERGENCY SPILL RESPONSE PROCEDURES AND EQUIPMENT

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

8.6.1 Notification Procedures

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

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

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

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

8.6.2 Procedure for Containing/Collecting Spills

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

If for some reason a chemical spill is not contained within a dike or sump area, an area of isolation will be established around the spill. The size of the area will generally depend on the size of the spill and the materials involved. If the spill is large (greater than 55 gallons) and involves a tank or a pipeline rupture, an initial isolation of at least 100 ft. in all directions will be used. Small spills (less than or equal to 55 gallons) or leaks from a tank or pipe will require evacuation of at least 50 ft. in all directions to allow cleanup and repair and to prevent exposure. When any spill occurs, only those persons involved in overseeing or performing emergency operations will be allowed within the designated hazard area. If possible the area will be roped or otherwise blocked off.

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

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

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

Clean up personnel will take the following measures:

- Make sure all unnecessary persons are removed from the hazard area.

- Put on protective clothing and equipment.

- If a flammable material is involved, remove all ignition sources, and use spark and explosion proof equipment for recovery of material.

- Remove all surrounding materials that could be especially reactive with materials in the waste. Determine the major components in the waste at the time of the spill.

- If wastes reach a storm sewer, try to dam the outfall by using sand, earth, sandbags, etc. If this is done, pump this material out into a temporary holding tank or drums as soon as possible.

- Place all small quantities of recovered liquid wastes (55 gallons or less) and contaminated soil into drums for incineration or removal to an approved disposal site.

- Spray the spill area with foam, if available, if volatile emissions may occur.

- Apply appropriate spill control media (e.g. clay, sand, lime, etc.) to absorb discharged liquids.

- For large spills, establish diking around leading edge of spill using booms, sand, clay or other appropriate material. If possible, use diaphragm pump to transfer discharged liquid to drums or holding tank.

8.6.3 Emergency Response Equipment

The following equipment will be staged in the support zone and throughout the site, as needed, to provide for safety and first aid during emergency responses.

- ABC-type fire extinguisher
- First-aid kit, industrial size
- Eyewash
- Emergency signal horn
- Self contained breathing apparatus (two)
- Stretcher/backboard

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

EQUIPMENT NAME	APPLICATION
Portable HNU Photoionization Detector	Measures selected inorganic and organic chemical concentrations
MSA Oxygen and Combustible Gas Meter or equivalent	Measures oxygen and combustible gas levels

8.6.4 Personal Protective Equipment

A supply of two (minimum) SCBAs will be located in the support zone for use in emergency response to hazardous materials releases. They will be inspected at least monthly, according to OSHA requirements. In addition, all emergency response personnel will have respirators available for use with cartridge selection determined by the Site Safety Officer based on the results of direct reading instruments. Emergency response personnel will also be provided with protective clothing as warranted by the nature of the hazardous material and as directed by the Site Safety Officer.

8.6.5 Emergency Spill Response Clean-Up Materials and Equipment

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

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

- Sand or clay to solidify/absorb liquid spills.
- Appropriate solvents e.g. CITRIKLEEN, for decontamination of structures or equipment.

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

- Plastic shovels for recovering corrosive and flammable materials.
- Sausage-shaped absorbent booms for diking liquid spills, drains, or sewers.
- Mercury collection device.
- Overpack drums for containerizing leaking drums.
- Five (5) 55-gallon open-top drums for containerization of waste materials.

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

8.7 EMERGENCY CONTINGENCY PLAN

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

8.8 MEDICAL EMERGENCY CONTINGENCY MEASURES

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

8.8.1 Response

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

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

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

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

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

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

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

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

If decontamination can be performed, observe the following procedures:

- Wash external clothing and cut it away.

If decontamination cannot be performed, observe the following procedures:

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

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

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

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

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

8.8.2 Notification

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

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

8.8.3 Directions To Hospital

Written directions to the hospital and a map will be posted in all trailers in the staging area. A hospital direction map is included in Appendix G. Directions to the hospital are as follows:

Take WV Rt 956 to Rt 220 N to Cresaptown, MD; in Cresaptown take Winchester Road to Bradock Road; first light on Bradock Road, turn left to Seaton Drive to hospital.

8.9 FIRE CONTINGENCY MEASURES

OHM personnel and subcontractors are not trained professional firefighters. Therefore, if there is any doubt that a fire can be quickly contained and extinguished, personnel will notify the emergency coordinator by radio and vacate the structure or area. The emergency coordinator will immediately notify the local Fire Department.

The following procedures will be used to prevent the possibility of fires and resulting injuries:

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

8.9.1 Response

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

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

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

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

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

8.10 HAZARDOUS WEATHER CONTINGENCY MEASURES

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

- Lightning
- Heavy Rains/Snow
- High Winds

8.10.1 Response

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

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

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

8.10.2 Notification

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

- OHM employees and subcontractors
- Client Representative
- Local Civil Defense Organization

8.11 SPILL/RELEASE CONTINGENCY MEASURES

This section will discuss the measures to be taken in the event of release or spill of a hazardous material:

8.11.1 Response

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

First aid will be administered to injured/contaminated personnel. Unsuspecting persons/vehicles will be warned of the hazard. All personnel will act to prevent any unsuspecting persons from coming in contact with spilled materials by alerting other nearby persons. Without taking unnecessary risks, personnel will attempt to stop the spill at the source, if possible. This may involve activities such as uprighting a drum, closing a valve or temporarily sealing a hole with a plug.

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

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

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

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

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

9.0 TRAINING REQUIREMENTS

As a prerequisite to employment at OHM, all field employees are required to take a 40-hour training class and pass a written examination. This training covers all forms of personal protective equipment, toxicological effects of various chemicals, hazard communication, bloodborne pathogens, handling of unknown tanks and drums confined-space entry procedures, and electrical safety. This course is in full compliance with OSHA requirements in 29 CFR 1910.120. In addition, all employees receive annual 8-hour refresher training and three day on-site training under a trained experienced supervisor. Supervisory personnel receive an additional 8-hour training in handling hazardous waste operations.

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

Site-specific training for the Allegany Ballistics Laboratory, which will include potential site contaminants, site physical and environmental hazards, emergency response and evacuation procedures, and emergency telephone numbers will be held at the site location by the SS and SSO before any site work activities begin.

10.0 MEDICAL SURVEILLANCE PROGRAM

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

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

TABLE 10.1
WORKER MEDICAL PROFILE

Item	Initial	Annual
Medical History	X	X
Work History	X	X
Visual Acuity and Tonometry	X	X
Pulmonary Function Tests	X	X
Physical Examination	X	X
Audiometry Tests	X	X
Chest X-Ray	X	X
Complete Blood Counts	X	X
Blood Chem. (SSAC-23 or equivalent)	X	X
Urinalysis	X	X
Dermatology Examination	X	X
Electrocardiogram/Stress Test	X	X (based on age)

Specific Tests (as required): PCB blood or fat, urine mercury, urine arsenic, urine phenol, urine halomethanes, blood cyanide, cholinesterase-pseudo-cholesterase, nerve conduction velocity tests, blood lead, urine lead.

10.1 EXAMINATION SCHEDULE

Employees are examined initially upon start of employment, annually thereafter, and may be examined upon termination of employment. Unscheduled medical examinations are conducted:

- At employee request after known or suspected exposure to toxic or hazardous materials
- At the discretion of the client, the CIH, SSO, or OHM occupational physician after known or suspected exposure to toxic or hazardous materials

- At the discretion of the OHM occupational physician

All nonscheduled medical examinations will include, as a minimum, all items specified above for periodic surveillance examination, with the exception of the chest X-ray, which will be conducted at the discretion of the occupational physician performing the examination.

APPENDIX A
HEALTH AND SAFETY PLAN CERTIFICATION

HEALTH-AND-SAFETY PLAN CERTIFICATION

By signing this document, I am stating that I have read and understand the site health-and-safety plan for OHM Remediation Services Corp. personnel and visitors entering the Allegany Ballistics Laboratory site.

REPRESENTING	*NAME (PRINT)*	*SIGNATURE*	*DATE*

APPENDIX B
OHM HAZARD COMMUNICATION PROGRAM

APPENDIX B
OHM HAZARD COMMUNICATION PROGRAM

1. OBJECTIVE

A Hazard Communication (Employee Right-To-Know) Program will be instituted at all OHM Remediation Services Corp. (OHM) facilities and job-sites. A copy of the written Hazard Communication Program contained in this procedure will be present at all OHM job-sites, shops, and facilities.

2. PURPOSE

The purpose of Hazard Communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at field project sites, shops, and facilities are transmitted (communicated), according to 29 CFR 1910.1200 and 29 CFR 1926.59 to all OHM personnel and OHM subcontractors.

3. GENERAL REQUIREMENTS

3.1 It is the responsibility of site supervisors, shop supervisors, and facilities managers to ensure that the Hazard Communication Program for the area under their supervision is updated as necessary.

3.2 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 by on site operations. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.

3.3 Material Safety Data Sheets (MSDSs)--There will be an MSDS located on site for each hazardous chemical known to exist or which is being used on site. All MSDSs will be located in the site health and safety plan which can be found in the office trailer. MSDS's for products in use may be stored in a separate binder.

3.4 Employee Information and Training--Training employees on chemical hazards is accomplished through an ongoing corporate and regional training program. Additionally, chemical hazards will be communicated to employees through daily safety meetings held at OHM field projects and by an initial site orientation program.

3.5 OHM 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
- Emergency spill procedures
- Proper storage and labeling

3.6 Before any new hazardous chemical is introduced on site, each employee will be given information in the same manner as during the initial safety class. The site supervisor will be responsible for seeing that the MSDS on the new chemical is available. During the mandatory morning safety briefing, information on each new chemical will be presented.

Should any new chemical be brought on site, the appropriate MSDSs will be added and reviewed with the employees.

1. GENERAL

The following written Hazard Communication Program has been established for OHM Remediation Services Corp. (OHM). The purpose of this program is to transmit information to the workers about the chemical hazards in the work place using various media. The transmittal of information will be accomplished by means of a comprehensive Hazard Communication Program, which will include container labeling and other forms of warning, material safety data sheets (MSDSs), and employee training in accordance with 29 CFR 1910.1200 and 29 CFR 1926.59.

Upon mobilization at the job site the Hazard Communication Program will be reviewed with all employees. Upon reading the Hazard Communication Program employees will be asked to sign the "Worker Hazard Communication Acknowledgment Form". The Hazard Communication Program will also be reviewed with new employees and visitors as they arrive on site. These persons will also be asked to sign the acknowledgment form. The Hazard Communication Program shall be available for review by anyone on site any time during normal work hours. OHM will accomplish the hazard communication requirements through formal safety training, departmental safety meetings, and job-site safety meetings.

The Health and Safety Department shall update the Hazard Communication Program when personnel responsibilities change, a new non-routine task is introduced, or an extremely hazardous material needs particular attention. This new program will then be distributed throughout the company.

2. RESPONSIBILITIES

Overall responsibility for compliance with the Hazard Communication Program rests with officers, managers, and supervisors of OHM. A brief outline of responsibilities for those persons directly involved with the program will follow. These responsibilities are not all inclusive, but are designed to give guidance in initial and long-term program development. Since each area is different, these responsibilities may vary.

This program is intended to cover those employees who are directly involved with the handling of hazardous chemicals or supervision of activities that involve the use of hazardous chemicals.

2.1 Health and Safety Department Responsibilities

- Review operations with site supervisors to determine what tasks require hazard communication training.
- Advise supervisory people as to which materials may need to be considered hazardous initially and eventually to ensure that hazard task determination is being done according to the written policy.
- Follow up through safety meetings and safety audits to ensure that supervisors are carrying out prescribed company policy.
- Notify supervisors immediately of any operating changes affecting the hazardous chemicals being used.
- Periodically audit the Hazard Communication Program's progress using the Hazard Communication Program audit sheet found at the end of this procedure.

2.2 Training Department Responsibilities

- Ensure that up-to-date records are maintained on training of all employees required to handle hazardous chemicals. The supervisor should keep copies of these records and should also send copies of the initial training to the corporate training secretary for the training file.
- Educate personnel upon initial 40-hour OSHA training to the requirements of the Hazard Communication Standard.

2.3 Site Supervisors' Responsibilities

- Identify jobs requiring the use of hazardous chemicals and provide a list of those jobs and chemicals to the health and safety department.
- Provide the training required by the Hazard Communication Standard and document training of employees in the safe handling of hazardous chemicals.
- Ensure inspection of engineering controls and personal protective equipment before each use. The health and safety department shall help determine a suitable inspection plan for each application as needed.
- Make daily surveys of the work area to ensure that safe practices are being followed. Advise employees of and document unsafe work practices on the first occasion and consider further unsafe work practices as disciplinary violations. Use documentation as topics of safety meetings.
- Ensure required labeling practices are being followed. Labels should be affixed to the container when it arrives. If the contents are transferred to another container, then all label information (manufacturer, manufacturer's telephone number, product name, target organ(s) and product number) must also be affixed to the new container, so that all containers of the material, regardless of size, are labeled. Contact the health and safety department for proper labels.
- Enforce all applicable safety and health standards through periodic documented audits.
- Before ordering a material, determine if a MSDS exists on file. Request a MSDS from the manufacturer for all new products.
- Contact the health and safety department upon receiving new MSDSs to ensure that they have a copy. If they do not, then the site supervisor shall forward a copy to them.

2.4 Employee Responsibilities

- Read and understand entire Hazard Communication Program.
- Obey established safety rules and regulations.
- Use all safety procedures and personal protective equipment as required by company procedures.
- Notify supervisor of the following:
  - Any symptoms or unusual effects that may be related to the use of hazardous chemicals.
  - Any missing, incomplete, or unreadable labels on containers.
  - Missing, damaged, or malfunctioning safety equipment.
- Use approved labels on containers; do not remove labels (labels are available from the health and safety department).
- Use only approved containers for hazardous chemicals. (Is chemical and container compatible and appropriate?)
- Know where emergency equipment and first-aid supplies are located.
- Know location of MSDSs. These will be located in the break/decon area and the job-site office trailer.

- Know what you are expected to do in case of an emergency. Before the commencement of any task, emergency considerations shall be made.

2.5 Shipping/Receiving Personnel Responsibilities

- The Project Control Technician (PCT) or other persons assigned by the site supervisor shall ensure MSDSs are received with initial shipment of a hazardous chemical; if not, contact purchasing to request the appropriate MSDS and also call the health and safety department to determine if there is a MSDS available until the requested MSDS arrives.

- Ensure labels with required information are affixed to all containers.

- Store hazardous materials in designated locations.

- Use proper personal protective equipment when handling hazardous chemicals.

- Report damaged containers or spills to the site supervisor and the site safety officer immediately.

3. HAZARD DETERMINATION

OHM will rely on MSDSs from chemical suppliers and manufacturers to meet hazard determination requirements. Other relevant data from laboratory analyses, chemical reference materials, and chemical manufacturers' written evaluation procedures will be utilized when warranted. No other method shall be used to determine a chemicals' hazards unless approved by the health and safety department.

4. LABELING

The site supervisor will be responsible for seeing that all containers arriving at OHM job sites are properly and clearly labeled. Site supervisors shall also check all labels for chemical identity and appropriate hazard warnings. If the hazardous chemical is regulated by OSHA in a substance specific health standard (29 CFR 1910), the site supervisor shall ensure that the labels or other forms of warning used are in accordance with the requirements of that standard. Any container that is not labeled shall be immediately labeled after initial discovery with the required information.

The site supervisor, general foreman, or foreman shall be responsible for seeing that all portable containers used in their work area are properly labeled with chemical identity and hazard warning. (Refer to MSDS for required labeling information.)

The site supervisor, general foreman, or foreman shall also ensure that labels on hazardous chemical containers are not removed or defaced unless the container is immediately marked with the required information and that all labels are legible in English and prominently displayed on the container or readily available in the work area throughout each shift.

If any container is found and the contents cannot be identified, the site supervisor shall be contacted immediately. When proper identification is made, a label shall be affixed to the container immediately. If it is discovered that no MSDS is available, the manufacturer and the health and safety department shall be contacted to assist in locating the proper MSDS. If there is no means of identifying the material in the container, the container shall be taken out of service, away from all personnel until it can be tested by the health and safety department or laboratory personnel. The site supervisor shall communicate their findings or awareness of such containers to all personnel working in the area and to the regional health and safety manager.

5. MATERIAL SAFETY DATA SHEETS (MSDS)

The site supervisor at OHM job sites will be responsible for maintaining a current MSDS relevant to the hazardous chemicals used on their job sites. The health and safety department will be responsible for compiling the initial MSDS file for the job site and aiding all job sites with the completion and maintenance of their respective MSDS files.

All MSDSs shall be readily available for review by all employees during each work shift. Each job site will designate a clearly marked "Employee Right-to-Know" station where employees can immediately obtain a MSDS and the required information in an emergency. MSDSs shall also be made available, upon request, to designated OHM representatives, other employer's employees, and to any OSHA inspector in accordance with the requirements of 29 CFR 1910.1200(e).

Although manufacturers are required to provide employers with MSDSs on an initial chemical shipment, OHM purchasing agents (and site supervisors purchasing their own material) shall request MSDSs and updates to MSDSs on all purchase orders. Site supervisors that are without proper MSDSs shall be responsible for requesting this information from chemical manufacturers. The site supervisor shall maintain a file of follow-up letters for all hazardous chemical shipments they receive without MSDSs.

6. EMPLOYEE INFORMATION AND TRAINING

It is the responsibility of the supervisor in charge of each employee to ensure that the employee is properly trained. Training employees on chemical hazards and chemical handling is accomplished at the time of initial employment at OHM, whenever a new chemical (or physical) hazard is introduced into the work area, and through ongoing formal and informal training programs. Additionally, chemical hazards are communicated to employees through weekly and morning, job- site safety meetings, which shall be documented according to topic, major points discussed, and names of those attending (attendance is mandatory). Records of all formal training conducted at OHM are coordinated and maintained by the Training Department secretary.

At a minimum, OHM will inform employees on the following:

- The requirements of 29 CFR 1910.1200--Hazard Communication--Evaluating the potential hazards of chemicals and communicating information concerning hazards and appropriate protective measures to employees. OHM shall accomplish employee training in several different ways including, but not limited, to 40-hour OSHA Hazardous Waste Worker Training (29 CFR 1910.120), shop safety meetings, job-site safety meetings, Health and Safety Department safety meetings, and formal and informal training about specific chemical hazards.

- The location and availability of the written Hazard Communication Program, list of hazardous chemicals, and MSDSs will be periodically posted on the employee bulletin boards providing the location of the above material.

- Any operations in their work area where hazardous chemicals are present.

- How to work safety with chemicals present in the workplace and minimize potential exposure.

Employee training shall include the following:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (monitoring instruments, visual appearance or odor, and acute and chronic health effects).

- The physical, chemical, and health hazards of the chemicals in the work area.

- The methods of preventing exposure to hazardous chemicals including the measures OHM has taken to protect the employees.

- Procedures to follow if OHM employees are exposed to hazardous chemicals (location of the nearest phone, emergency eyewash, and shower will be included). These discussions shall include proper operating procedures for all emergency equipment.

- The details of the OHM written Hazard Communication Program, including an explanation of the labeling system and the MSDSs, and how employees can obtain and use the appropriate hazard information.

- Standard operating procedures within each respective shop. OHM company policy determines what is considered standard operating procedures.

- Procedures for workers involved in non-routine tasks.

Each site supervisor shall ensure that the above training is emphasized to OHM employees. The health and safety department will ensure that each job site is properly informing and training all employees through group meetings and individual discussions. Whenever a new hazardous chemical is placed into use, the site supervisor shall inform the employees of the hazards said chemical may pose. The site supervisor shall also be responsible for obtaining and making available a MSDS for the new chemical.

7. HAZARDOUS NON-ROUTINE TASKS

Occasionally, employees at OHM are required to perform tasks which are considered to be non-routine. All tasks OHM considers non-routine shall be carefully discussed among the supervisor and those performing the task. This safety briefing shall include all possible hazards an employee may encounter while completing the task, including:

- Hazard recognition
- Chemicals involved and their hazardous properties
- Physical hazards
- Methods of avoiding hazards (monitoring instruments, proper personal protective equipment, etc.)

The following is a list of some of the non-routine tasks which may occur at OHM job sites. These tasks are all covered in detail in various OHM standard operating Procedures.

7.1 Confined Space Entry
7.2 Excavation, Trenching, and Shoring
7.3 Decontamination of Equipment
7.4 Laboratory Spills
7.5 High-Pressure Washer (Laser) Operation
7.6 Line Entry Procedure
7.7 Hot Work

8. INFORMING CONTRACTORS

It shall be the responsibility of the OHM site supervisor to provide subcontractors with the following information:

- Hazardous chemicals to which they may be exposed while performing a task including the following:

  - Chemical properties
  - Physical properties
  - Acute/Chronic health effects

- Location of "Employee Right-to Know" station which includes the following:

  - MSDS for work area
  - Hazard Communication Program
  - Other relevant safety material such as Project Health and Safety Plan (HASP)

- Precautionary measures to be taken to protect employees from chemical and physical hazards.

- Location of nearest emergency equipment (fire extinguisher, eyewash, shower, phone, first-aid kit, etc.)

- Procedures to follow in the event of employee exposure.

- Steps OHM has taken to reduce the risk of exposure to physical and chemical hazards including the following:

  - Safety meetings
  - Hazard Communication Program
  - Proper storage and labeling of hazardous chemicals
  - Health and safety department shop audits

- The methods used to label all hazardous chemicals.

- Emergency evacuation signals and evacuation rally locations.

The health and safety department shall offer assistance in providing the above information to subcontractors working at OHM job sites. On initial visit by a subcontractor to OHM job sites, a "Contractor Right-to-Know" release form shall be completed. This form will state that the above information has been communicated to the perspective contractor.

Conversely, the site supervisor shall obtain the above information from subcontractors for hazardous materials they have brought to our projects.

8.1 Contractor Right-to-Know Acknowledgment

By signing this sheet, the signee is stating that an OHM employee or representative has briefed said signee on the essentials of OHM's Hazard Communication Program, including hazardous chemical(s) to which one may be exposed, location of program and MSDS, precautionary measures taken to protect contractors from chemical and physical hazards, location of nearest emergency equipment, procedures to follow in the event of employer's employee chemical exposure, and method used to label all hazardous chemicals.

Name	Date	Company
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

9. LIST OF HAZARDOUS CHEMICALS

The following is a list of hazardous chemicals used on this OHM job site. Further information on each hazardous chemical listed below can be found in the MSDS which are included in the site specific health and safety plan.

- Typical OHM Job-Site Hazardous Chemical Inventory List

Available On Site	Chemicals
_____	Acetone
_____	Acetylene
_____	Activated Charcoal, Powder
_____	Alum (Aluminum Sulfate)
_____	Anti-fog Bausch & Lomb
_____	Argon/Methane (95%/5%)
_____	Brake Fluid
_____	Calcium Hydroxide (Hydrated Lime)
_____	Calibration Check Gas
_____	Carbon
_____	Caustic Soda (Sodium Hydroxide)
_____	Citrikleen
_____	Coal Fly Ash
_____	Compressed Air
_____	Diatomaceous Earth
_____	Diesel Fuel
_____	Dry Ice (Solid Carbon Dioxide)
_____	Ethylene Glycol
_____	Ferric Chloride
_____	Freon
_____	Gear Grease - Delta
_____	Helium
_____	Hexane
_____	Hydraulic Fluid
_____	Hydrochloric Acid
_____	Hydrogen
_____	Isobutylene
_____	Kiln Dust
_____	Methanol
_____	Nitrogen
_____	Nitrous Oxide
_____	Oxygen
_____	Penetone
_____	Pentane
_____	Polymers (Flocculants)
_____	Premium Unleaded Gasoline
_____	PVC Solvent Cleaner
_____	PVC Cement
_____	Regular Leaded Gasoline
_____	Starting Fluid
_____	Stoddard Solvent
_____	Sulfuric Acid
_____	10W-40 Motor Oil - Shell

_____ Tube Grease - Kendall
_____ TU Type 555 Thread Sealing Compound
_____ 2-Cycle Oil - Wolf's Head

- Site-Specific Hazardous Chemical Inventory

APPENDIX C
MATERIALS SAFETY DATA SHEETS (MSDSs)

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 59

BERYLLIUM
METAL/POWDER

Date April 1980

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: BERYLLIUM METAL/POWDER
OTHER DESIGNATIONS: Glucinium, Glucinum, Be, CAS #007 440 417
MANUFACTURER: Material is available from several suppliers, including:

CERAC, Inc.
P.O. Box 1178
Milwaukee, WI 53201
Phone: (414) 289-9800

Brush Wellman
Metal & Oxide Div.
Elmore, OH 43416
Phone: (419) 862-2745

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Beryllium Beryllium Oxide	> 97 < 3	8-hr TWA 2 µg/m^3*(as Be) Ceiling Level 5 µg/m^3 Peak 25 µg/m^3/30 min
*Current (1979) OSHA and ACGIH TLV. In 1975 OSHA proposed an 8-hr TWA of 1 µg/m^3 with a ceiling of 5 µg/m^3 (15 min. sample); OSHA believes that beryllium and its compounds should be treated as a carcinogenic threat to man. (The proposed OSHA standard is still under review, but is expected to issue in 1980.)		Human, inhalation TCLo 300 mg/m^3, pulmonary effects Rabbit, intravenous TDLo 20 mg/kg, neoplastic effects

SECTION III. PHYSICAL DATA

Boiling point at 1 atm, deg C -----	2970	Specific gravity at 20 C ---------	1.848
Vapor pressure at 1910 C, mm Hg ---	7.6	Melting point, deg C ----------	1278±5
Water solubility, hot water -----	Slight	Atomic weight ----------	9.01
cold water ----	Insol.		

Appearance & Odor: A grayish-white metal (hexagonal crystal structure) also as powdered metal; no odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
N/A	Powder ca. 1200 F	Dust explosion hazard		

Extinguishing Media: Do not use water or CO_2. Smother fire with approved dry powder extinguisher.* Beryllium can be a moderate fire hazard if exposed to flame. The hazard increases as particle size decreases. A cloud of Be dust in air can be explosive (areas where dusting may occur require Class II, Group E electrical services, 29 CFR 1910.309). Combustion products of this material are highly toxic. Firefighters should use full protective clothing, eye protection, and self-contained breathing apparatus. After exposure to a beryllium fire, they should clean equipment and clothing thoroughly and bathe carefully. *Sand, graphite, powder, and sodium chloride have also been recommended.

SECTION V. REACTIVITY DATA

Beryllium is stable at room temperature and resists oxidation at ordinary temperatures.* When heated in air or in mixed CO_2 and nitrogen, it can be ignited.
It is acid and alkali soluble; it reacts with strong bases to evolve hydrogen.
Mixtures of the powdered metal with CCl_4 or trichloroethylene will flash on heavy impact.
Warm beryllium will react incandescently with phosphorus, fluorine or chlorine.
Molten lithium metal (180 C) severely attacks beryllium metal.

*Will form oxide on solid surfaces when moist.

SECTION VI. HEALTH HAZARD INFORMATION

TLV 2 μg/m³ (See Sect. II)

Be is highly toxic by inhalation of fume or dust. Prolonged or repeated skin contact can cause skin irritation or dermatitis. Eye contact can produce conjunctivitis. Implantation under the skin (via a chip or sliver or by particles entering a wound) can produce hard lesions with central non-healing areas which must be surgically removed. Acute inhalation can produce pneumonitis with non-productive cough, chest pain, shortness of breath, weakness, and pulmonary edema. Chronic exposures can produce berylliosis (progressive lung damage) and systemic beryllium disease, including pneumonitis (as above), joint pain, skin lesions, chills & fever, & damage to liver, spleen & heart. Present studies have indicated that Be is so poorly absorbed through the gut that ingestion is not an important hazard. (Hamilton, Industrial Toxicology, 3rd Edition). Animal studies have shown beryllium to produce lung and bone tumors; it is a suspected carcinogen for man.

FIRST AID:

Eye Contact: Flush eyes thoroughly with running water for 15 minutes, including under the eyelids. Get medical attention.

Skin Contact: Wash affected area thoroughly with soap and water after removing contaminated clothing. If skin is broken, get medical attention.

Inhalation: Remove to fresh air. Restore breathing and support with oxygen as needed. Keep warm and at rest. Get medical attention.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

If powdered metal is spilled, notify safety personnel. Exclude all from area except clean-up personnel with protective equipment against contact or inhalation hazards. Provide ventilation and remove sources of heat or ignition. Pick up powder spills by methods such as vacuuming or wet mopping; prevent dusting conditions. Collect particulate scrap in sealed container for recovery or disposal.

DISPOSAL: Scrap or waste material disposal is best accomplished by arranging to return to the supplier in a mutually acceptable form. Beryllium waste unsuitable for recycle must be handled in accordance with Federal, State, and Local regulations. Burying in an approved landfill, or burning in an approved incinerator with a scrubber, followed by burying the residues in an approved landfill, have been used in the past.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Isolate workplaces where beryllium dust and fume are generated. Provide adequate general and local exhaust ventilation (with filtration to purify recycled air and to protect the external environment) to meet TLV requirements. Provide approved respirators for emergency and nonroutine use above the TLV: High efficiency filter masks are suitable as high as 50 μg/m³; use air-supplied or self-contained respirators above 50 μg/m³. A full-facepiece respirator is needed above 10 μg/m³.

Workers may require body-covering protective clothing, gloves and safety goggles. When exposed above the TLV, a change of clean protective clothing and a shower at the end of the day is required. (Wash protective clothing with suitable protection for the launderer.) Avoid carrying beryllium particulate outside the workplace on hair or clothing.

Eyewash stations and safety showers should be available.

Monitor the workplace to properly determine and control exposure to beryllium.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Use only with adequate ventilation where Be can become airborne. When Be or its alloys is heated (as in welding or sintering processes) hazardous levels of fume can be generated. Store in clean, dry place away from incompatible materials (see Sect V) in low fire-hazard area. Protect containers from physical damage. Label clearly. Use good housekeeping practices to prevent accumulation of Be-containing deposits. Give preplacement and annual medical exams to those who may be exposed above the TLV. Preclude from exposure those with pulmonary disease, chronic skin, liver, heart, or kidney conditions, abnormal chest X-ray or blood count, or vital capacity depression greater than 10% Provide worker training.

DOT Classification of powder - POISON B.

DATA SOURCE(S) CODE: 1-12, 18-20, 24-26

APPROVALS: MIS, CRD J. M. Nielsen

Industrial Hygiene and Safety 4-21-80

MEDICAL REVIEW: 5/5/80

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One Genium Plaza
Schenectady, NY 12304-4690
(518) 377-8854

Material Safety Data Sheet Collection

Mercury **MSDS No. 26**

Date of Preparation: 1/77 Revision: D, 6/94

Section 1 - Chemical Product and Company Identification 44

Product/Chemical Name: Mercury
Chemical Formula: Hg
CAS No.: 7439-97-6
Synonyms: colloidal mercury, hydrargyrum, liquid silver, Quicksilver
Derivation: Obtained by roasting cinnabar (mercury sulfide) and purified by distillation, or as a by-product of gold mining.
General Use: Used in agricultural poisons, anti-fouling paint, dental amalgams, mining amalgamation (to remove gold and other metals from ore), thermometers, barometers, dry cell batteries, chlorine and caustic soda production, electrical apparatus, and as a neutron absorber in nuclear power plants.
Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

Mercury, ca 100 %wt

OSHA PEL
Ceiling: 0.1mg/m^3 (vapor and inorganic Hg)
8-hr TWA: 0.05 mg/m^3 (vapor), skin; (Vacated 1989 Final Rule Limit)

ACGIH TLVs
TWA: 0.025 mg/m^3 (inorganic compounds), skin

NIOSH REL
10-hr TWA: 0.05 mg/m^3 (vapor), skin

DFG (Germany) MAK
TWA: 0.01 ppm (0.1 mg/m^3)
Category III: Substances with systemic effects
Onset of Effect: > 2 hr
Half-life: > shift length (strongly cumulative)

Peak Exposure Limit:
0.1 ppm (1 mg/m^3), 30 min. average value, 1/shift

IDLH Level
28 mg/m^3

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Mercury exists as a heavy, odorless, silver-white liquid metal. It is highly toxic by both acute and chronic exposure. Exposure can cause corrosion of the eyes, skin, and respiratory tract and may result in irreversible nervous system damage. It readily forms amalgamations with most metals except iron.

Wilson Risk Scale
R 1
I 4
S 2*
K 1
*Skin absorption

HMIS
H 4*
F 0
R 0
*Chronic effects
PPE†
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, eye and skin contact/absorption.
Target Organs: Central nervous system, eyes, skin, respiratory system, liver, kidneys.
Acute Effects
Inhalation: Exposure to high vapor concentrations can cause severe respiratory damage. Other symptoms include wakefulness, muscle weakness, anorexia, headache, ringing in the ear, headache, diarrhea, liver changes, fever, gingivitis, chest pain, difficulty breathing, cough, inflammation of the mouth (stomatitis), salivation, bronchitis, and pneumonitis. Acrodynia (pink or Swifts disease), characterized by redness and peeling of the skin on the toes and fingers, was commonly seen in children in the 1950s and is still *infrequently* seen in workers.
Eye: Irritation and corrosion.
Skin: Skin can become severely irritated if allowed to remain in contact with mercury. Skin absorption will occur at 2.2% of the rate of absorption through the lungs.
Ingestion: Mercury generally passes through the digestive tract uneventfully. However, large amounts may get caught up in the intestine and require surgical removal. If an abscess or other perforation is present along the digestive tract, absorption into the blood stream with subsequent mercury poisoning is possible.
Carcinogenicity: IARC, NTP, and OSHA do not list mercury as a carcinogen.
Medical Conditions Aggravated by Long-Term Exposure: Central nervous system disorders.
Chronic Effects: Chronic exposure appears more common than acute and is primarily associated with central nervous system damage which can be permanent (ex. paresthesia of the hands, lips, feet). Early signs of toxicity include weakness, fatigue, anorexia, weight loss, and gastrointestinal disturbances. If exposure levels are high, characteristic tremors of the fingers, eyelids, and lips occur with progression to generalized tremors of the entire body. Psychic disorders are noticeable and characterized by behavior and personality changes, increased excitability, memory loss, insomnia, and depression. In severe cases, delirium and

hallucinations may occur. Kidney damage is observed with oliguria (decreased urine output) progressing to anuria (urine cessation) and may require dialysis. The cornea and lens of the eyes may take on a brownish discoloration and the extraocular muscles may be damaged. This syndrome has been termed *Asthenic-Vegetative Syndrome* or *Micromercurialism.* Chronic symptoms occur increasingly with exposures to 0.1 mg/m^3 or higher. *Mutation:* Aneuploidy and other chromosomal aberrations have been observed in the lymphocytes from whole blood cultures in workers exposed to mercury. *Reproductive:* Mercury has been detected in stillborn babies of women treated with mercury for syphilis. In a study of six men acutely exposed (occupationally) to mercury levels as high as 44 mg/m^3, all suffered impaired sexual function. Repeated skin contact may cause allergic dermatitis in some individuals.

NOTE: Spilled mercury will release sufficient vapor over time to produce chronic poisoning.

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.

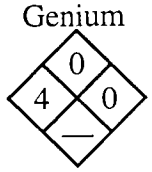
Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water and then wash exposed area with soap. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. In general, mercury will pass through the digestive tract uneventfully.

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

Note to Physicians: BEI: *blood* (15 µg/L), *urine*: (35 µg/g creatinine). Extremely high urine levels of 0.5 to 0.85 mg Hg/L are indicative of polyneuropathy. 0.4 to 22 µg/L is reported to be the human lethal blood level. Obtain urinalysis including at a minimum: albumin, glucose, and a microscopic examination of centrifuged sediment. Use BAL or 2, 3-dimercaptosuccinic acid as chelators. *Do not* use calcium sodium EDTA because of nephrotoxicity. An electromyograph may determine extent of nerve dysfunction. It has been noted that exposure to mercury may predispose persons to development of carpal tunnel syndrome.

Section 5 - Fire-Fighting Measures



Flash Point: Nonflammable

Autoignition Temperature: Nonflammable

LEL: None reported.

UEL: None reported.

Extinguishing Media: Use agents suitable for surrounding fire.

Unusual Fire or Explosion Hazards: None reported.

Hazardous Combustion Products: Toxic mercury vapor and mercuric oxide.

Fire-Fighting Instructions: 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.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Keep a mercury spill kit readily available in areas where mercury is used. Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind.

Small and Large Spills: Follow instructions on mercury spill kit. Most kits come with an aspiration-driven vacuum trap with a mercury "sweeper" (copper or copper-plated brush). Wash spill area with a dilute calcium sulfide or nitric acid solution. If spill cannot be taken up readily, dust the top of the spill with flowers of sulfur or preferably, calcium polysulfide. This will produce a surface coating of mercury sulfide which will reduce mercury vapor dispersion into the air.

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

Section 7 - Handling and Storage

Handling Precautions: Use appropriate PPE when working with mercury. *Do not* use on porous work surfaces (wood, unsealed concrete, etc.) to prevent spills from lodging in cracks.

Storage Requirements: Store in a cool, dry, well-ventilated area away from heat and incompatibles (Sec. 10). Store on non-porous floors and wash them regularly with a dilute calcium sulfide solution. Because mercury will form amalgamations with most metals except iron, metal shelves should be painted with a sufficiently thick coating to prevent this from happening.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Wherever possible, enclose processes to prevent mercury vapor dispersion into work area.

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

Administrative Controls: Consider pre-placement and periodic medical exams of exposed workers with emphasis on the skin, eyes, central nervous system, liver, and kidneys.

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 $\leq$ 0.5 mg/m^3, use any chemical cartridge

respirator with cartridges providing protection against mercury and equipped with an ESLI (end of service life indicator), any SCBA, or any SAR (supplied-air respirator). For ≤ 1.25 mg/m^3, use any SAR operated in continuous-flow mode, any PAPR (powered, air-purifying respirator) with an ESLI. For ≤ 2.5 mg/m^3, use any SCBA or SAR with a full facepiece, any SAR with a tight-fitting facepiece and operated in continuous-flow mode, or any chemical cartridge respirator with a full facepiece, chemical cartridges providing protection against mercury, and equipped with an ESLI. For ≤28 mg/m^3, use any SAR operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA with full facepiece and operated in pressure-demand or other positive pressure mode. *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.

Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets made of butyl rubber, nitrile rubber, fluorocarbon rubber, neoprene rubber, polyvinyl chloride, chlorinated polyethylene, or polycarbonate to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

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

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

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 - Physical and Chemical Properties

Physical State: Liquid metal
Appearance and Odor: Silvery-white, odorless
Vapor Pressure: 0.0018 mm Hg at 77 °F (25 °C)
Formula Weight: 200.59
Density (H_2O=1): 13.534 g/cm^3 at 77 °F (25 °C)
Boiling Point: 674.09 °F (356.72 °C)
Freezing Point: -37.97 °F (-38.87 °C)
Viscosity: 15.5 mP at 77 °F (25 °C)
Electrical Resistivity: 95.76 µohm at 68 °F (20 °C)

Water Solubility: 0.28 µmol/L at 77 °F (25 °C)
Other Solubilities: Soluble in boiling sulfuric acid, nitric acid (reacts); slightly in lipids, and 2.7 mg/L in pentane. Insoluble in alcohol, ether, cold sulfuric acid, hydrogen bromide, and hydrogen iodide.
Surface Tension: 484 dyne/cm at 77 °F (25 °C)
Critical Temperature: 2664 °F (1462 °C)
Critical Pressure: 1587 atm

Section 10 - Stability and Reactivity

Stability: Mercury does not tarnish at ordinary temperatures but when heated to near its boiling point, it slowly oxidizes to mercuric oxide.

Polymerization: Hazardous polymerization does not occur.

Chemical Incompatibilities: Mercury forms alloys (amalgamates) with most metals except iron. It is incompatible with oxidizers such as bromine, 3-bromopropyne, methylsilane + oxygen, chlorine, chlorine dioxide, nitric acid, or peroxyformic acid; tetracarbonyl nickel + oxygen, alkynes + silver perchlorate, ethylene oxide, acetylenic compounds (explosive), ammonia (explosive), boron phosphodiiodide, methyl azide, nitromethane, and ground sodium carbide.

Conditions to Avoid: Exposure to high temperatures, metal surfaces or incompatibles.

Hazardous Decomposition Products: Thermal oxidative decomposition of mercury can produce mercuric oxide.

Section 11- Toxicological Information

Toxicity Data:*

Reproductive:
Rat, inhalation: 890 ng/m^3/24 hr for 16 weeks prior to mating had an effect on spermatogenesis.

Acute Dermal Toxicity:
Man, skin, TD_{Lo}: 129 mg/kg for 5 continuous hours caused ringing in the ears, headache, and allergic dermatitis.

Acute Oral Toxicity:
Man, oral, TD_{Lo}: 43 mg/kg caused tremor and jaundice or other liver changes.

Acute Inhalation Effects:
Woman, inhalation, TC_{Lo}: 150 µg/m^3/46 days caused anorexia, diarrhea, and wakefulness.
Man, inhalation, TC_{Lo}: 44300 µg/m^3/8 hr caused muscle weakness, liver changes, and increased body temperature.

Chronic Effects:
Rat, inhalation: 1 mg/m^3/ 24 hr for 5 continuous weeks caused proteinuria.

* See NIOSH, *RTECS* (OV4550000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: Catfish, LC_{50} = 0.35 mg/L/96 hr; mollusk (*Modiolus carvalhoi*), LC_{50} = 0.19 ppm/96 hr: tadpole (*Rana hexadactyla*), LC_{50} = 0.051 ppm/96 hr. Mercury is transformed to methyl mercury by bacteria in the environment and undergoes bioaccumulation readily. BCF for freshwater fish = 63,000; for saltwater fish = 10,000; and for marine and freshwater invertebrates = 100,000.

Environmental Degradation: Mercury is expected to volatilize rapidly when deposited on soil surfaces. Once in the air, it can be transported long distances before being redeposited on soil or in water. In water, mercury appears to bind to particulates where it eventually becomes deposited on the bed sediment. In general, mercury entering the environment can be deposited and revolatilized several times.

Section 13 - Disposal Considerations

Disposal: Incineration is *not* an appropriate disposal method. Wastewater may be treated by addition of chlorine to oxidize the mercury to its ionic state. The water can then be passed through an absorbent (an activated charcoal concentrate with a sulfur coating or peanut shell charcoal) to collect the ionic mercury, followed by distillation to recover the mercury. Sodium borohydride, a reducing agent, can be used to precipitate mercury from waste solutions. Bioremediation, using *Pseudomonas putida*, has also been suggested. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Mercury
Shipping Symbols: A, W
Hazard Class: 8
ID No.: UN2809
Packing Group: III
Label: Corrosive
Special Provisions (172.102): –

Packaging Authorizations
a) Exceptions: 173.164
b) Non-bulk Packaging: 173.164
c) Bulk Packaging: 173.240

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 35 kg
b) Cargo Aircraft Only: 35 kg

Vessel Stowage Requirements
a) Vessel Stowage: B
b) Other: 40, 97

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste (40 CFR 261.33): U151
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) per RCRA, Sec. 3001; CWA, Sec. 307(a), CAA, Sec. 112
CERCLA Reportable Quantity (RQ), 1 lb (0.454 kg)
SARA 311/312 Codes: 1, 2
Listed as a SARA Toxic Chemical (40 CFR 372.65)
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, 132, 136, 148, 149, 159, 167, 176, 187, 189

Prepared By ..... M Gannon, BA
Industrial Hygiene Review ..... RE Langford, PhD, CIH
Medical Review ..... T Thoburn, MD, MPH

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...s highly toxic fumes of I^-, NO_x, and NH_3. See also IODINE and AMMONIA.

NGX500 **HR: 3**
NITROGEN TRIIODIDE-SILVER AMIDE
mf: $I_3N{\bullet}AgH_2N$ mw: 518.60

SAFETY PROFILE: Dry complex may explode. When heated to decomposition it emits highly toxic fumes of NO_x and I^-. See also SILVER COMPOUNDS, AMIDES, and IODIDES.

NGY000 CAS:55-63-0 **HR: 3**
NITROGLYCERIN
DOT: UN 0143/UN 0144/UN 1204
mf: $C_3H_5N_3O_9$ mw: 227.11

PROP: Colorless to yellow liquid; sweet taste. Mp: 13°, ... explodes @ 218°, d: 1.599 @ 15°/15°, vap press: 1 ... @ 127°, vap d: 7.84, autoign temp: 518°F, decomp ... 50-60°, volatile @ 100°. Misc with ether, acetone, ...cial acetic acid, ethyl acetate, benzene, nitrobenzene, ...idine, chloroform, ethylene bromide, dichloroethylene; ... sol in petr ether, glycerol.

SYNS: ANGININE ◇ BLASTING GELATIN (DOT) ◇ BLASTING OIL ... ONOIN ◇ GLYCERINTRINITRATE (CZECH) ◇ GLYCEROL, NI... ACID TRIESTER ◇ GLYCEROL TRINITRATE ◇ GLYCEROL ... NITRATE de) (FRENCH) ◇ GLYCEROLTRINTRAAT (DUTCH) ... YCERYL NITRATE ◇ GLYCERYL TRINITRATE ◇ GLYCERYL ... NITRATE, solution up to 1% in alcohol (DOT) ◇ GTN ◇ KLAVI ... NDAL ◇ MYOCON ◇ NG ◇ NIGLYCON ◇ NIONG ◇ NITRIC ACID ... ESTER OF GLYCEROL ◇ NITRINE-TDC ◇ NITROGLICERINA ... NIAN) ◇ NITROGLICERYNA (POLISH) ◇ NITROGLYCERIN, liq... desensitized (DOT) ◇ NITROGLYCERIN, liquid, not desensitized (DOT) ... NITROGLYCERINE ◇ NITROGLYCEROL ◇ NITROGLYN ◇ NITROL ... NITROLINGUAL ◇ NITROLOWE ◇ NITRONET ◇ NITRONG ... NITRO-SPAN ◇ NITROSTAT ◇ NK-843 ◇ NTG ◇ PERGLOTTAL ... 3-PROPANETRIOL, TRINITRATE ◇ 1,2,3-PROPANETRIYL NI... RATE ◇ RCRA WASTE NUMBER P081 ◇ SK-106N ◇ SOUP ◇ TNG ... TRINITRIN ◇ TRINITROGLYCERIN ◇ TRINITROGLYCEROL

TOXICITY DATA with REFERENCE
...-rbt 500 mg/24H MLD NTIS** AD-B011-150
...ma-sat 50 µg/well CBINA8 19,77,77
...-rat TDLo:11 mg/kg (female 7-17D post):TER ...ACHDS 13,3807,85
...-rat TDLo:11 mg/kg (female 7-17D post):REP ...ACHDS 13,3807,85
...-rat TDLo:36500 mg/kg/2Y-C:ETA ATSUDG 4,88,80
...-man TDLo:51429 µg/kg/2D-I:CNS,EYE AIMEAS ...500,84
...-rat LD50:105 mg/kg YACHDS 13,3649,85
...-rat LD50:102 mg/kg IYKEDH 13,90,82
...-rat LD50:94 mg/kg YACHDS 13,3649,85
...-rat LD50:23200 µg/kg JJATDK 3,161,83
...-mus LD50:115 mg/kg YACHDS 13,3649,85
...-mus LD50:104 mg/kg IYKEDH 13,90,82
...-mus LD50:110 mg/kg YACHDS 13,3649,85
ivn-mus LD50:10600 µg/kg IYKEDH 13,90,82
ivn-dog LD50:19 mg/kg OYYAA2 22,629,81
scu-cat LDLo:150 mg/kg AEPPAE 200,271,42
scu-rbt LDLo:400 mg/kg AEPPAE 200,271,42
ivn-rbt LD50:45 mg/kg NIIRDN 6,547,82

CONSENSUS REPORTS: Reported in EPA TSCA Inventory. Community Right-To-Know List.

OSHA PEL: (Transitional: TWA CL 0.2 ppm (skin))
STEL: 0.1 mg/m³ (skin)
ACGIH TLV: TWA 0.05 ppm (skin)
DFG MAK: 0.05 ppm (0.5 mg/m³) (skin)
NIOSH REL: CL (Nitroglycerin or EGDN) 0.1 mg/m³/20M
DOT Classification: Class A Explosive; Label: EXPLOS. A, desensitized (UN0144); Forbidden, not desensitized; Flammable Liquid; Label: Flammable Liquid (UN1204, NA1204); Class A Explosive; Label: Explosive A, Poison (UN0143).

SAFETY PROFILE: Human poison by an unspecified route. Poison experimentally by ingestion, intraperitoneal, subcutaneous, and intravenous routes. An experimental teratogen. Other experimental reproductive effects. A skin irritant. Questionable carcinogen with experimental tumorigenic data. Mutation data reported. It can cause respiratory difficulties and death due to respiratory paralysis by ingestion. The acute symptoms of nitroglycerin poisoning are headaches, nausea, vomiting, abdominal cramps, convulsions, methemoglobinemia, circulatory collapse and reduced blood pressure, excitement, vertigo, fainting, respiratory rales and cyanosis. Toxic effects may occur by ingestion, inhalation of dust, or absorption through intact skin. Human systemic effects by intravenous route: encephalitis, miosis, corneal damage. Used as a vasodilator and as an explosive.

A very dangerous fire hazard when exposed to heat, flame, or by spontaneous chemical reaction. A severe explosion hazard when shocked or exposed to O_3, heat, or flame. Nitroglycerin is a powerful explosive, very sensitive to mechanical shock, heat, or UV radiation. Small quantities of it can readily be detonated by a hammer blow on a hard surface, particularly when it has been absorbed in filter paper. It explodes when heated to 215°C. Frozen nitroglycerin is somewhat less sensitive than the liquid. However, a half-thawed or partially thawed mixture is more sensitive than either one. When heated to decomposition it emits toxic fumes of NO_x. See also EXPLOSIVES, HIGH; and DYNAMITE.

NGY500 CAS:53569-64-5 **HR: 3**
NITROGLYCERIN mixed with ETHYLENE GLYCOL DINITRATE (1:1)
mf: $C_3H_5N_3O_9{\bullet}C_2H_4N_2O_6$ mw: 379.19

APPENDIX D
PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM

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1. OBJECTIVE

OHM Remediation Services Corp. (OHM) personnel will be protected for chemical, physical, and environmental hazards by the appropriate personal protective equipment (PPE) when engineering and administrative controls are not effective in controlling job hazards.

2. PURPOSE

The purpose of this procedure is to address the elements of the PPE program. This PPE program conforms to the requirements found in 29 CFR 1910.120 (g) Engineering controls, work practices, and personal protective equipment for employee protection; 29 CFR 1910 Subpart I - Personal Protective Equipment - .132 General Requirements, .133 Eye and Face Protection, .135 Head Protection, .136 Foot Protection, .138 Hand Protection; and 29 CFR 1910.1200 Hazard Communication.

3. RESPONSIBILITY AND AUTHORITY

The responsibility and authority for the selection, use, and maintenance of personal protective equipment is shared between management, supervisory, health and safety, and employee personnel.

3.1 Management - Management has the responsibility to provide PPE appropriate for the hazard/s associated with expected work tasks.

3.2 Supervisors - Supervisors have the responsibility conduct hazard assessments and ensure personnel utilizing PPE in compliance with this SOP. Supervisors may request assistance from or designate authority to health and safety personnel for hazard assessment, selection, inspection, and decontamination of PPE. The use of PPE by employees is the supervisors responsibility.

3.3 Health and Safety Personnel - Health and safety personnel have responsibility to assist supervisors in hazard assessment, selection, inspection, and decontamination of PPE. In event of conflict, health and safety personnel have the authority implement the necessary measures.

3.4 Employees - Employees have the responsibility to use, inspect, and decontaminate PPE as directed by supervisors.

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4. PROGRAM ELEMENTS

Program elements define the regulatory requirements of a PPE program.

4.1 Hazard assessment - All tasks undertaken by OHM personnel will be assessed for chemical, physical, and environmental hazards present or likely to be present which necessitate the use of PPE to ensure adequate protection. This assessment shall take place prior to commencement of work.

4.2 Hazard Reassessment - The level of protection or type of personal protective equipment shall be increased when additional information on site conditions indicates that increased protection is necessary to reduce employee exposures below permissible exposure limits, published exposure levels for hazardous substances and health hazards or other physical and environmental hazards.

4.3 PPE Selection - The regional health and safety director/manager or his/her designee will initially select the level and types of PPE that will protect the affected employee from the hazards identified in the initial hazard assessment.

4.4 Written Certification - The site specific Health and Safety Plan (HASP) will serve as the written certification that identifies the workplace was evaluated. The HASP shall be dated. The signature line shall designate the person certifying that the evaluation has been performed.

4.5 Communication of Selection - Employees will be informed of the PPE selection decisions through reading or verbally reviewing the HASP, pre-project safety briefings, job safety analysis (JSA) review, safety meetings and/or some combinations.

4.6 PPE Use and Fit - The supervisor will be responsible for the proper use and fit of PPE by workers under his/her direction and will monitor the effectiveness of these items. Heath and safety personnel will advise and assist the supervisor in these areas.

4.7 Work Mission Duration - The supervisor will be responsible for the establishment of the duration of specific work missions. The duration will be determined by the complexity of the assignment, PPE involved, physical factors, temperature, humidity, weather conditions, elevation of work, and acclimation of the worker to the demands of the task assigned. The supervisor will consider the recommendations of the health and safety personnel.

A sufficient amount of rest breaks will be allowed in order to avoid

overexertion or thermal stress by the employees while maintaining productive work practices. Further guidance is offered in OHM Health and Safety Procedure No. 22 Heat Stress and No. 23 Cold Stress.

4.8 PPE Maintenance and Storage - Each employee is responsible for the proper maintenance and storage of the standard issue equipment (e.g., hard hat, full-face piece negative pressure respirator, safety glasses). The supervisor will assure that proper maintenance is carried out.

4.9 PPE Decontamination - Each employee is responsible for daily cleaning and decontamination of reusable PPE such as outer gloves, outer boots, reusable chemically resistant clothing, and standard issue PPE such as hard hats and respirators.

OHM will provide an area/s for decontamination operations, necessary cleaning agents, tools eg. brushes and wash basins, and a method to dispose of materials generated during decontamination activities.

OHM will attempt to reduce decontamination requirements through the use of disposable protective clothing and gloves as feasible.

4.10 PPE Training - All employees will receive training in the proper use of PPE prior to wearing the equipment in a work situation. This training will be administered upon commencement of employment during HAZWOPER training. PPE refresher training will be reviewed annually during the HAZWOPER refresher training. Project specific training will be provided as required.

4.11 PPE Donning and Doffing Procedures - All employees will receive training upon commencement of employment and during annual refresher training concerning the donning and doffing of PPE. Periodic training will be provided as required.

4.12 PPE Inspection - Each employee shall inspect PPE for defects and proper function prior to each use. Defective or damaged PPE shall not be used. Any PPE found to be defective or have missing parts will be replaced prior to use.

4.13 PPE In Use Monitoring - The supervisor is responsible for monitoring the effectiveness of selected PPE. If at any time level of PPE is to be downgraded, it is mandatory that the change be approved by the regional health and safety director/manager or his/her designee.

4.14 Evaluation of PPE Program - Health and safety personnel will compile data on PPE in the field to determine that the PPE performs to OHM needs. Periodically, this information should be reviewed by the corporate director

of health and safety to ensure that PPE is providing the necessary level of protection, quality, and is appropriate for the work performed.

If at any time the failure of PPE causes injury to an employee or fails to perform as expected, the supervisor will take the unit or item out of service and investigate the incident. The incident shall be immediately reported to the regional health and safety director/manager. If after scrutiny, the unit or item is determined to have a manufacturing defect, all identical units will be removed from use until corrective actions are taken.

4.15 Limitations During Temperature Extremes - Extreme temperatures exert stress on personnel and may alter the performance characteristics of PPE. During periods of extreme temperature, work assignments will be adjusted to protect the employee from overexertion or exposure. The supervisor will evaluate if temperature extremes are effecting performance characteristics of PPE and report these findings to the regional health and safety director/manager and/or his/her designee.

4.16 Unserviceable PPE - Any PPE which is no longer functioning properly or is no longer serviceable shall be removed from use and either repaired or destroyed.

5. SAFETY EQUIPMENT POLICY

OHM will provide, maintain, and replace personal protective equipment as detailed below.

5.1 Standard issue safety equipment - Standard issue safety equipment will be provided at no cost to field employees. These items consist of:

- Hard hat
- Safety glasses with clear and shaded lenses
- Full-face respirator with nose cup

5.2 Company provided equipment - OHM will provide at no cost to the employee the following items on a task specific or project specific basis:

- Chemical protective equipment such as gloves, boots, and clothing
- Specialty glasses or goggles
- Face shields
- Flame resistant clothing

- Hearing protection
- Fall protection

5.3 Employee provided equipment - The employee shall provide the following equipment:

- ANSI approved steel toed and shank boots/shoes (Note: Further guidance is provided in Section 7 Safety footwear)
- Outerwear for cold weather

5.4 Equipment replacement - OHM will replace worn out or work damaged equipment detailed in 5.1 and 5.2. OHM reserves the right to charge employees for the replacement cost of equipment which is lost or damaged though neglect or abuse.

5.5 Additional PPE - The regional health and safety director/manager and/or his/her designee or the supervisor may require additional company provided PPE on a task specific basis.

6. WORK CLOTHES

OHM employees, subcontractors, and visitors will observe the requirements for proper work clothing when on OHM project sites, facilities, and shops.

6.1 Pants - Long pants are required at all times. These pants must be in good repair.

6.2 Shirts - Shirts will be worn on the job. Shirts will be buttoned up the front and at the cuff unless rolled up. Shirt tails must be kept in the trousers. Sleeveless shirts are prohibited at all work locations. Supervisory personnel are expected to wear a shirt with a collar. T-shirts are permitted for personnel who wear protective clothing most of the day.

6.3 Clothing - Loose or ragged clothing will not be worn.

6.4 Modifications - Regional health and safety director/manager may modify work clothing requirements on a project specific basis.

6.5 Contaminated Clothing - Clothing (including shoes) saturated with petroleum products or chemicals will be removed immediately to prevent irritation and possible dermal exposure.

6.6 Jewelry - Rings and other jewelry (except watches) must be removed when working in areas where they could catch on moving objects, sharp

protrusions, come in contact with electrical circuits or chemical agents, or compromise PPE ie. rings capable of cutting gloves. Additionally, the supervisor may deem other types of jewelry inappropriate for the work task.

6.7 Hair Length - Hair long enough to constitute a hazard while working around moving machinery or rotating tools and equipment must be secured by a net or tied back. Hair styles must not interfere with the ability to properly wear safety headgear, safety spectacles, and respiratory protection.

7. EYE/FACE PROTECTION

All OHM employees, subcontractors, and visitors shall wear eye and face protection meeting the requirements of ANSI document Z87.1 - 1989 titled "Practice of Occupational and Educational Eye and Face Protection" during the tasks posing exposure to eye or face injury.

7.1 Requirements - To protect the face and eyes against injuries from flying objects, splashing liquids, and harmful rays, safety spectacles with side shields, goggles, face shields, cutting goggles, and welding helmets will be used. The supervisor will be responsible to identify the need for eye/face protection and specify the eye/face protection required for each operation. A selection guide is attached in Table 1.

7.2 Safety spectacles - Safety spectacles are protective devices intended to shield the wearer's eyes from a variety of hazards. While they are primary protectors and may be used alone, they may also be used in conjunction with other protective devices such as goggles and face shields.

7.3 Goggles - Goggles are protective devices intended to fit the face immediately surrounding the eyes in order to shield the eyes from a variety of hazards. While they are primary protectors and may be used alone, they also may be used in conjunction with other protectors.

7.4 Face shields - Face shields are protective devices intended to shield the wearer's face, or portions thereof, in addition to the eyes, from certain hazards. Face shields are secondary protectors and shall be used with primary protectors.

7.5 Cutting goggles - Cutting goggles are protective devices designed to protect the eyes from radiation and impact. Goggles are primary protectors and in some situations must be supplemented with face shields. See Table 3 for selection guidelines.

7.6 Welding helmets - Welding helmets are protective devices intended to shield the eyes and face from optical radiation and impact. Welding helmets are secondary protectors and shall be used only in conjunction with

primary protectors such as safety spectacles or goggles. See Table 2 for selection guidelines.

7.7 Prescription Spectacles - For personnel that wear prescription spectacles, OHM provides prescription safety spectacles with side shields. It is mandatory that prescription safety spectacles not be altered by the employee and be worn at all times when safety spectacles are required.

7.8 Contact lenses - Contact lenses are not permitted to be worn where accidental eye contact with chemical agents or physical materials is possible. OHM provides prescription spectacles and other protective devices for use in these situations.

7.9 Shaded lenses - Shaded lenses eg. sun glasses are not to be worn indoors or under low light conditions.

8. SAFETY HEADGEAR

All OHM employees, subcontractors, and visitors shall wear safety headgear meeting the requirements of ANSI document Z89.1-1986 titled "Protective Headwear for Industrial Workers - Requirements" when exposed to overhead hazards.

8.1 Requirement - Safety headgear shall be worn by all personnel while engaged in work where there is a hazard of falling objects, low overhead restrictions, and other overhead hazards exist. Safety headgear may also be required to be worn by contractual requirements.

8.2 Use - Safety headgear must be worn as prescribed by the manufacturer in the bill front position unless the headgear was approved to be worn in another position.

8.3 Modifications - Safety headgear shall not be painted, drilled or modified in any manner. Use of safety related headgear stickers are permitted.

8.4 Life Expectancy - No maximum mandatory service life is specified by regulation for safety headgear. However, a hardhat should be removed from service if chemical corrosion, cracks, deformities, worn suspension, or discoloration is noted with the unit.

9. SAFETY FOOTWEAR

All OHM employees, subcontractors, and visitors that enter OHM project sites and are exposed to foot hazards shall wear footwear meeting the ANSI document Z41 - 1991 titled "Protective Footwear" during operations posing foot injury.

9.1 Project Sites - Steel toe and shank leather work boots shall be worn on all OHM project sites. High top or low top sneakers, western style boots, or other footwear even though ANSI approved are not appropriate for the activities encountered at hazardous waste and emergency response sites and shall not be worn.

9.2 OHM Facilities and Shops - Personnel working at OHM shops and facilities have the option of wearing other types of ANSI approved safety work shoes and boots provided they are appropriate for the tasks being performed. The supervisor of the work area is responsible to decide what type footwear is appropriate.

10. HAND PROTECTION/GLOVES

OHM employees, subcontractors, and visitors will don appropriate gloves when engaged in any operation that presents a hazard to the hands.

10.1 Use - Appropriate work gloves shall be available for hand protection against heat and flame, cold, chemicals, petroleum products, corrosive materials, moisture, mechanical abrasion, electricity, and sharp and rough surfaces.

10.2 Selection - Glove selection of the appropriate hand protection shall be based on an evaluation of the performance characteristic of the hand protection relative to the task(s) to be performed, chemical concentration and properties, physical conditions present, duration of use, and the hazards and potential hazards identified. The type of work gloves used must be approved by the regional health and safety director/manager and his/her designee and specified in the HASP for the particular task.

10.3 Electrical - When working on high voltage (480 volts and above) electrical equipment, electrically tested high voltage gloves will be worn. Leather protection will be worn over these gloves. (NOTE: Only authorized personnel are permitted to work on High Voltage electrical equipment).

11. PROTECTIVE CLOTHING

OHM employees, subcontractors, and visitors will don appropriate protective clothing when engaged in any operation that presents a hazard to the body.

11.1 Use - Appropriate clothing shall be available for body protection against heat and flame, cold, chemicals, petroleum products, corrosive materials, moisture, mechanical abrasion, electricity, and sharp and rough surfaces.

11.2 Selection - Clothing selection of the appropriate body protection shall be based on an evaluation of the performance characteristic of the body protection relative to the task(s) to be performed, chemical concentration

and properties, physical conditions present, duration of use, and the hazards and potential hazards identified. The type of protective clothing used must be approved by the regional health and safety director/manager and his/her designee and specified in the HASP for the particular task.

12. TOTALLY-ENCAPSULATING CHEMICAL PROTECTIVE SUITS

Totally-encapsulating chemical protective suits (Level A) shall be used in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

12.1 Use - OHM will only use Level A protection when all other reasonable efforts of controlling employee exposure through engineering or administrative means are not possible.

12.2 Authorization - Level A protection may only be used after authorization of the regional health and safety director/manager has been granted.

12.3 Health and Safety Personnel - An appropriately experienced health and safety employee must be assigned to the project site where Level A is to be used. They must evaluate that the following items are ready:

- Communications
- Decontamination
- Emergency rescue procedures and personnel
- Emergency medical attention

12.4 OHM will discard and properly dispose of any Level A suit which has come in contact with chemical contaminants or sustained physical damage at least at the end of the project.

13. LOANING PERSONAL PROTECTIVE EQUIPMENT

OHM personnel should not loan OHM personal protective equipment to any client, subcontractor, or visitor personnel. If there are urgent circumstances, such as an emergency response where the equipment cannot be obtained elsewhere and chemical exposure is possible, OHM personnel can loan personal protective equipment such as respirators, protective clothing and other safety equipment to client personnel or personnel from other organizations. However because of the potential liability involved, approval of senior OHM management is required as well as the requirement that a representative of the company and the individual using the equipment execute an OHM Indemnification and Release Agreement.

TABLE 1
FACE PROTECTION SELECTION GUIDELINES

Hazard	Protection
Flying fragments, objects, large chips, particles, sand, and dirt from chipping, grinding, machining, masonry work, riveting, and sanding	Safety spectacles or goggles Supplement with face shield for severe exposure
Chemical splash from corrosive and chemical handling, pressure washing operations	Goggles Supplement with face shield for severe exposure
Nuisance dust from woodworking, buffing, and general dusty conditions	Safety spectacles or goggles
Hot sparks from grinding operations	Safety spectacles or goggles Supplement with face shield for severe exposure
Molten metal from torch cutting operations	Shaded cutting goggles (see Table 3) and face shield
Welding operations	Safety spectacles and shaded welding hood (see Tables 2)

OHM Remediation Services Corp.
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TABLE 2

GUIDE FOR WELDING SHADE NUMBERS

Operation	Electrode Size 1/32 inch	Arc Current (A)	Minimum Protective Shade	Suggested* Shade No. (Comfort)
Shielding metal arc welding	Less than 3	Less than 60	7	---
	3-5	60-160	8	10
	5-8	160-250	10	12
	More than 8	250-550	11	14
Gas metal arc welding and flux cored arc welding		Less than 60	7	---
		60-160	10	11
		160-250	10	12
		250-500	10	14
		150-500	10	14
Air carbon Air cutting	(Light)	Less than 500	10	12
	(Heavy)	500-1000	11	14
Plasma arc welding		Less than 20	6	6 to 8
		20-100	8	10
		100-400	10	12
		400-800	11	14
Plasma arc cutting	(Light)	Less than 300	8	9
	(Medium)	300-400	9	12
	(Heavy)	400-800	10	14
Torch brazing		---	---	3 or 4
Torch soldering		---	---	2
Carbon arc welding		---	---	14

*As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

TABLE 3

GUIDE FOR CUTTING SHADE NUMBERS

Operation	Plate Thickness	Minimum Protective Shade
Gas Welding		
Light	Under 1/8	4 or 5
Medium	1/8 to 1/2	5 or 6
Heavy	over 1/2	6 or 8
Oxygen Cutting		
Light	Under 1	3 or 4
Medium	1 to 6	4 or 5
Heavy	Over 6	5 or 6

OHM Corporation

INDEMNIFICATION AND RELEASE AGREEMENT

FOR AND IN CONSIDERATION OF the use by the undersigned of property belonging to OHM Remediation Services Corp. (hereinafter referred to as "OHM") and which may include full-face mask respirators, self-contained breathing apparatus, and other equipment and supplies, and other good and valuable consideration, the undersigned , for himself and his successors, and assigns, does hereby release and discharge OHM, its officers, employees, agents, and subcontractors from any and all claims, actions, demands, damages, costs, loss of services, expenses, compensation, third-party actions, or suits, including attorneys fees, arising and resulting from the aforementioned use of property, equipment, or supplies belonging to OHM.

In addition, the undersigned, on behalf of his employer, principal, himself, and his successors, and assigns, agrees to release, save, and hold harmless, protect, indemnify, and defend OHM, and its officers, employees, agents, and subcontractors against any and all claims, actions, and expenses as above described, whether for bodily injury, property damage or destruction, or both, arising or resulting in any way from the use by the undersigned of property of OHM and agrees to save, hold harmless, protect, indemnify, and defend OHM against any such claims, actions, or expenses, referenced above, that might be brought against OHM by any third persons or the heirs, successors, executors or assigns of the undersigned.

The undersigned acknowledges by signing that he has carefully read this Agreement, understands the contents thereof, and has freely and voluntarily signed the same.

EXECUTED on _____, 19___.

1. OHM Regional Vice President (or designee) authorizing use of equipment:

   _____

2. CLIENT OR SUBCONTRACTOR REPRESENTATIVE AUTHORIZING EQUIPMENT USE:

   I authorize the individual(s) in 3. below to use OHM provided personal protective equipment

   Company Name_____

   Sign Name_____

   Print Name_____

   Title_____

3. INDIVIDUAL USING EQUIPMENT: I certify that I am familiar with the equipment and medically qualified to wear the equipment

   Company Name_____

   Sign Name_____

   Print Name_____

   NOTE: A continuation sheet can be used if more than one individual is to be certified to use equipment

4. OHM Representative Acknowledging Signatures:

   Sign Name_____

Revised 11/19/92

APPENDIX E
PHASE SAFETY PLANS

APPENDIX F
NIOSH ANALYTICAL METHOD 7102/7300 (BERYLLIUM)

FORMULA: Be

M.W.: 9.01

BERYLLIUM and compounds, as Be

METHOD: 7102

ISSUED: 2/15/84

REVISION #1: 8/15/87

OSHA: 2 µg/m³; C 5 µg/m³
NIOSH: not to exceed 0.5 µg/m³ [1]
ACGIH: 2 µg/m³ (suspect carcinogen)

PROPERTIES: hard, light metal; valence +2;
MP 1284 to 1300 °C;
d 1.85 g/mL (20 °C)

SYNONYMS: CAS #7440-41-7; other synonyms vary as to compound.

SAMPLING

SAMPLER: FILTER
(0.8-µm cellulose ester membrane)

FLOW RATE: 1 to 4 L/min

VOL-MIN: 25 L @ 2 µg/m³
-MAX: 1000 L @ 2 µg/m³

SHIPMENT: routine

SAMPLE STABILITY: stable

BLANKS: 10% of samples

ACCURACY

RANGE STUDIED: 2.7 to 11.8 µg/m³ [2]
(40-L samples)

BIAS: not significant

OVERALL PRECISION (s_r): 0.064 [2]

MEASUREMENT

!
!TECHNIQUE: ATOMIC ABSORPTION, GRAPHITE FURNACE
!
!ANALYTE: beryllium
!
!ASHING REAGENTS: HNO_3, 10 mL; H_2SO_4, 1 mL
!
!CONDITIONS: 150 °C until brown fumes disappear;
! 400 °C to dense fumes of H_2SO_4
!
!FINAL SOLUTION: 2% Na_2SO_4, 3% H_2SO_4;
! 10 mL
!
!GRAPHITE FURNACE: 110 °C dry 20 sec;
! 900 °C char 10 sec;
! 2800 °C atomize 18 sec
!
!WAVELENGTH: 234.9 nm
!
!BACKGROUND CORRECTION: D_2 or H_2 continuum
!
!INJECTION VOLUME: 10 µL
!
!CALIBRATION: Be^{++} in 2% Na_2SO_4,
! 3% H_2SO_4
!
!RANGE: 0.05 to 1 µg per sample [3]
!
!ESTIMATED LOD: 0.005 µg per sample [3]
!
!PRECISION (s_r): 0.008 [3]
!

APPLICABILITY: The working range is 0.5 to 10 µg/m³ for a 90-L air sample. The method is applicable to ceiling measurements using a 25-L air sample.

INTERFERENCES: Calcium interference is masked by 3% (v/v) sulfuric acid. Sodium, potassium, and aluminum enhance beryllium absorbance; this effect is overcome by addition of 2% (w/v) sodium sulfate to both standards and samples. Perchloric, phosphoric, and hydrofluoric acids produce interfering non-atomic peaks. These must be removed by digesting to dryness.

OTHER METHODS: This revises Method P&CAM 288 [3], which replaced Method S339 [4]. Flame atomic absorption and plasma emission (ICP-AES) are not sensitive enough for beryllium at these levels.

REAGENTS:

1. Nitric acid, conc.
2. Sulfuric acid, conc.
3. Sodium sulfate, reagent grade.
4. Sodium sulfate, 2% (w/v)/3% sulfuric acid (v/v). Add 10 g sodium sulfate and 15 mL H_2SO_4 to deionized water. Dilute to 500 mL.
5. Calibration stock solution, 1000 µg Be/mL,* commercially available, or dissolve 1.000 g Be metal in a minimum volume of 1+1 HCl, dilute to 1 L with 1% (v/v) HCl
6. Argon, prepurified.
7. Water, distilled or deionized.

*See SPECIAL PRECAUTIONS.

EQUIPMENT:

1. Sampler: mixed cellulose ester membrane filter, 0.8-µm pore size, 37-mm diameter in three-piece cassette filter holder.
2. Personal sampling pump, 1 to 4 L/min, with flexible connecting tubing.
3. Atomic absorption spectrophotometer with graphite furnace and background corrector.
4. Beryllium hollow cathode lamp.
5. Pressure regulator, two-stage, for Argon.
6. Beakers, Phillips, 125-mL.*
7. Watchglasses.*
8. Volumetric flasks, 10-mL.*
9. Pipets, 10-mL delivery, with pipet bulb.*
10. Automatic pipettor with tips, 10-µL and assorted sizes for standards.
11. Hotplate, 150 to 400 °C.
12. Waterbath, 60 to 70 °C.
13. Bottles, polyethylene, 25-mL.

*Clean all glassware with conc. nitric acid and rinse thoroughly before use.

SPECIAL PRECAUTIONS: Beryllium is very toxic and a suspected human carcinogen [1]. Perform all acid digestions in a fume hood.

SAMPLING:

1. Calibrate each personal sampling pump with a representative filter in line.
2. Sample at an accurately known flow rate between 1 and 4 L/min for a sample size of 25 to 1000 L. Do not exceed 2 mg total dust loading on the filter.

SAMPLE PREPARATION:

3. Open cassettes and transfer filters to clean Phillips beakers.
4. Add 10 mL conc. HNO_3 and 1 mL conc. H_2SO_4. Cover with watchglass.
5. Heat in fume hood on hotplate (150 °C) until brown fumes of HNO_3 disappear, then at 400 °C until dense fumes of H_2SO_4 appear.
   NOTE: Verify that the compounds in the samples are soluble with this ashing procedure, e.g., ore or mining samples will require HF in the digestion. If additional ashing acids are used (e.g., HF, $HClO_4$, or H_3PO_4), evaporate to complete dryness at this point.
6. Cool and rinse watchglass and sides of beaker with distilled water and evaporate just to dryness. Remove beaker immediately and air-cool.
7. Pipet 10.0 mL 2% Na_2SO_4/3% H_2SO_4 solution into beaker and cover. Start sulfate reagent blanks at this step.
8. Heat in 60 to 70 °C waterbath for 10 min. Allow to stand overnight before analysis to ensure complete dissolution of $BeSO_4$.

CALIBRATION AND QUALITY CONTROL:

9. Calibrate daily with at least five working standards over the range 0.005 to 1 µg Be per sample.

a. Use serial dilutions of known amounts of calibration stock solution in 2% Na_2SO_4/3% H_2SO_4 to prepare working standards. Store in polyethylene bottles. Stable at least four weeks.
b. Analyze together with samples and blanks (steps 11 and 12).
NOTE: Analyze working standards alternately with the samples to compensate for the increasing Be signal as the graphite tube ages.

10. Analyze three quality control blind spikes and three analyst spikes.

MEASUREMENT:

11. Set spectrophotometer and graphite furnace according to manufacturer's recommendations and to conditions on page 7102-1.
12. Inject 10-µL aliquots of samples into graphite tube. Record absorbance (peak height mode).

CALCULATIONS:

13. Read absorbance of samples, A; average media blanks, A_b; average sulfate reagent blanks, A_r; and working standards, A_s.
14. Using the working standard, C_s (µg/mL), analyzed adjacent to the sample of interest, calculate concentration, C (µg/m³), of Be in the air volume sampled, V (L):

$$C = \frac{(A - A_b) \cdot C_s \cdot 10^4}{(A_s - A_r)V}, \mu g/m^3$$

EVALUATION OF METHOD:

This method was evaluated using NBS Standard Reference Material No. 2675 for Be over the range of 0.1 to 0.4 µg Be/filter (equivalent to one-half to two times the OSHA PEL). Beryllium recovery was 98.2% with a measurement precision, s_r, of 0.008 [3]. This method is an improvement of S339 [4], which was validated over the range of 2.68 to 11.84 µg/m³ using a 40-L sample. Mean recovery was 106.9% with overall precision of 0.064 [2].

REFERENCES:

[1] Criteria for a Recommended Standard...Occupational Exposure to Beryllium, U.S. Department of Health, Education and Welfare, Publ. (NIOSH) 72-10268 (1972); and as revised in August, 1977 in NIOSH testimony at OSHA hearing.
[2] Documentation of the NIOSH Validation Tests, S339, U.S. Department of Health, Education and Welfare, Publ. (NIOSH) 77-185 (1977).
[3] NIOSH Manual of Analytical Methods, 2nd ed., V. 5, P&CAM 288, U.S. Department of Health, Education and Welfare, Publ. (NIOSH) 79-141 (1979).
[4] Ibid., V. 3, S339, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-C (1977).

METHOD REVISED BY: Mary Ellen Cassinelli, NIOSH/DPSE; S339 validated under NIOSH Contract CDC-99-74-45.

ELEMENTS (ICP)

METHOD: 7300
ISSUED: 2/15/84

M.W.: Table 1

OSHA/NIOSH/ACGIH: Table 1

PROPERTIES: Table 1

ELEMENTS:	aluminum	cobalt	manganese	silver	tungsten
	arsenic	copper	molybdenum	sodium	vanadium
	beryllium	iron	nickel	tellurium	yttrium
	cadmium	lead	phosphorus	thallium	zinc
	calcium	lithium	platinum	tin	zirconium
	chromium	magnesium	selenium	titanium	

SYNONYMS: vary depending upon the compound.

SAMPLING

SAMPLER: FILTER
(0.8-µm, cellulose ester membrane)

FLOW RATE: 1 to 4 L/min

VOL-MIN: Table 1
-MAX: Table 1

SHIPMENT: routine

SAMPLE STABILITY: stable

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: not studied

BIAS: none identified

OVERALL PRECISION (s_r): not evaluated

MEASUREMENT

TECHNIQUE: INDUCTIVELY COUPLED ARGON PLASMA, ATOMIC EMISSION SPECTROSCOPY

ANALYTE: elements above

ASHING REAGENTS: conc. HNO_3, 4 mL; and conc. $HClO_4$, 1 mL

CONDITIONS: room temperature, 30 min; 150 °C to near dryness

FINAL SOLUTION: 4% HNO_3, 1% $HClO_4$, 10 mL

WAVELENGTH: depends upon element; Table 2

BACKGROUND CORRECTION: spectral wavelength shift

CALIBRATION: elements in 4% HNO_3, 1% $HClO_4$

RANGE: 2.5 to 1000 µg per sample [1]

ESTIMATED LOD: 1 µg per sample [1]

PRECISION (s_r): Table 2

APPLICABILITY: The working range of this method is 0.005 to 2.0 mg/m³ for each element in a 500-L air sample. This is simultaneous elemental analysis, not compound specific. Verify that the types of compounds in the samples are soluble with this ashing procedure.

INTERFERENCES: Spectral interferences are the primary interferences encountered in ICP-AES analysis. These are minimized by judicious wavelength selection, interelement correction factors and background correction [1,2].

OTHER METHODS: This method replaces P&CAM 351 [2] for trace elements. Atomic absorption spectroscopy (e.g., Methods 70XX) is an alternate analytical technique for many of these elements.

REAGENTS:

1. Nitric acid, conc.
2. Perchloric acid, conc.*
3. Ashing acid: 4:1 (v/v) HNO_3:$HClO_4$. Mix 4 volumes conc. HNO_3 with 1 volume conc. $HClO_4$.
4. Calibration stock solutions, 1000 µg/mL. Commercially available, or prepared per instrument manufacturer's recommendation (see step 12).
5. Dilution acid, 4% HNO_3, 1% $HClO_4$. Add 50 mL ashing acid to 600 mL water; dilute to 1 L.
6. Argon.
7. Distilled,deionized water.

*See Special Precautions.

EQUIPMENT:

1. Sampler: cellulose ester membrane filter, 0.8-µm pore size, 37-mm diameter; in cassette filter holder.
2. Personal sampling pump, 1 to 4 L/min, with flexible connecting tubing.
3. Inductively coupled plasma-atomic emission spectrometer, equipped as specified by the manufacturer for analysis of elements of interest.
4. Regulator, two-stage, for argon.
5. Beakers, Phillips, 125-mL, or Griffin, 50-mL, with watchglass covers.*
6. Volumetric flasks, 10- and 100- mL.*
7. Assorted volumetric pipets as needed.*
8. Hotplate, surface temperature 150 °C.

*Clean all glassware with conc. nitric acid and rinse thoroughly in distilled water before use.

SPECIAL PRECAUTIONS: Perform all perchloric acid digestions in a perchloric acid hood.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Sample at an accurately known flow rate between 1 and 4 L/min for a total sample size of 200 to 2000 L (see Table 1) for TWA measurements. Do not exceed a filter loading of approximately 2 mg total dust.

SAMPLE PREPARATION:

3. Open the cassette filter holders and transfer the samples and blanks to clean beakers.
4. Add 5 mL ashing acid. Cover with a watchglass. Let stand 30 min at room temperature.
   NOTE: Start a reagent blank at this step.
5. Heat on hotplate (120 °C) until ca. 0.5 mL remains.
   NOTE: Some species of Li, Mn, Mo, Sn, W, and Zr will not be completely solubilized by this procedure. Alternative solubilization techniques for most of these elements can be found elsewhere [2,3,4,5,6,7].
6. Add 2 mL ashing acid and repeat step 5. Repeat this step until the solution is clear.
7. Remove watchglass and rinse into the beaker with distilled water.
8. Increase the temperature to 150 °C and take the sample to dryness.
9. Dissolve the residue in 2 to 3 mL dilution acid.
10. Transfer the solutions quantitatively to 10-mL volumetric flasks.
11. Dilute to volume with dilution acid.

CALIBRATION AND QUALITY CONTROL:

12. Calibrate the spectrometer according to the manufacturers recommendations.
    NOTE: Typically, an acid blank and 10 µg/mL multielement working standards are used. The following multielement combinations are chemically compatible in 4% HNO_3/1% $HClO_4$:
    a. Ag, Ca, Co, Mn, Pb, V, Zn;
    b. Al, Be, Cd, La, Li, Ni, Tl;
    c. As, B, Ba, Mg, Mo, P, Sn;

d. Cu, Fe, Na, Pt, Sr, Te, Y;
e. Cr, K, Sb, Se, Ti, Zr; and
f. Si, W (distilled water only)

13. Analyze a standard for every ten samples.
14. Check recoveries with at least two spiked media blanks per ten samples.

MEASUREMENT:

15. Set spectrometer to conditions specified by manufacturer.
16. Analyze standards and samples.
    NOTE: If the values for the samples are above the range of the standards, dilute the solutions with dilution acid, reanalyze and apply the appropriate dilution factor in the calculations.

CALCULATIONS:

17. Obtain the solution concentrations for the sample, C_s (µg/mL), and the average media blank, C_b (µg/mL), from the instrument.
18. Using the solution volumes of sample, V_s (mL), and media blank, V_b (mL), calculate the concentration, C (mg/m^3), of each element in the air volume sampled, V (L):

$$C = \frac{C_s V_s - C_b V_b'}{V}, \ mg/m^3.$$

EVALUATION OF METHOD:

Method P&CAM 351 was evaluated in 1981 [1,2]. The precision and recovery data were determined at 2.5 and 1000 µg of each element per sample on spiked filters. The precision and recovery data, instumental detection limits, sensitivity, and analytical wavelengths are listed in Table 2. The values in Table 2 were determined with a Jarrell-Ash Model 1160 ICP operated according to manufacturer's instructions.

REFERENCES:

[1] Hull, R.D. "Multielement Analysis of Industrial Hygiene Samples," NIOSH Internal Report, presented at the American Industrial Hygiene Conference, Portland, Oregon (May 1981).
[2] NIOSH Manual of Analytical Methods, 2nd ed., V. 7, P&CAM 351, U.S. Department of Health and Human Services, Publ. (NIOSH) 82-100 (1981).
[3] Ibid, S341 (Lead).
[4] Ibid, V. 2, S5 (Manganese), U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-B (1977).
[5] Ibid, V. 4, P&CAM 271 (Tungsten), U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 78-175 (1978).
[6] Ibid, V. 5, P&CAM 173 (Metals by Atomic Absorption), U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 79-141 (1979).
[7] Ibid, V. 3, S183 (Tin), S185 (Zirconium), and S376 (Molybdenum), U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-157-C (1977).

METHOD REVISED BY: R. DeLon Hull and Mark Millson, NIOSH/DPSE.

Table 1. Properties and sampling volumes.

Element (Symbol)	Properties: Atomic Weight	Properties: MP, °C	Permissible Exposure Limits, mg/m³ TWA OSHA/NIOSH/ACGIH	Air Volume @ OSHA, L: MIN	Air Volume @ OSHA, L: MAX
Silver (Ag)	107.87	961	0.01/ -- / 0.1	250	2000
Aluminum (Al)	26.98	660	-- / -- / 10.	5 (g)	100 (g)
Arsenic (As)	74.92	817*	0.5/C 0.002/ 0.2	5	2000
Beryllium (Be)	9.01	1278	0.002/ 0.0005/ 0.002	1250	2000
Calcium (Ca)	40.08	842	5 (b)/ -- / 2 (b)	5	200
Cadmium (Cd)	112.40	321	0.2/ 0.04/ 0.05	13	2000
Cobalt (Co)	58.93	1495	0.1/ -- / 0.1	25	2000
Chromium (Cr)	52.00	1890	1.0 (c)/ 0.025/ 0.5 (c)	5	1000
Copper (Cu)	63.54	1083	1.0/ -- / 1.0	5	1000
Iron (Fe)	55.85	1535	10 (b)/ -- / 5 (b)	5	100
Lithium (Li)	6.94	179	0.025 (d)/ -- / 0.025 (d)	100	2000
Magnesium (Mg)	24.31	651	15 (b)/ -- / 10 (b)	5	67
Manganese (Mn)	54.94	1244	C 5/ -- / C 5	5	200
Molybdenum (Mo)	95.94	651	15 (e)/ -- / 10 (e)	5	67
Sodium (Na)	22.99	98	2 (f)/ C 2 (f)/ C 2 (f)	13	2000
Nickel (Ni)	58.71	1453	1/ 0.015/ 1 (c)	5	1000
Phosphorus (P)	30.97	44	-- / -- / 0.1	25 (g)	2000 (g)
Lead (Pb)	207.19	328	0.05/ 0.1/ 0.15	50	2000
Platinum (Pt)	195.09	1769	0.002 (a)/ -- / 1 (c)	1250	2000
Selenium (Se)	78.96	217	0.2/ -- / --	13	2000
Tin (Sn)	118.69	232	2/ -- / 2 (c)	5	500
Tellurium (Te)	127.60	450	0.1/ -- / 0.1	25	2000
Titanium (Ti)	47.90	1675	-- / -- / 10 (b)	5	100
Thallium (Tl)	204.37	304	0.1 (a)/ -- / 0.1 (a)	25	2000
Vanadium (V)	50.94	1890	C 0.5/ 1 (c)/ 0.05 (V_2O_5)	5	2000
Tungsten (W)	183.85	3410	-- / 5 (e)/ 5 (e)	5 (g)	200 (g)
Yttrium (Y)	88.91	1495	1/ -- / 1	5	1000
Zinc (Zn)	65.37	419	5 (b)/ 5 (b)/ 5 (b)	5	200
Zirconium (Zr)	91.22	1852	5/ -- / 5	5	200

(a) soluble
(b) oxide
(c) metal
(d) hydride
(e) insoluble
(f) hydroxide
(g) at the ACGIH TLV

Table 2. Measurement procedures and data (a).

Element	Wavelength (nm)	Instrumental LOD (ng/mL)	Sensitivity (Intensity/ µg/mL)	Recovery (%) @ 2.5 µg/ filter (b)	Recovery (%) @ 1000 µg/ filter	Precision (s_r) (N = 3) @ 2.5 µg/ filter	Precision (s_r) (N = 3) @ 1000 µg/ filter
Ag	328.3	26	0.65	111	91	0.02	0.075
Al	308.2	14	0.23	93	100	0.092	0.023
As	193.7	13	0.57	103	99	0.062	0.026
Be	313.0	1.5	1.29	107	90	0.040	0.034
Ca	315.9	10	0.49	99	95	0.036	0.014
Cd	226.5	1.6	0.83	107	99	0.032	0.020
Co	231.2	7.4	0.38	101	95	0.040	0.005
Cr	205.6	1.3	0.50	98	106	0.053	0.016
Cu	324.8	2.1	0.72	98	99	0.036	0.022
Fe	259.9	3.9	0.13	94	97	0.068	0.016
Li	670.8	2.8	0.48	89	95	0.171	0.043
Mg	279.6	24	0.22	105	106	0.084	0.027
Mn	257.6	0.4	0.74	84	93	0.062	0.035
Mo	281.6	7.0	0.18	94	88	0.023	0.049
Na	589.0	10	0.76	(c)	101	(c)	0.045
Ni	231.6	3.4	0.41	105	97	0.027	0.020
P	214.9	22	0.17	(c)	91	(c)	0.056
Pb	220.4	17	0.42	105	95	0.060	0.011
Pt	203.7	15	0.69	106	91	0.041	0.075
Se	190.6	21	0.28	105	97	0.068	0.049
Sn	190.0	64	0.49	74	67	0.33	0.16
Te	214.3	29	0.41	102	94	0.050	0.063
Ti	334.9	1.2	0.55	96	108	0.051	0.029
Tl	190.9	17	0.22	103	99	0.043	0.017
V	310.2	3.2	0.88	99	94	0.043	0.014
W	207.9	13	2.58	35	23	0.053	0.60
Y	371.0	0.8	2.35	99	100	0.015	0.013
Zn	213.9	0.6	0.60	101	94	0.013	0.013
Zr	339.2	1.9	0.88	75	98	0.049	0.008

(a) Values reported were obtained with a Jarrell-Ash Model 1160 ICP; performance may vary with instrument and should be independently verified.
(b) 2.5 µg/filter corresponds to 5 µg/m^3 for a 500-L air sample.
(c) Blank levels too high to make accurate determinations

APPENDIX G
HOSPITAL DIRECTIONS MAP

OHM CORPORATION PITTSBURGH, PA | DRAWN BY B.O'Connor 4-7-94 | CHECKED BY | APPROVED BY | DRAWING NUMBER 15986-A5

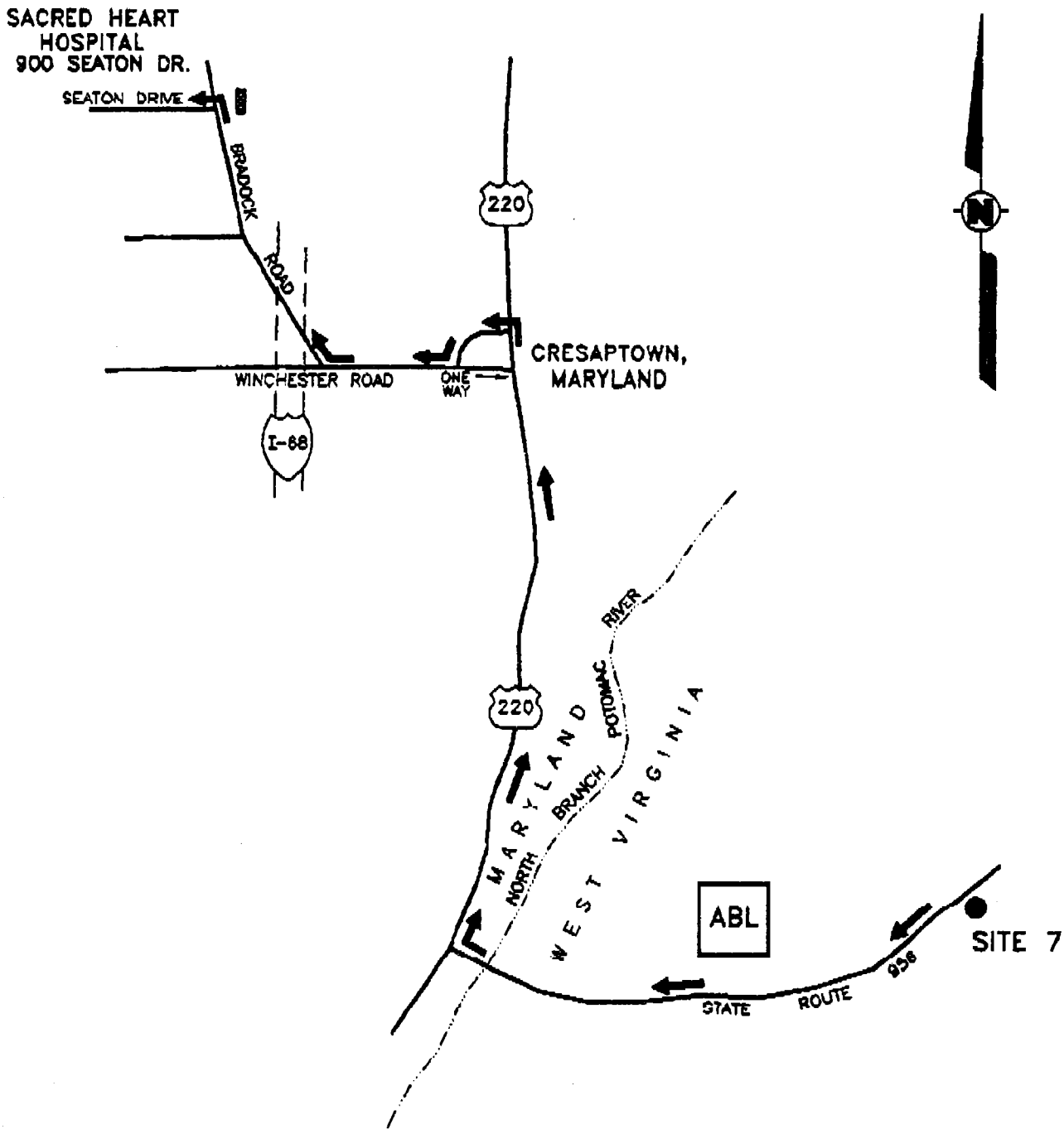

FIGURE E-1

HOSPITAL DIRECTIONS MAP
CONSTRUCTION INVESTIGATION FOR SITE 7, BERYLLIUM LANDFILL
ALLEGANY BALLISTICS LABORATORY, WEST VIRGINIA

PREPARED FOR

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

OHM Corporation

"THIS DRAWING NOT TO SCALE"

APPENDIX D - HOSPITAL DIRECTIONS MAP

OHM CORPORATION PITTSBURGH, PA | DRAWN BY B.O'Connor 4-7-94 | CHECKED BY | APPROVED BY | DRAWING NUMBER 15986-A5

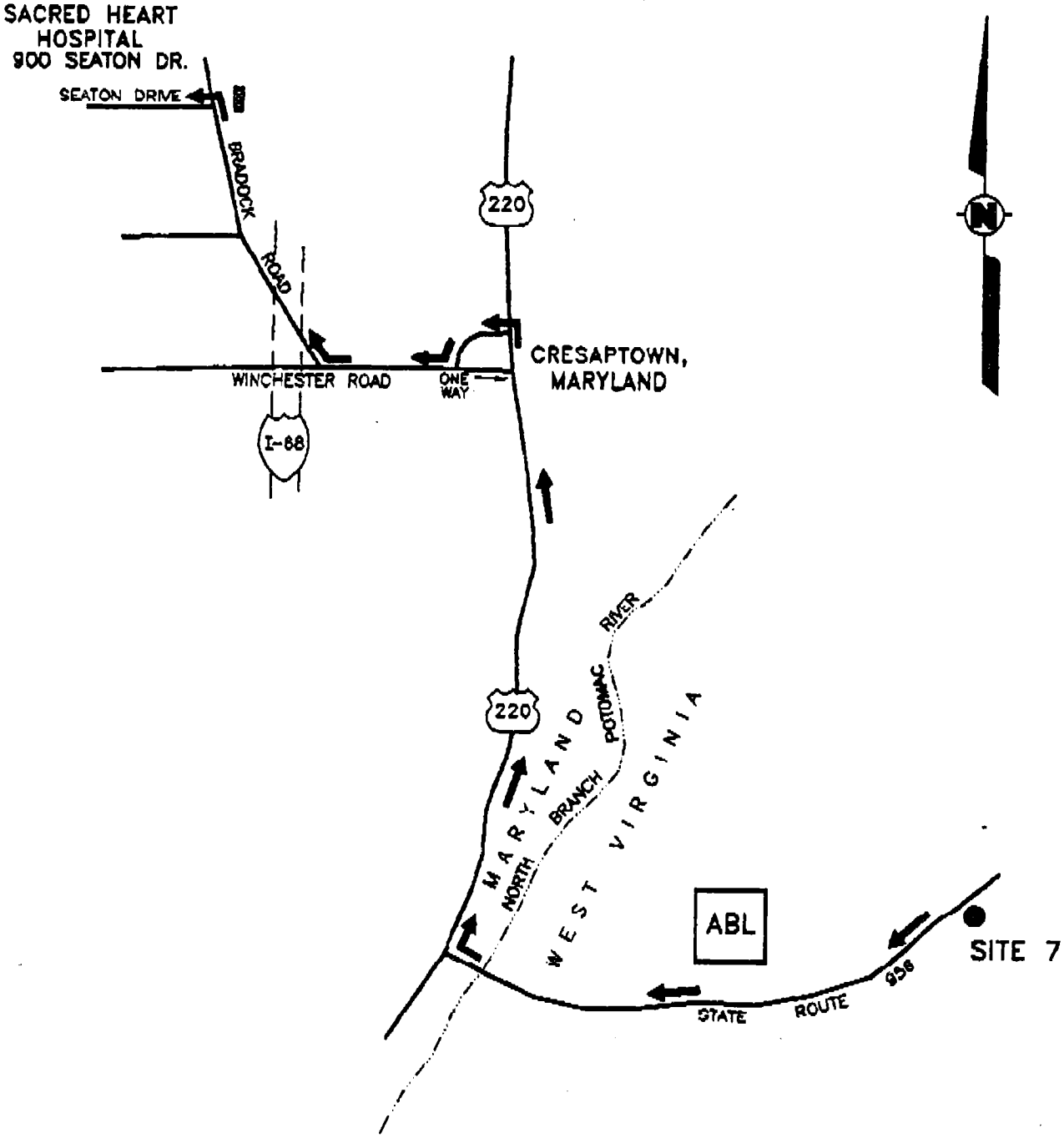

FIGURE E-1

HOSPITAL DIRECTIONS MAP
CONSTRUCTION INVESTIGATION FOR SITE 7, BERYLLIUM LANDFILL
ALLEGANY BALLISTICS LABORATORY, WEST VIRGINIA

PREPARED FOR

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION, NORFOLK, VIRGINIA

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