

FINAL WORK PLAN

**SITE 11
HOT SPOT REMOVAL ACTION
NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA**

CONTRACT NO. N62470-02-D-3260

Prepared for:

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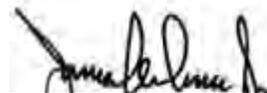
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**TASK ORDER 113
SHAW PROJECT NO. 128068**

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List of Acronyms

bgs	Below Ground Surface
CAX	Cheatham Annex
E&S	Erosion and Sediment
EE/CA	Engineering Evaluation/Cost Analysis
EPA	Environmental Protection Agency
ERA	Ecological Risk Assessment
ESCP	Erosion and Sediment Control Plan
NAVFAC MIDLANT	Naval Facilities Engineering Command Mid-Atlantic
NTCRA	Non-Time Critical Removal Action
PAH	Polychlorinated Aromatic Hydrocarbons
PBA	Project Business Associate
PCBs	Polychlorinated Biphenyls
PM	Project Manager
ppm	Parts Per Million
PQCP	Program Quality Control Plan
PRG	Proposed Remediation Goal
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RPM	Remedial Project Manager
Shaw	Shaw Environmental Inc.
SOW	Scope of Work
SS	Site Superintendent
SSHSP	Site Specific Health and Safety Plan
SSO	Site Safety Officer
SVOC	Semi-Volatile Organic Compound
SWPPP	Storm Water Pollution Prevention Plan
T & D	Transport and Disposal
TO	Task Order
UFP-SAP	Uniform Federal Policy Sampling and Analysis Plan
VESCH	Virginia Erosion and Sediment Control Handbook
VISION	Value Added Information Service Interactive On-Line Network
VOC	Volatile Organic Compound
WPNSTA	Naval Weapons Station Yorktown

1.0 INTRODUCTION

1.1 TASK ORDER DESCRIPTION

Shaw Environmental Inc., (Shaw), has been tasked by Naval Facilities Engineering Command Mid –Atlantic (NAVFAC MIDLANT) under Contract No. N62470-02-D-3260, Task Order No. 0113 (TO 113), to perform a removal action at the Site 11, Bone Yard area, at Naval Weapons Station Yorktown (WPNSTA), Cheatham Annex (CAX), located in Williamsburg, Virginia (**Figure 1**). The overall goal of this removal action is to mitigate potential unacceptable ecological risk from exposure to site soil through the removal and disposal of contaminated soil to a depth of 3 feet at four soil focus areas. In order to meet these goals, it is estimated that the removal of approximately 2,000 cubic yards of contaminated soil is required. Following laboratory confirmation that the remedial goals have been met; the site will be restored with imported clean fill material and topsoil to its original elevations. The site will then be seeded, planted, and mulched.

The excavated soil waste will be transported and disposed of at a permitted off-site facility. It is estimated that 100 cubic yards of concrete and debris will also be removed from the site and disposed of accordingly in addition to the excavated soil waste. This removal action is classified as Non-Time Critical Removal Action (NTCRA) and therefore shall be conducted under the guidance of the Engineering Evaluation/Cost Analysis Report (EE/CA) (CH2MHill, 2008), *Alternative 3 – Soil Excavation and Off-site Disposal*. **Figure 2** shows the approximate areas of excavation and restoration.

The scope of work (SOW) for TO 113, Site 11 Hot Spot Removal Action, may be summarized as follows:

- Pre-construction submittals and plans;
- Mobilization of resources and site set up;
- Pre-construction perimeter sampling;
- Waste characterization sampling;
- Site clearing and grubbing;
- Site pre-excavation survey;
- Excavation of approximately 2,000 cubic yards of contaminated soil;
- Concrete structure demolition and debris removal, approximately 100 cubic yards;
- Transportation and disposal (T & D) of contaminated soil and debris to an approved disposal facility;
- Confirmation sampling (excavation floor);

- Post excavation site survey;
- Backfill and restoration of the excavation area;
- Project demobilization; and
- Final report preparation and review.

1.2 **SITE DESCRIPTION AND BACKGROUND**

Site 11 encompasses an estimated 2.7-acre area located approximately 250 feet south of Antrim Road and the Public Works Department. Site 11 consists of an open, overgrown, grassy field surrounded by mixed-hardwood woodland. Old building foundations, concrete pads, and low retaining walls litter the site, both inside and outside of the wooded areas. Site 11 was reportedly used between 1940 and 1978 to store containers of waste-oil and tar as well as asphalt and other scrap materials on the ground. Oil, asphalt, gasoline, and other unspecified materials have been identified in the disposal area.

The human health risk assessment concluded there were no potential unacceptable risks to current on-site workers or trespassers or to future construction workers or adult residents from exposure to soils. Furthermore, while potential unacceptable risk was identified for future child residents, mainly due to ingestion of iron, that risk is considered manageable since that average iron concentration across the site is less than background and the Environmental Protection Agency (EPA) Region 3 residential soil screening level.

The Ecological Risk Assessment (ERA) indicated that Polychlorinated Aromatic Hydrocarbons (PAHs), pesticides, and inorganics contributed to a potential unacceptable ecological risk in soil. The soils that pose a potential ecological risk are isolated to four areas. While this assessment identified two other soil sample locations that were recommended for further evaluation (Remedial Investigation [RI] sample locations 11SS24 and 11SS12), these locations will not be included in this action. RI sample location 11SS24, where mercury was detected at 0.17 L parts per million (ppm), will not be included because this concentration is below background (0.24 ppm). RI sample location 11SS12, where lead was detected at 385 ppm, will not be included because both the maximum concentration of lead in surrounding soils (58.6 ppm at RI sample location 11SS13) and average residual concentrations of lead across the site without addressing sample location 11SS12 (42 ppm) are below the ecological screening criteria of 120 ppm (Final EE/CA for CAX Site 11 CH2M HILL, 2008 / July 23, 2008 Partnering Team Meeting).

2.0 RESOURCES AND PROJECT ORGANIZATION

This section details the equipment and materials Shaw anticipates using during work at Site 11.

2.1 MANPOWER REQUIREMENTS

Shaw will mobilize operational personnel to perform on-site activities based upon nearest available resources. Field administrative support for this task order will be performed from Shaw's construction trailer located on-site at CAX. Project management, scheduling, and technical support will be based in the Shaw Norfolk, Virginia office.

2.2 PROJECT MANAGEMENT AND FIELD SUPERVISION

The Shaw project management approach is to work closely with the client to accomplish all project objectives and ensure continuous client satisfaction with the project. Therefore, the Project Manager (PM) will have overall responsibility for project schedule, costs, and resources. A Site Superintendent (SS) will be assigned to the project with responsibility for accomplishing field-work. The SS will report directly to the PM and supervise day-to-day activities in the field.

The PM and SS will jointly develop project schedules and budgets throughout the project. Resource requirements will be addressed with the full support of the Shaw resource manager prior to mobilization and on a regular basis during the course of work.

A Project Business Associate (PBA) will be assigned to the project to assist with daily cost tracking and equipment/materials procurement. The PBA will work closely with the PM and SS with regard to project costs and planning.

2.3 PERSONNEL – DUTIES AND RESPONSIBILITIES

2.3.1 Shaw Responsibilities

Shaw will accomplish the following:

- Perform the scope of work described in the Work Plan as required by TO 113, Site 11 Hot Spot Removal Action;

- Attend a preconstruction meeting with the WPNSTA CAX Remedial Project Manager (RPM), as well as, the WPNSTA CAX Safety, Security, Fire, and Environmental Department representatives, as necessary;
- Prepare monthly performance reports;
- Prepare and submit a monthly status report to WPNSTA CAX documenting percentage completion, unresolved delays (encountered or anticipated) that may affect scheduling and a description of efforts made to mitigate those delays, revisions to the construction schedule, listing of activities scheduled for the next month; and other information relating to progress of construction;
- Initiate and maintain a thorough and proactive safety program during the entire project.
- If a conflict, error, or discrepancy is found in contract documents, obtain a written interpretation or clarification from the WPNSTA CAX RPM before proceeding with the task(s) in question;
- Notify the WPNSTA CAX RPM in writing of any change to site conditions.
- Implement the Program Quality Control Plan (PQCP) and establish a chain-of-command;
- Assign a project team for the life of the project (with prior written notice provided to WPNSTA CAX before any necessary changes in Shaw supervision are executed);
- Maintain at the site two record copies of as-built drawings; and one copy of specifications, addenda, written amendments, change orders, work directive changes, field test records, field orders, and written interpretations and clarifications;
- Manage resources to meet the project schedule in a cost-effective manner;
- Effectively communicate project-related information with the WPNSTA CAX RPM.

2.3.2 Responsibilities of Shaw’s Project Management Team

The project manager will have day-to-day responsibility for technical, schedule (**Appendix A**), and budget issues. The SS, Site Safety Officer (SSO), PBA, and other support personnel will support the PM in the field (as needed). Responsibilities and authority of the PM and supporting field personnel are discussed in the following sections.

2.3.3 Project Manager – Millard S. Dunham

The PM is the person in charge of the overall project and has full authority for project coordination and direction. The PM will communicate directly with the WPNSTA CAX RPM. Specific responsibilities assigned to the PM will include:

- Interpret and plan overall work effort;
- Review and approve submittals;
- Define resource needs and secure staff and equipment commitments;
- Monitor subcontractor performance, schedules, budgets, and invoices;
- Develop, review, and meet work schedule and budget objectives;
- Ensure technical adequacy of field, laboratory, data management, and construction activities;
- Attend meetings at WPNSTA CAX, as required;
- Document the need for required contract modifications;

To carry out these functions, the PM will have the authority to:

- Determine staff and subcontractor priorities;
- Allocate additional personnel as needed;
- Establish work budgets and schedules with milestones;
- Approve subcontractor work and invoices;
- Communicate with the SS regarding site activities and identify potential concerns;
- Review and approve invoices.

2.3.4 Site Superintendent – Dennis Kelley

The SS is the Shaw site contact and is responsible for the performance of site remediation activities in accordance with the Work Plan and other project plans and specifications. The SS also has the responsibility of performing inspection activities as per the Storm Water Pollution Prevention Plan (SWPPP) (**Appendix B**). The SS responsibilities include:

- Implementing day-to-day aspects of the Site Specific Health and Safety Plan (SSHSP) (**Appendix D**) and Work Plan;
- Coordinating engineering activities at the site, as directed by the PM;
- Managing day-to-day administrative and procurement activities at the site;
- Monitoring work progress and schedule, and advise project manager of variances;
- Compliance of site work tasks with governing state and federal regulations pertinent to the work;
- Assisting in preparation of work progress schedules, project reports, and as-built drawings;
- Compiling the daily logs into a weekly report for submittal to the PM;
- Attending work progress meetings;
- Timely reporting of any proposed significant project changes to the PM to allow review and approval prior to incorporating the changed condition.

2.3.5 Site Quality Control Manager – Dennis Kelley

The Quality Control (QC) Manager, in their role as the WPNSTA CAX site QC representative, will be responsible for performing inspection activities as per the PCQP and the QC Plan Addendum (**Appendix C**). The QC Manager will be supported in the field by a sample technician and geotechnician, as needed. The QC Manager and technicians will monitor site activities on a periodic basis. Results of the inspections and testing will be documented in a report describing site operations performed each day. The QC Manager will also be responsible for:

- Day-to-day coordination of technical activities;
- Reviewing results of on-site verification testing and inspection reports;
- Implementing appropriate plan provisions;
- Serving as the collection point for remediation-related non-conformance;
- Perform, or cause to be performed, daily inspections and tests necessary to achieve the quality of construction outlined in the plans and specifications for work performed on and off site;
- Maintain the latest drawings and specifications with amendments and/or approved modifications at the site and ensure they are used for shop drawings, fabrication, construction, inspections, and testing;
- Maintain as-built drawings at the site, available for review by WPNSTA CAX at any time;
- Hold and preside over bi-weekly quality review meetings to discuss work performed and review proposed work;
- Maintain a contractor-generated submittal register for the duration of the contract. A review of the register will be performed at least every 14 days in conjunction with the scheduled dates on the register and in relation to actual work status
- Review submittals for conformance with contract requirements prior to delivery to WPNSTA CAX;
- Establish and maintain a Rework Item List of work that does not conform to specifications. Track and monitor these items to assure that the rework inspection and testing activities and frequencies are in accordance with contract requirements
- Attend and assist the government at the pre-final inspection and the final acceptance inspection;
- Confirm the quality and quantity of materials delivered to the site as referenced by project specifications and/or design drawings.

2.3.6 Site Safety Officer – Jim Greer

The SSO is responsible for implementing the SSHSP to satisfy federal, state, and local regulations and is consistent with site conditions. The SSO may take actions independent of the project group to stop the project, if required, to address safety concerns. The SS is responsible for conformance of site work with requirements and procedures identified in the SSHSP. The SSO will oversee the day-to-day implementation of the SSHSP as follows:

- Directing entrance and exit medical physical requirements, as required;
- Approval of personnel protective equipment and safety procedures specified in the SSHSP;
- Overseeing the maintenance and use of field monitoring equipment;
- Designating appropriate personnel protection levels, including upgrades ;
- Providing guidance to the project staff to maintain compliance of site work with federal and state regulations.

2.3.7 Project Business Associate – Frank Adams

The responsibilities of the PBA will be:

- Accrue daily costs into Value Added Information Service Interactive On-Line Network (VISION)/Insite;
- Assist the project manager with preparation of schedules, budgets, and invoices;
- Use VISION to track costs and budget variances;
- Provide weekly progress reports on budget and schedule status to the PM;
- Prepare daily report deliverables;
- Audit weekly postings of charges to work budgets;
- Assist SS with procurement activities;
- Finalize costs for invoices to the government;
- Perform site administrative duties.

2.3.8 Equipment Operators and Field Technicians

The responsibilities of the equipment operators and field technicians will be:

- Perform sampling activities in accordance with WPNSTA CAX and Shaw procedures;
- Conduct and record the results of QC inspections and testing;
- Operate construction equipment;
- Remediate the site in accordance with SS directives.

3.0 REMEDIATION ACTIVITIES

3.1 OVERVIEW OF PROPOSED APPROACH AND RATIONALE

Shaw has developed an operational approach for the removal action at WPNSTA CAX, Site 11, which is protective of the Shaw and WPNSTA CAX personnel as well as the environment. This approach is based on firsthand experience with similar projects and consultation with in-house specialists.

It is estimated that up to 2,000 cubic yards of contaminated soil and approximately 100 cubic yards of concrete and debris will require removal from the site. The soil and debris will be transported and disposed at a permitted off-site facility. Restoration will include backfilling the excavated areas with clean fill material, compacting with field equipment, applying a layer of topsoil, re-grading the fill material to approximate original elevations, and vegetation with native grasses.

3.2 PRE-MOBILIZATION ACTIVITIES

Shaw has prepared the following documents for review and approval by WPNSTA CAX:

- Work Plan
- Quality Control Plan Addendum (**Appendix C**)
- Erosion and Sediment Control Plan (ESCP) (**Section 6**)
- Site-Specific Health and Safety Plan (SSHSP) (**Appendix D**)
- Site-Specific Accident Prevention Plan (**Appendix G of SSHSP**)
- Uniform Federal Policy Sampling and Analysis Plan (UFP - SAP) (**Appendix E**)
- Storm Water Pollution Prevention Plan (SWPPP) (**Appendix B**)

3.2.1 Utility Mark-out and Line Termination

Shaw will contact Miss Utility for a utility mark-out at Site 11 prior to mobilization and site set-up.

3.2.2 Pre-Construction Meeting

Prior to mobilization, Shaw will coordinate the scheduling of a pre-construction meeting. Shaw will use the meeting to present in detail the steps of the remedial activities and construction activities. Lines of communication between Shaw, WPNSTA CAX RPM, Navy, and WPNSTA CAX personnel will be confirmed during the meeting.

3.2.3 WPNSTA Yorktown CAX Permits

Shaw will submit applications as required to WPNSTA CAX in conjunction with mobilization to the site. Shaw anticipates that a permit will be required for hot work. In the event a hot work permit is required, it will be renewed at the beginning of each shift or as required by the WPNSTA CAX Safety Department.

3.2.4 Pre-Construction Survey

Prior to performing the excavations at Site 11, a pre-excavation survey will be performed by a professional surveyor licensed in the state of Virginia to document initial site conditions. The survey will be referenced to existing benchmarks to provide accurate “as built” drawings following excavation. The extent of the proposed excavation and capture elevations for the restoration effort will be identified and marked during the survey.

3.3 MOBILIZATION AND SITE PREPARATION

Shaw will schedule a mobilization date upon receiving Work Plan approval and notice to proceed. Shaw personnel, equipment, and materials will be mobilized from local project sites in Hampton Roads. Rental equipment will be mobilized from local vendors based upon lowest qualified bidder.

Shaw will comply with site security requirements upon mobilization and throughout the course of the project. Shaw will submit pass information for clearances in advance to mobilization and security passes will be obtained for on-site Shaw and subcontract employees. Shaw personnel will be restricted from entering areas at WPNSTA CAX not associated with the project.

Shaw will mobilize labor, equipment, and materials necessary to safely and efficiently remediate the site. An existing road (**Figure 2**) will be utilized as site haul road. There is currently an

existing roadway on site near soil focus areas 2 and 3 (**Figure 2**) through the wooded area to allow egress to the soil focus areas for the removal action. A project support area will be established at Shaw's existing construction trailer located at CAX.

3.3.1 Construction Zone

Construction zones will be set up around each excavation area. Shaw will install a temporary, high-visibility barricade fence at the limits of each construction zone to restrict access to unauthorized personnel and to keep personnel and animals from falling into the excavations at night. The Shaw SS and SSO will monitor and control construction area access. Site activities within the exclusion area will conform to the SSHSP. The high-visibility fence will be removed at the completion of restoration.

3.3.2 On-Site Traffic Patterns

Due to limited sight distances caused by uneven terrain, Shaw will establish defined routes for material handling and movement around the site. Shaw will employ spotters to guide heavy equipment operators and vehicles transporting materials in tight work areas. A general traffic pattern for the site will be established and will be communicated in advance to field personnel.

3.3.3 Off-Site Traffic Control

Shaw will conform to WPNSTA CAX requirements with respect to controlling unauthorized vehicle access into the site. In addition, Shaw will coordinate any required roadway closures with the appropriate department(s) at WPNSTA CAX. Haul routes through the base will be approved in advance by WPNSTA CAX.

3.3.3.1 Established WPNSTA Yorktown CAX Truck Haul Route

The approved haul route for T & D vehicles from the main gate off of I-64 at WPNSTA CAX to the Site 11 removal action location off Antrim Road haul route is approximately two miles round-trip and is as follows:

- Enter WPNSTA Yorktown CAX and maintain course on Sanda Avenue until making a right onto Antrim Road.
- Follow Antrim Road approximately two-tenths of a mile past 2nd Street and the entrance will be on the right.

All haul trucks entering WPNSTA Yorktown CAX will need to pass through truck inspection prior to entering the base.

3.3.4 Stand-by Station Fire Protection

Shaw will consult with the Navy to determine the requirements for placing the base Fire Department on stand-by status during site activities. In addition, Shaw will implement on-site fire protection measures specified by WPNSTA CAX.

3.3.5 Lay Down Pad/Inspection Pads

A lay down area will be established at Site 11 and Shaw will utilize temporary inspection pads. Plastic sheeting will be placed to minimize the spread of contamination. The inspection pads may be moved around the site as necessary to minimize the potential for uncontrolled contamination migration.

3.3.6 Clearing and Grubbing

Clearing and grubbing will consist of felling trees, the removal of stumps, and removal of vegetation within the areas to be excavated and the areas used for egress to each soil focus area, as necessary. Shaw will perform the clearing activities first. Once cleared, Shaw will install the silt fence around the perimeter of each proposed excavation area prior to the intrusive grubbing operations to remove the low growth vegetation. The trees that need to be cut down will be cut to reasonable lengths and stockpiled near the site pending removal. Shaw will chip the small sized branches to aid in removal. The stumps and timber not wanted by WPNSTA CAX will be transported and disposed off site. An attempt to minimize the clearing and grubbing required at the site will be made by utilizing past paths used at the site.

3.3.7 Erosion and Sediment Controls

Erosion and sediment (E&S) controls will be installed as necessary as discussed in **Section 6** and the SWPP (see also **Figure 2**). All E&S features will be installed in accordance with the Virginia Erosion and Sediment Control Handbook (VESCH) (Third Edition, Dated 1992).

3.3.8 Temporary Haul Road Construction

A temporary stone haul road will be constructed at Site 11 in order for heavy equipment and haul trucks to safely gain access to the soil focus areas. Access roads were previously built and used at Site 11, but since that time they have become overgrown with vegetation but remain relatively clear of large trees. Shaw will make every attempt to construct the new haul roads along these same paths in an effort to minimize the resulting amount of environmental disturbance and time and effort required to clear the area. The material needed to construct the haul road at Site 11 will be reused material from the previous work performed at WPNSTA CAX Site 1 (TO 069 Hot Spot Removal). Schedule 40 steel pipe will be used to create a temporary culvert in the event that storm water runoff channels are encountered and crossed during construction to aid in preserving the natural settings of the surrounding land. The installation of temporary cross-flow sections will also serve to prolong the life of the haul road by minimizing washouts that could occur during severe weather events. The location of the temporary haul road will be at the location of the existing road shown on **Figure 2**.

3.3.9 Contaminated Material Stockpiling

Excavated materials will be loaded into trucks and disposed of at an approved offsite disposal facility. Excavated material may be direct loaded or placed into staging piles prior to load out. If stockpile areas are necessary they will be kept within the excavation footprint to prevent cross-contamination between contaminated and clean soil. Waste profile sample results will be used to determine the proper disposal facility. Copies of waste manifests will be maintained and will be included in the construction completion report.

3.3.10 Pre-construction Perimeter Samples

Pre-construction samples will be collected to delineate the perimeter for each of the four soil focus areas (**Figure 3**). Pre-construction sampling will be performed, and the data compared to the Proposed Remediation Goals (PRGs) as summarized in **Table 3-1** below. The samples will be collected as described below and analyzed in accordance with the UFP-SAP (**Appendix E**). Refer to the *UFP-SAP Worksheet #10* for a detailed approach regarding pre-construction perimeter samples.

- **Area 1:** Collect co-located surface (0-6 inches) and subsurface soil (2-3 ft bgs) samples at the three locations shown on **Figure 3**. The northeast/east portion of Area 1 is already defined by the 1999 removal action sample locations 11-HA01, 11-HA03, and 11-HA06

(Baker, 2007) Analyze for total PAHs, 4,4-DDD, 4,4-DDE, copper, lead, mercury, and zinc.

(Page change is required for the final EECA: Area 1 bullet should also reference 2002 RI sample location 11SS02 as an existing clean data point).

- **Area 2:** Collect co-located surface (0-6 inches) and subsurface soil (2-3 ft bgs) samples at the four locations approximately 10 feet out from former RI sample location 11SS13 as shown on **Figure 3**. Analyze for zinc only.
- **Area 3:** Collect one surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression shown on **Figure 3**. The lateral extent of contamination is constrained by the limits of the pit. Analyze for 4,4-DDD, 4,4-DDE, copper, iron, lead, mercury, selenium, and zinc. Area 3 is a man made pit and the lateral extent is defined by the pit walls and a two foot berm. The only area not defined is the down gradient spillover point. The partnering team agreed that one sample was adequate to represent the two foot wide spillover point.
- **Area 4:** Collect one surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression shown on **Figure 3**. The lateral extent of contamination is constrained by the limits of the pit. Analyze for 4,4-DDD, 4,4-DDE, lead, mercury, selenium, and zinc. Area 4 is a man made pit and the lateral extent is defined by the pit walls and a two foot berm. The only area not defined is the down gradient spillover point. The partnering team agreed that one sample was adequate to represent the two foot wide spillover point.

Table 3-1
Soil Remediation Goals
Site 11, WPNSTA Yorktown CAX - Williamsburg, Virginia

Contaminant of Concern	Proposed Remediation Goals (PRGs) for Soil	Applicable Removal Area
<i>Inorganics (mg/kg)</i>		
Copper	70	1, 3
Lead	120	1, 3, 4
Mercury	0.24	1, 3, 4
Selenium	1.8	3, 4
Zinc	120	1, 2, 3, 4
Iron	46,400	3
<i>Pesticides (µg/kg)</i>		
4,4-DDD	100	1, 3, 4
4,4-DDE	100	1, 3, 4
<i>Semi-Volatile Organic Compounds (SVOCs) (µg/kg)</i>		
Total PAHs	18,000	1

3.3.11 Disposal Profile Sampling

Disposal profile sampling will be required for the disposal facilities before the waste can be accepted and to ensure that the waste is not hazardous. Based on data from previous investigations, any excavated soil (and concrete from the remaining old concrete foundation pad) from the removal action outlined in the EE/CA (CH2MHill, 2008) is assumed to be non-hazardous. Excavated material will be sampled and analyzed in accordance with the UFP-SAP (**Appendix E**). Refer to the *UFP-SAP Worksheet #10* for a detailed approach regarding disposal profile samples. Material classified as non-hazardous will be disposed in a Navy-approved and permitted subtitle D landfill, potentially as daily cover.

Hazardous wastes are not expected to be encountered at Site 11. However, mercury and lead are elevated from a potential Resource Conservation and Recovery Act (RCRA) characterization perspective in various areas. Therefore, samples will be collected from each area and analyzed per the *UFP-SAP Worksheet #10* (**Appendix E**). Soils classified as hazardous will be handled according to Virginia Hazardous Waste Management regulations.

3.4 SITE REMEDIATION

The remediation activities for Site 11 will consist of the removal of approximately 2,000 cubic yards of contaminated soil and approximately 100 cubic yards of concrete and debris. Confirmation sampling will be carried out to confirm the site meets the established remediation goals for the constituents of concern. The site will then be restored by backfilling with clean fill material, a 6 inch layer of topsoil, and then grading to the sites approximate original grade. The site will then be seeded/mulched and trees will be planted that will compliment the surrounding area.

3.4.1 Soil Excavation

The excavation limits at Site 11 will be identified and staked based on the SOW. It is anticipated that the four soil focus areas (Area1-4) will be excavated to a depth of three (3) feet below ground surface (bgs). The total estimated volume of contaminated soil and debris is approximately 2,000 cubic yards. Locations for each soil focus area are referenced on **Figure 2**.

Contaminated soil will be removed from the contaminated area and directly loaded into trucks for transportation and disposal to an approved offsite disposal facility. In the event that contaminated soil needs to be stockpiled, stockpiles will be kept within the site limits and in the

excavation footprints of the respective soil focus areas to prevent cross-contamination of clean soil. Any debris found that is greater than one foot in length will be removed and placed in a roll-off box for separate disposal.

It is not expected that any of the monitoring wells located at Site 11 will be disturbed during the removal action. However, in the event that any of the monitoring wells need to be abandoned, the well will be filled with bentonite chips and the casing will be cut off at post-excavation level. The surface concrete casing and bollards will be demolished and removed from the site.

3.4.2 Concrete and Debris Removal

A 4,500 square foot old concrete foundation pad and the remaining retaining walls and foundation of Area 1, located at Site 11, will be demolished and removed from the site to an approved disposal/recycle facility. It is estimated that approximately 100 yards of concrete and debris will be removed from the site. Heavy equipment will be brought to Site 11 to break down the concrete into manageable pieces, and the resulting debris will be loaded into roll-offs for disposal.

3.4.3 Confirmation Sampling and Analysis

Confirmation soil samples will be collected and analyzed per the *UFP-SAP Worksheet #10 (Appendix E)*. If the concentrations of contaminants of concern exceed the PRGs then an additional 1 to 2 feet of material will be excavated in the direction of the contamination. Excavation may be stopped at anytime at the discretion of the Navy RPM. Each soil focus area will only be analyzed for the particular contaminants of concern as described in **Table 3-1** (same analyses as pre-construction sampling). Sample labeling, identification, and decontamination procedures are discussed further in *UFP-SAP* provided as **Appendix E**.

3.4.4 Post Removal Survey

Upon completion of all excavation activities, a site land survey will be performed to determine the extent of the excavated area. This area will be surveyed using 0.5 foot elevation contours to identify limits of the excavations and to provide an accurate volume of soil and debris removed from the site. A final site survey will be performed after restoration activities to document “as built” conditions of the site.

3.5 SITE RESTORATION

Excavated areas will be restored by regrading and back-filling the areas with common fill material, as needed, to a level six inches below the approximate finished grade. Shaw will coordinate with WPNSTA CAX Land Management personnel to determine a suitable off-site fill material supplier or a suitable WPNSTA CAX fill source. Clean common fill material that is imported to the site will be analyzed as per the *UFP-SAP* (**Appendix E**).

The common fill material will be placed within the excavation area in 12-inch lifts and will be field compacted using construction equipment. A six inch lift of topsoil will be placed over the common fill material. The final grade for Area 1 and 2 will be original grade and Area's 3 and 4 will be backfilled to grade. Once the topsoil is placed, Shaw will plant a blend of native grass seed, as per the SOW, to complete site restoration. Shaw will coordinate the planting of native grasses with Mr. John McCloskey of the U.S. Fish & Wildlife Service.

Shaw will ensure that imported materials are certified clean through laboratory analytical testing. Imported fill material and topsoil will be sampled and analyzed per the *UFP-SAP* (**Appendix E**). Geotechnical and chemical testing results will be submitted to WPNSTA Yorktown CAX.

Shaw will monitor the progress of site restoration and stabilization to determine the appropriate time for removal of erosion and sediment control features. Shaw may recommend leaving the erosion and sediment control features in place until permanent vegetation is established following demobilization.

3.6 PROJECT SCHEDULE

The proposed project schedule is presented as **Appendix A**.

4.0 Data Management Reporting

To ensure the integrity of sample analytical data from the time of collection in the field to the tabulation of results, data documentation protocols will be implemented. This will include providing sample labels, chain-of-custody records, and field information forms to document field information; and comparing laboratory analysis reports with tabular displays and graphic displays to evaluate the accuracy of data transfer. A report will be prepared summarizing the data collection and the analytical results for each sampling event. The PM will be responsible for assessing whether the data collected meet the PRGs.

4.1 CONSTRUCTION COMPLETION REPORT PREPARTION AND REVIEW

Upon completion of field activities, Shaw will prepare a construction completion report documenting site activities and reporting collected data. This report will include daily notes from field activities, a description of each project task, any problems encountered along with corrective measures, project photographic documentation, as-built drawings, and pertinent analytical data/reports. Shaw will submit a draft completion report to WPNSTA CAX for review and comment. Upon receiving review comments, Shaw will incorporate received comments and will submit the report as the final version.

5.0 ENVIRONMENTAL PROTECTION PLAN

5.1 PURPOSE

This plan presents environmental protection measures to be employed during site activities. Shaw will implement procedures and supply materials necessary for environmental protection for activities associated with excavation, backfill, and decontamination of Site 11. Principle concerns include small spills and E&S control. Additional information may be found in the SSHSP (**Appendix D**).

5.2 EMERGENCY AND DECONTAMINATION EQUIPMENT

5.2.1 Small-Scale Emergency Equipment

Small scale emergency equipment will include dry chemical, ABC-rated fire extinguishers; spill control equipment; absorbent materials; decontamination equipment; air purifying respirators; radio and telephone equipment; and various hand tools. This equipment will be made accessible to the on-site workers.

5.2.2 Large-Scale Emergency Equipment

Large-scale emergency equipment will consist of an excavator, if equipment of such size and power is necessary. Other emergency equipment will be made available from the local fire department.

5.2.3 Decontamination Equipment

Equipment necessary for decontamination activities will be provided, installed, and verified in working order prior to any site operations. Equipment for the decontamination area includes the following items:

- Clean water supply,
- Detergent solution,
- Brushes,
- Waste containers.

5.3 PREVENTIVE ACTIONS

5.3.1 Equipment Maintenance

Construction equipment will be properly maintained to ensure safe operation. The excavator will be regularly inspected and maintained (and documented in the inspection/maintenance log) in such manner as to minimize spillage or leakage which may occur during on-site transportation operations.

5.3.2 Housekeeping Program

The Shaw housekeeping program includes many items such as neat and orderly storage of materials, proper truck and tank placards, prompt removal of spillage, refuse pickup and disposal, maintenance of roads and surfaces, and provisions for the storage of material. A daily departure inspection will be performed by the SS.

Small spills may include solid or liquid materials being mishandled, dumped, leaked, knocked over, etc. Any material spillage will be immediately contained and collected for subsequent disposal. Excavation will be performed such that exposed source materials remain within the limits of excavation. Any spilled liquids will be contained and collected by absorbent materials. Spilled fuel and impacted soil will be collected and staged for later disposal.

5.4 PROTECTION OF NATURAL RESOURCES

There are no known special protections of natural resources at this site.

5.5 PETROLEUM WASTES

Shaw will implement reasonable precautions to prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water. Equipment and storage vessels containing oils and fuels will be visually inspected prior to site entry and daily thereafter for leakage, drips, or other preventable releases. Any equipment or vessel damage will be immediately repaired or removed from the site. Releases of oily wastes will be acted-on upon observation and impacted materials disposed of appropriately. Shaw will immediately notify WPNSTA CAX of any oil spills.

The site will be equipped with a spill kit, sufficient to contain and clean up on-site quantities of petroleum products. In the event of a spill, Shaw will notify the appropriate personnel.

5.6 WASTE HANDLING

Contaminated materials will be removed and direct loaded into trucks for transportation and disposal. Soil may be temporarily stockpiled within the footprint of the individual contaminated soil area if necessary.

The T & D activities will be performed in accordance with local, state, and federal regulations as well as WPNSTA CAX contract requirements.

5.7 EROSION AND SEDIMENT CONTROL

Shaw will limit the extent of operations to the areas required for excavation. Attempts will be made to minimize the disturbed area in order to prevent potential damage to the service area. A system of silt fencing will be used to prevent site erosion. This silt fencing will be reinforced with hay bales in areas where there is a potential for concentrated flow.

Disturbed areas will be re-graded, seeded, fertilized, and mulched to promote a permanent vegetative cover as well as appropriately landscaping the site with trees that compliment the sites surrounding area. Prior to seeding, six inches of clean topsoil will be placed and graded over the disturbed area. Seed and fertilizer will be spread in accordance with the ESCP (**Section 6**).

6.0 EROSION AND SEDIMENT CONTROL PLAN

This plan describes the E&S control measures that will be installed at Site 11 to limit the migration of soil and sediment from disturbed areas. Additional measures are provided for stabilization and restoration of the site following fill placement and site grading. E&S control devices and procedures will be in accordance with the VESCH Third Edition, 1992, as prepared by the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation (Tel: 804-786-2064) (**Appendix F**). Measures to address SWPPP are discussed throughout this ESCP and the Environmental Protection Plan (**Section 5**).

Earth-disturbing activities are as follows:

- Clearing and grubbing of vegetation;
- Excavation and removal of contaminated soils;
- Fill/topsoil placement and site grading.

Proposed E&S control measures are as follows:

- Silt fencing with straw bale reinforcement if needed ;
- Temporary stone construction entrance/access road;
- Dust control;
- Topsoil placement;
- Erosion matting placement (as needed);
- Permanent seeding, planting, and mulching.

6.1 SILT FENCE

Silt fence will be installed at Site 11 to minimize off-site migration of soils. Installation of the silt fence will be conducted as shown in VESCH Standard and Specification 3.05. At a minimum, silt fence will be installed as part of the site preparation work and will be in place locally prior to any ground disturbance. Straw bale reinforcements will be placed in areas where there is a potential for concentrated flow. The silt fencing will be inspected during each workday and after every significant precipitation event. Shaw will complete any needed repairs promptly following detection. The silt fence will be removed upon establishment of adequate vegetative cover and with the prior authorization of WPNSTA CAX.

6.2 TEMPORARY DIVERSION DIKES

Temporary diversion dikes, consisting of compacted soil, will be used as necessary to divert storm water runoff away from open excavation during removal activities. The diversion dikes

will be installed using clean fill as described in VESCH Standard and Specifications 3.09. The diversion dikes will be removed after excavations are backfilled with clean fill material and stabilized.

6.3 DUST CONTROL

Dust control will be performed as necessary in disturbed areas using a small centrifugal pump, polyethylene water tank, and water authorized for use. Dust control will be performed in accordance with the guidance provided in VESCH Standard and Specification 3.39 and as directed by WPNSTA CAX.

6.4 EROSION MATTING

Following topsoil placement, the steepest areas of restored slope will be covered with erosion matting, fastened with staples, and seeded if needed. This will help prevent erosion and promote the growth of vegetation in that area.

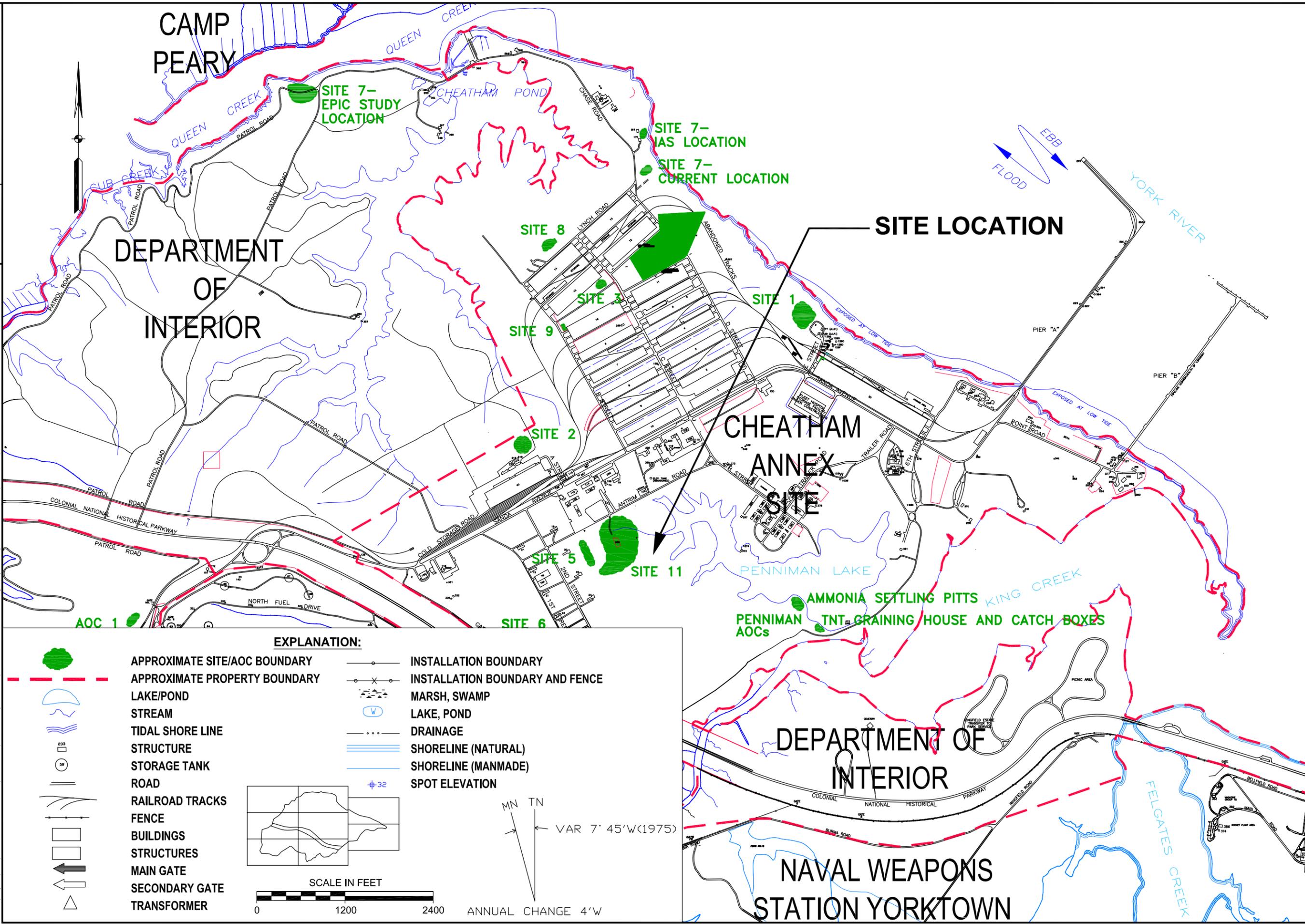
6.5 PERMANENT SEEDING AND MULCHING

An approved seed mixture will be applied to the excavated area and the restored slope. Seeding will be accomplished with either a hand-held broadcast seeder or by a hydroseeding subcontractor. The seed will be covered with mulch or erosion matting unless the seed is applied by hydroseeding. Seed and mulch application will be performed in conformance with VESCH Standard and Specifications 3.32 or as directed by WPNSTA CAX.

6.6 STORM WATER POLLUTION AND PREVENTION

A SWPPP will be implemented on site to manage possible pollution vectors on the worksite. The SWPPP is included in **Appendix B**.

FIGURES



EXPLANATION:

	APPROXIMATE SITE/AOC BOUNDARY		INSTALLATION BOUNDARY
	APPROXIMATE PROPERTY BOUNDARY		INSTALLATION BOUNDARY AND FENCE
	LAKE/POND		MARSH, SWAMP
	STREAM		LAKE, POND
	TIDAL SHORE LINE		DRAINAGE
	STRUCTURE		SHORELINE (NATURAL)
	STORAGE TANK		SHORELINE (MANMADE)
	ROAD		SPOT ELEVATION
	RAILROAD TRACKS		
	FENCE		
	BUILDINGS		
	STRUCTURES		
	MAIN GATE		
	SECONDARY GATE		
	TRANSFORMER		

SCALE IN FEET

0 1200 2400

ANNUAL CHANGE 4"W

MN TN

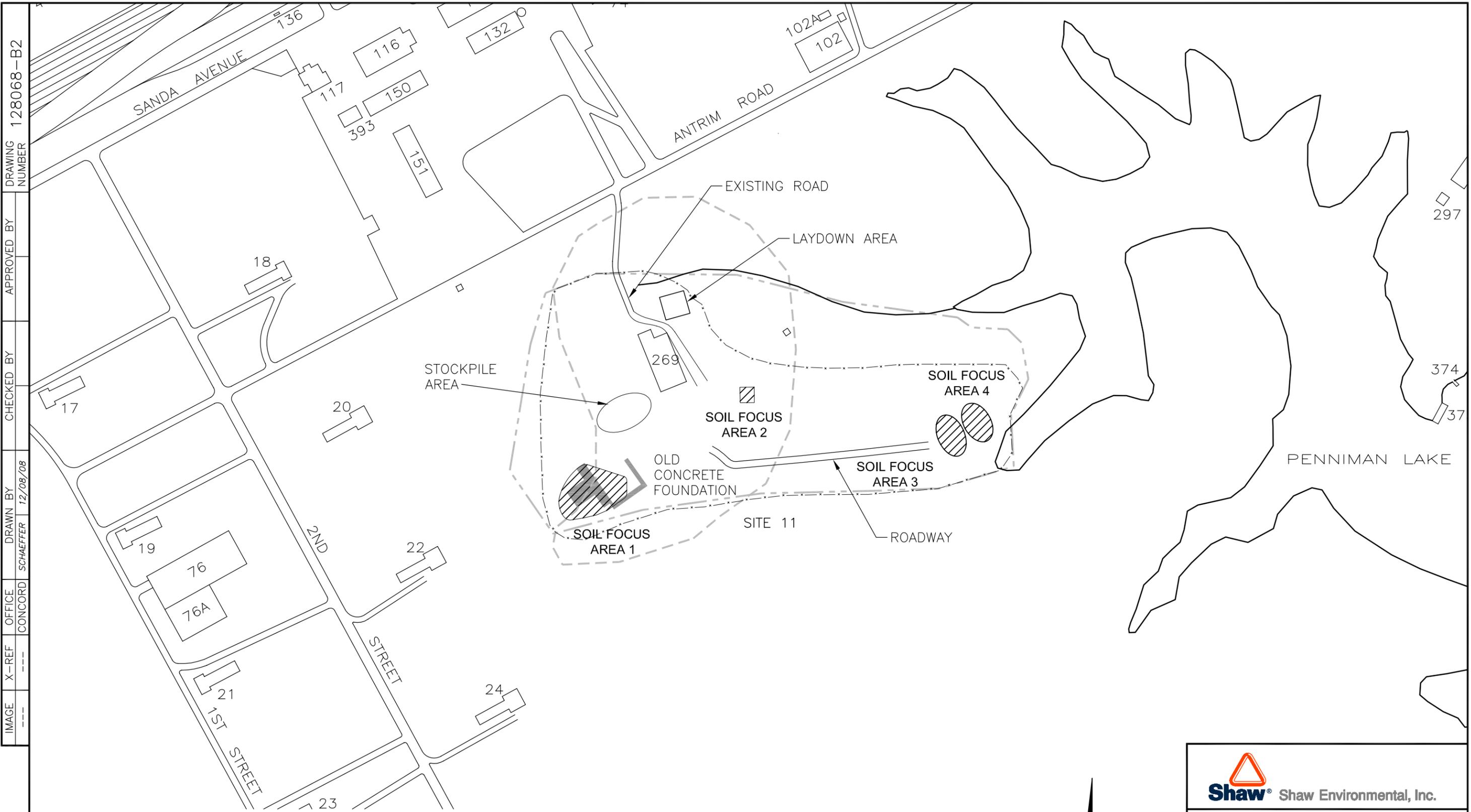
VAR 7° 45' W (1975)

NAVAL FACILITIES ENGINEERING COMMAND		NAVAL STATION		NAVAL WEAPONS STATION	
ATLANTIC DIVISION		YORKTOWN, VIRGINIA		YORKTOWN, VIRGINIA	
NAVAL DIVISION		CHEATHAM ANNEX		SITE 11	
NAVAL STATION		SITE LOCATION		SITE LOCATION	
DESIGNED BY	LAM	CHECKED BY	LAM	APPROVED BY	MLH
DRAWN BY	TFR	DATE	04/11/05	DATE	04/11/05
SCALE: AS SHOWN		SIZE: B		TASK ORDER NO. 0113	
CONSTR. CONTRACT NO. N62470-02-D-3260		NAVFAC DRAWING NO.		SHEET I.D.	
FIGURE 1					

Shaw Environmental, Inc.

DESIGNED BY: LAM
 CHECKED BY: LAM
 DRAWN BY: TFR
 APPROVED BY: MLH

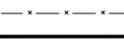
DESCRIPTION/ISSUE	REVISIONS

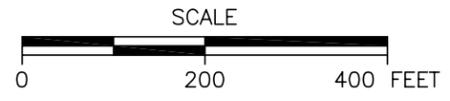


DRAWING NUMBER 128068-B2
 APPROVED BY
 CHECKED BY
 DRAWN BY SCHAEFFER 12/08/08
 OFFICE CONCORD
 X-REF
 IMAGE

FORMAT REVISION 2/26/99

LEGEND

	EXCAVATION AREA
	OLD CONCRETE FOUNDATION
	ORIGINAL SITE 11 BOUNDARY
	REVISED SITE BOUNDARY FROM EE/CA
	SILT FENCE

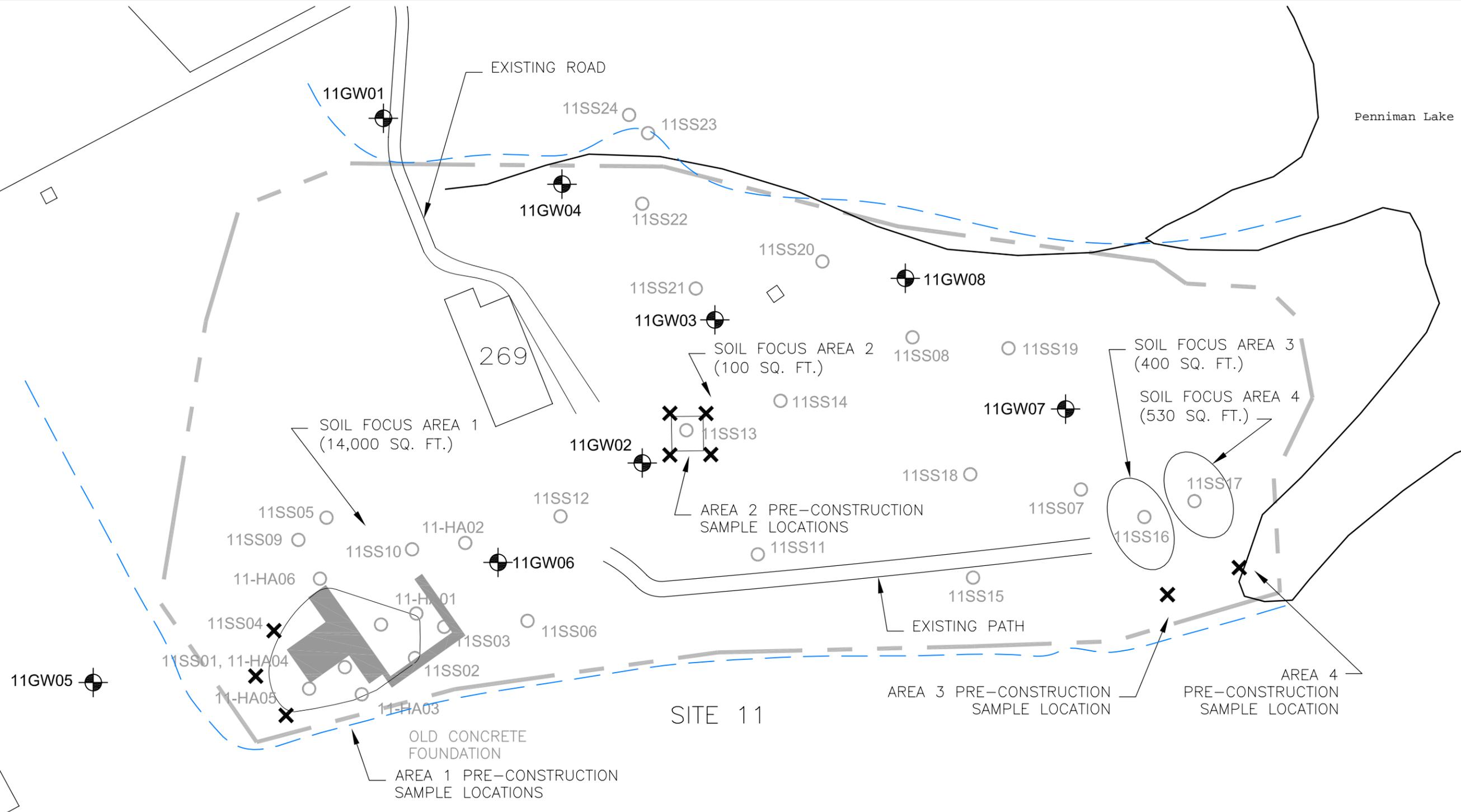


 **Shaw** Shaw Environmental, Inc.

NAVAL WEAPONS STATION YORKTOWN
 YOURKOWN, VIRGINIA
 CHEATHAM ANNEX SITE

FIGURE 2
SITE PLAN
 CHEATHAM ANNEX
 SITE 11

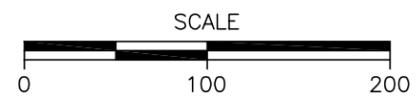
22



LEGEND:

- SURFACE SOIL SAMPLE LOCATIONS (1999 AND 2002)
- ⊕ MONITORING WELL
- ✕ APPROXIMATE PRE-CONSTRUCTION PERIMETER SAMPLING LOCATION

- UNNAMED TRIBUTARY
- OLD CONCRETE FOUNDATION
- ESTIMATED EXTENT OF SOIL FOCUS AREAS (APPROX. 0.35 ACRE)
- SITE 11 STUDY AREA BOUNDARY



NAVAL WEAPONS STATION YORKTOWN
 YOURKTOWN, VIRGINIA
 CHEATHAM ANNEX SITE

FIGURE 3
 PRE-CONSTRUCTION
 PERIMETER SAMPLING LOCATIONS
 SITE 11

APPENDIX A

PROJECT SCHEDULE

TO 113 - HSR, Site 11, Yorktown, VA

PROJECT START

01010		Project Start	100	1	0	20JUL07A	20JUL07A
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ESTIMATING ACTIVITIES

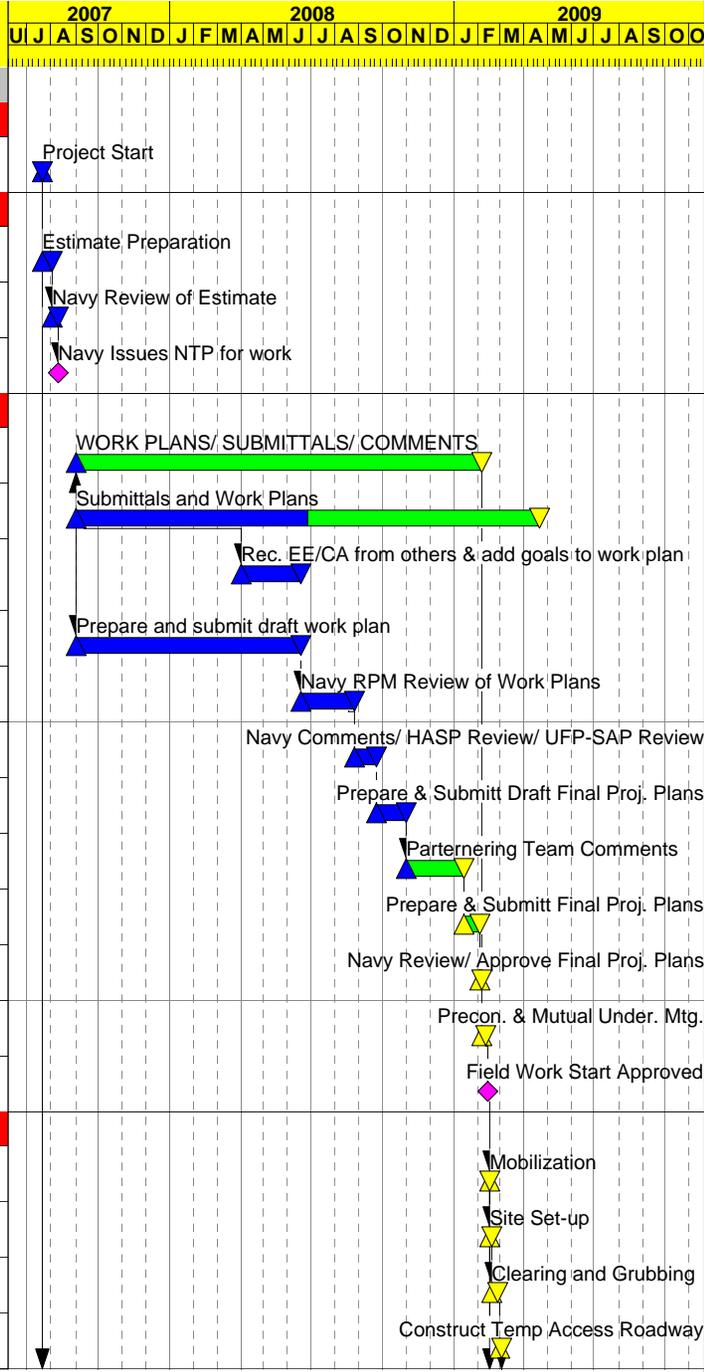
01001000	01001000	Estimate Preparation	100	10	0	20JUL07A	02AUG07A
01001003		Navy Review of Estimate	100	7	0	02AUG07A	10AUG07A
01001006		Navy Issues NTP for work	100	0	0	10AUG07A	

WORK PLANNING ACTIVITIES

01332		WORK PLANS/ SUBMITTALS/ COMMENTS	0	374*	27*	03SEP07A	05FEB09
01002000	01002000	Submittals and Work Plans	50	54	79	03SEP07A	20APR09
01002003		Rec. EE/CA from others & add goals to work plan	100	54	0	03APR08A	17JUN08A
01002006		Prepare and submit draft work plan	100	66	0	03SEP07A	17JUN08A
01002007		Navy RPM Review of Work Plans	100	43	0	18JUN08A	26AUG08A
01002009		Navy Comments/ HASP Review/ UFP-SAP Review	100	33	0	26AUG08A	23SEP08A
01002012		Prepare & Submitt Draft Final Proj. Plans	100	27	0	24SEP08A	30OCT08A
01002015		Partnering Team Comments	0	43	11	31OCT08A	14JAN09
01002018		Prepare & Submitt Final Proj. Plans	0	13	13	15JAN09	02FEB09
01002021		Navy Review/ Approve Final Proj. Plans	0	3	3	03FEB09	05FEB09
01003000	01003000	Precon. & Mutual Under. Mtg.	0	3	3	06FEB09	10FEB09
01003003		Field Work Start Approved	0	0	0	13FEB09	

FIELD ACTIVITIES

02001000	02001000	Mobilization	0	1	1	16FEB09	16FEB09
02002000	02002000	Site Set-up	0	2	2	17FEB09	18FEB09
02003000	02003000	Clearing and Grubbing	0	7	7	19FEB09	27FEB09
02004000	02004000	Construct Temp Access Roadway	0	3	3	02MAR09	04MAR09



Start Date 13JUL07
 Finish Date 14OCT09
 Run Date 12JAN09 17:36

113U

Sheet 1 of 2
TO 113- Hot Spot Removal, Site 11
Project 128068
WPNSTA Yorktown, VA
as of November 30, 2008

SHAW ENVIRONMENTAL, INC.

APPENDIX B

STORM WATER POLLUTION PREVENTION PLAN



**STORM WATER POLLUTION
PREVENTION PLAN
FOR CONSTRUCTION ACTIVITIES**

**SITE 11
HOT SPOT REMOVAL ACTION
NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA**

CONTRACT NO. N62470-02-D-3260

Prepared for:

**DEPARTMENT OF THE NAVY
NAVFAC MID-ATLANTIC
9742 Maryland Avenue
Norfolk, VA 23511**

Prepared by:

**SHAW ENVIRONMENTAL, INC.
500 East Main Street, Suite 1630
Norfolk, Virginia 23510**

**TASK ORDER 113
SHAW PROJECT NO. 128068**

FEBRUARY 2009

Storm Water Pollution Prevention Plan For Construction Activities

1.0 SITE DESCRIPTION			
<p><u>1.1</u> Project Title and Location: (Latitude and Longitude or Address)</p>	<p>Yorktown Naval Weapons Station Cheatham Annex, Site 11 Hot Spot Removal, Williamsburg Virginia</p> <p><u>Lat/Long:</u> 37° 14' 52.94" N 76° 32' 2.30" W</p>	<p><u>1.2</u> Operator's Name and Address:</p>	<p>Adair Franklin, registered Virginia Land Disturber</p> <p>Shaw E & I. 500 E. Main Street, Suite 1630 Norfolk, VA 23510</p>
<p><u>1.3</u> Description: (Purpose and Types of Soil Disturbing Activities)</p>	<ul style="list-style-type: none"> • Construction at the site will be limited to excavation, regrading, and concrete and debris removal from the site. The Site 11 Removal Action area will be excavated and regraded in order to remove contaminated hot spots. Excess concrete and associated debris will also be removed from the site. Backfill material and topsoil will be used to restore excavations to their approximate original grade. 		
<p><u>1.4</u> Runoff Coefficient:</p>	<p>0.1-0.3</p>		
<p><u>1.5</u> Site Area:</p>	<ul style="list-style-type: none"> - Total ~117,000 ft² (~2.7-acre) - Excavation ~25,000 ft² (~.6 acre) 		

1.6 Sequence of Major Activities:

- Site preparation will consist of the installation of a new temporary haul road which will allow for access of heavy equipment and haul vehicles. As part of the site preparation, silt fencing and other erosion controls will be installed, as needed, down slope of any areas that will be disturbed.
- The site clearing and grubbing will consist of felling trees, the removal of stumps, and removal of vegetation within the area surrounded by silt fence. It is not expected that a large amount of clearing will need to be performed. Haul roads will be constructed in paths that were historically used as roads and have yet to become densely vegetated.
- Excavation activities will include excavating the contaminated soil areas (four soil focus areas) to the desired depth.
- With excavation complete, the site will be regraded after backfilling with clean fill material. The fill material will be placed within the excavation area in 12-inch lifts and will be field-compacted using construction equipment. A 6-inch lift of topsoil will be placed over the common fill material. Site 11's final grade will equal the original grade prior to excavation and will promote positive drainage.
- Once topsoil is placed, Shaw will conduct restoration of the surrounding areas as described in the Scope of Work. Shaw will seed, and plant trees as part of site restoration. Erosion control devices will be left in place until permanent vegetation has been established at the site.

1.7 Name of Receiving Water(s):

Site 11 receives surface water run-off from surrounding wooded areas and is drained by two creeks running eastward to Penniman Lake which drains into King Creek leading to the York River.

1.8 Possible Pollution Sources

Possible pollution vectors lie in both the removal and processing of the materials to be removed. There is the potential of petroleum contamination from the use of construction equipment and trucks transporting material as well as introduction of non-natural debris (i.e. garbage) from personnel and machinery onsite.

2.0 CONTROLS

- **Clearing & Grubbing:** Prior to intrusive clearing and grubbing Shaw will install silt fence around proposed excavation areas to prevent surface soil from being washed away from the site.
- **Excavation:** Excavation areas will be surrounded by silt fencing and dust control measures (watering) will be implemented to minimize dust.
- **T&D:** Excavated soil and debris being transported will be in a solid state and will be covered with a tarp during transportation to prevent soil/dust from being deposited on roadways. If necessary, gravel entranceways will be installed to prevent the tracking of soil offsite.
- **Backfilling & Grading:** Silt fencing will remain until permanent vegetation is established at the site. Spill kits will remain onsite during construction activities. In the steepest graded areas erosion control matting will be securely stapled to the slope (areas TBD at completion of grading).

2.1 Erosion and Sediment Controls

2.1.1 Stabilization Practices	A silt fence will be installed around cleared and grubbed areas in order to prevent erosion. The silt fencing will be reinforced with straw bales in areas where there is a potential for concentrated flow. Also, upon regrading, erosion matting (Curlex™) will be placed and secured on the steepest areas of excavation to further prevent unwanted erosion. Straw and any remaining chipped material will be spread across the entire site as part of the restoration activities after planting and seeding has taken place.
--------------------------------------	---

2.1.2 Major Grading Activities

Following the completion of excavation activities (see the Project Schedule in Appendix A of the Work Plan) the site will be regraded so that it is approximately equal to the sites original grade. Clean backfill and topsoil will be imported to achieve this grade. When grading is completed, stabilizing erosion matting will field fitted and installed on the steepest areas of the site, as needed.

2.1.3 Structural Practices	If necessary, temporary diversion berms will be constructed to divert flowing runoff water from entering site excavations. In the event that concentrated flows occur, straw bales will be used to slow flow and prevent excessive erosion.
-----------------------------------	---

2.1.4 Storm Water Management

After construction is completed, Site 11 will be returned to its original grade and will be re-vegetated appropriately. Other than silt fencing and erosion control matting, no additional controls will be installed during construction. Due to the forested setting of Site 11, polluted storm water discharges are not expected.

2.2 Other Controls	
2.2.1 Solid Waste Disposal:	<ul style="list-style-type: none"> The contaminated waste material will be loaded into dump trucks for transport to a licensed disposal facility. Following loading, trucks will be inspected to ensure that no material is on their exterior, or seeping out of the truck. Any stockpiled soil will be located within the area to be excavated and silt fencing will be installed around the soil pile to prevent erosion. Any trash generated at the site will be placed in a roll-off box/dumpster for disposal at a local landfill.
2.2.2 Offsite Vehicle Tracking:	If needed, a temporary stone construction entrance, consisting of filter fabric overlain by VDOT #1 coarse aggregate (2- to 3-inch diameter), will be installed at proposed excavations to control migration of sediment onto adjacent roadways. The entrances may be omitted if, in the opinion of WPNSTA Yorktown CAX, significant tracking of sediment onto adjacent roads will not result from site activities. Each entrance will have minimum dimensions of 70 feet long by 12 feet wide, and will have a minimum thickness of 6 inches with three of the six inches embedded below surrounding grade. The entrance will be installed as described in VESCH Standard and Specification 3.02. The construction entrance will be removed upon completion of earthmoving and prior to site restoration.
2.2.3 Sanitary Waste Disposal	Sanitary wastes will be contained at the site by a port-a-john. These wastes will be removed by a licensed vendor and properly disposed.
2.3 TIMING OF CONTROLS/MEASURES	
<ul style="list-style-type: none"> Silt fencing will be installed prior to beginning any intrusive work. Erosion and sedimentation controls will be inspected every fourteen days or within forty-eight hours of any significant rainfall event. Dust control watering will be implemented on an as-needed basis throughout the entirety of the project. Haul trucks will be visually inspected for exterior traces of soil and/or contaminants with their haul loads being covered prior to each exit from the site. Gravel Construction Entrances (if needed) will be installed prior to heavy site traffic/haul truck activity which could result in offsite soil tracking. Erosion control matting will be placed and secured to appropriate slopes at the completion of final grading efforts, as needed. Exposed soils will also be seeded and planted at this time to promote permanent vegetative growth. Silt fencing will remain at the site until permanent vegetative growth is established. 	

2.4 Erosion and Sediment Control Inspection and Maintenance Practices

Prior to beginning any major land disturbance, erosion and sediment controls will be installed at the site. The erosion and sediment controls will be inspected and documented every fourteen days and within forty-eight hours after every significant rainfall event. Shaw will complete any needed repairs promptly following detection. Additional controls will be installed in the event the installed system is not sufficient or there is change in the site conditions.

2.5 Non-Storm Water Discharges

It is expected that the following non-storm water discharges will occur from the site during the construction period:

<input type="checkbox"/> Discharges from fire fighting activities	<input type="checkbox"/> Fire hydrant flushings
<input type="checkbox"/> Waters used to wash vehicles where detergents are not used	<input checked="" type="checkbox"/> Water used to control dust
<input checked="" type="checkbox"/> Potable water sources including waterline flushings	<input type="checkbox"/> Water used for hydrostatic testing of new pipeline construction
<input type="checkbox"/> Routine external building wash down which does not use detergents	<input type="checkbox"/> Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless spilled material has been removed) and where detergents are not used
<input checked="" type="checkbox"/> Air conditioning condensate	<input type="checkbox"/> Uncontaminated ground water or spring water
<input type="checkbox"/> Foundation or footing drains where flows are not contaminated with process materials such as solvents	

2.6 INVENTORY FOR POLLUTION PREVENTION PLAN

The following materials or substances are expected to be present on site during construction:

- Off-road fuel tank
- Port-a-john
- Spill-response kit (absorbents)
- Silt Fencing and Hay Bales
- Erosion control matting
- Back fill material
- Topsoil
-

2.7 SPILL PREVENTION

- Diesel Fuel Tank: The diesel fuel tank will be placed at the site in a low traffic area to avoid possible collisions or punctures, and to prevent the tank from being knocked over. Clay berms will also be constructed around the tank as a form of secondary containment in the event that a leak/spill does occur. A spill kit will also be in close proximity of the fuel tank.
- Port-a-johns: Any port-a-johns placed at the site will be situated on level terrain, away from high traffic areas in order to avoid tipping. These temporary facilities will also be serviced on a weekly basis by a licensed vendor.

2.8 Material Management Practices

<u>2.8.1</u> Good Housekeeping:	Good housekeeping measures have been developed to ensure that areas of the facility that contribute or potentially contribute pollutants to storm water discharges (i.e. areas around trash dumpsters and/or storage areas) are maintained in a clean and orderly manner. Good housekeeping measures include measures to eliminate or reduce exposure of garbage and refuse materials to precipitation or runoff prior to their ultimate disposal. Typical good housekeeping measures include activities that are performed on a daily basis by employees during the course of normal work activities.
---------------------------------	--

<u>2.8.2</u> Hazardous Products:	It is expected that the excavated materials from the site will be classified as non-hazardous but the contaminants of concern for the site will include PAHs, Pesticides, Mercury, Lead, and Copper. Necessary controls will be in place during excavation and transportation to prevent the spread of contamination. Product specific practices are detailed in Section 2.9.
----------------------------------	---

2.9 Product Specific Practices

<p><u>2.9.1</u> Petroleum Products:</p>	<p>Shaw will implement reasonable precautions to prevent hazardous petroleum substances from entering the ground, drainage areas, or local bodies of water. Equipment and storage vessels containing oils and fuels will be visually inspected prior to site entry and daily thereafter for leakage, drips, or other preventable releases. Any equipment or vessel damage will be immediately repaired or removed from the site. Releases of oily wastes will be remediated upon observation and impacted materials disposed of appropriately. Shaw will immediately notify WPNSTA Yorktown CAX of any oil spills. The site will be equipped with a spill kit, sufficient to contain and clean up on-site quantities of petroleum products. The spill kit will be located adjacent to the temporary diesel fuel tank so that any release can be quickly mitigated.</p>
<p><u>2.9.2</u> Fertilizers:</p>	<p>Fertilizers may be used as part of the site restoration activities. If fertilizers are used, they will be applied as per the manufacturer's instructions.</p>
<p><u>2.9.3</u> Paints:</p>	<p>Not Applicable</p>
<p><u>2.9.4</u> Concrete Trucks:</p>	<p>Not Applicable</p>
<p><u>2.10</u> Spill Control Practices</p>	
<p>Any spills may include solid or liquid materials being mishandled, dumped, leaked, knocked over, etc. Any material spillage will be immediately contained and collected for subsequent disposal. Excavation will be performed such that exposed source materials remain within the limits of excavation. Any spilled liquids will be contained and collected by absorbent.</p>	
<p><u>3.0</u> SITE MAP</p>	
<p>See Figure 2, Site Plan of Work Plan</p>	

POLLUTION PREVENTION PLAN CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature	Date

CONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of this Virginia Pollutant Discharge Elimination System (VPDES) general permit VAR10 that authorizes the storm water discharges from the construction activity identified as part of this certification.

Signature	Title	Date	Company Name, Address, and Telephone Number

PROJECT _____

STORM WATER POLLUTION PREVENTION PLAN

INSPECTION REPORT FORM

To Be Completed Every 14 Days and Within 48 Hours of a Rainfall Event

INSPECTOR: _____ DATE: _____

INSPECTOR'S QUALIFICATIONS _____

DAYS SINCE LAST RAINFALL _____
AMOUNT OF LAST RAINFALL _____ INCHES

AREA INSPECTED (areas not finally stabilized, material storage areas, and areas where vehicles enter/exit the site)

INCIDENCES OF NON-COMPLIANCE	CORRECTIVE ACTION TAKEN	BY WHOM	WHEN COMPLETE
LOCATION(S) OF DISCHARGES OF SEDIMENT OR OTHER POLLUTANTS FROM THE SITE			
LOCATION(S) OF BMP THAT NEED TO BE MAINTAINED			
LOCATION(S) OF BMP THAT FAILED TO OPERATE AS DESIGNED OR PROVED INADEQUATE FOR LOCATION			
LOCATION(S) WHERE ADDITIONAL BMP IS NEEDED THAT DID NOT EXIST AT TIME OF INSPECTION			

Incidences of noncompliance were not identified and the facility is in compliance with the storm water pollution prevention plan. I certify under penalty of law that this attachment was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

SIGNED _____

DATE _____

PROJECT _____

STORM WATER POLLUTION PREVENTION PLAN

CHANGE(S) REQUIRED TO THE STORM WATER POLLUTION PREVENTION PLAN _____

REASON(S) FOR THE CHANGE(S) _____

I certify under penalty of law that this attachment was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

SIGNED _____ DATE _____

APPENDIX C

QUALITY CONTROL PLAN



QUALITY CONTROL PLAN ADDENDUM

**SITE 11
HOT SPOT REMOVAL ACTION
NAVAL WEAPONS STATION
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA**

Prepared for:

**DEPARTMENT OF THE NAVY
Contract No. N62470-02-D-3260
NAVFAC Mid-Atlantic
Norfolk, VA**

Prepared by:

**Shaw Environmental, Inc.
500 E. Main Street, Suite 1630
Norfolk, Virginia 23510**

A handwritten signature in black ink, appearing to read "Millard S. Dunham", written over a horizontal line.

Millard S. Dunham, P.E.
Project Manager

A handwritten signature in black ink, appearing to read "Ernest P. Duke", written over a horizontal line.

Ernest P. Duke, P.G.
Program QC Manager

A handwritten signature in black ink, appearing to read "James A. Dunn, Jr.", written over a horizontal line.

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

**TASK ORDER 113
SHAW PROJECT 128068**

FEBRUARY 2009

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- V-1 Submittal Register
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- VII-1 Test Plan and Log
- VIII-1 Rework Items Log
- X-1 Quality Control Inspection Plan
- XI-1 Personnel Matrix

STATEMENT OF QC PROGRAM

This Addendum to the Program Quality Control Plan (PQCP) is prepared and submitted for Task Order 0113, Site 11 / Hot Spot Removal Action, Naval Weapons Station Yorktown Cheatham Annex. This plan incorporates methods and procedures from the PQCP approved by the Atlantic Division, Naval Facilities Engineering Command (NAVFAC). The PQCP was developed specifically to be responsive to the Contract Specification, Contract No. N62470-02-D-3260. Shaw Environmental, Inc. (Shaw) will perform the inspections and tests required to ensure that materials, workmanship, and construction conform to drawings, specifications, and contract requirements.

Note to Employees – Concept of Quality Control

Quality control should not be considered a person or an organization of personnel, but a concept to perform in such a manner that the end product of our efforts provides a quality product and customer satisfaction. The quality control individual or group cannot inspect quality into the final product, but only inspect and document the results of our efforts. The only people that can build quality into the product are the individuals performing the task of producing the end product.

It should be noted by all employees that the documentation requirements of Shaw procedures, plans, and the Task Order Specifications are considered equally as important as the end product itself. When it is stated that the documentation will be approved prior to the start of work, this is exactly what is intended. To eliminate problems in this area requires careful planning and execution by everyone.

We would do well to remember that our livelihood depends on how well we satisfy our customer. To accomplish this requires teamwork and attention to detail by all employees and contractors.

I. QUALITY CONTROL ORGANIZATION

The Site QC Manager will have the authority to implement and manage the PQCP, the three phases of quality control and the authority to stop work, which is not in compliance with the contract.

The site QC Manager for this task order will be Mr. Dennis Kelley. Mr. Kelley will function as the QC Manager for this task order under the direction and oversight of Mr. Duke, Shaw Program QC Manager. Mr. Kelley maintains current US Army Corps of Engineers (USACE) Construction Quality Management for Contractors, QC certification.

Mr. Kelley will work closely with the Project Manager, but will report directly to Mr. Ernie Duke, Program QC Manager regarding QC related issues on the site. Mr. Ernie Duke, Shaw Program QC Manager will serve to resolve any QC related issues, which need his involvement. The Site QC Manager will have a direct line of communication to Mr. Duke on QC issues.

The relationship between the QC organization, and production personnel of the task order, is provided in the Organizational Chart, Figure I-1.

II. IDENTIFICATION OF PERSONNEL ASSIGNED TO THE QC ORGANIZATION

The resume of the Site QC Manager is provided as Figure II-1.

III. APPOINTMENT LETTER

The Site QC Manager appointment letter is presented as Figure III-1.

IV. OUTSIDE ORGANIZATIONS

A list of outside organizations such as subcontractors employed by Shaw for work under this task order is provided in Exhibit IV-1. This list provides each firm's name and address and a description of the services each firm will provide. This list will be maintained current and will be available for review.

V. INITIAL SUBMITTAL REGISTER & REVIEWER

V.1 Submittal Register

The Initial Submittal Register is provided as Exhibit V-1. The status of each submittal will be recorded and maintained by the Site QC Manager. The Submittal Register will be submitted at the end of each month.

V.2 Personnel Authorized to Review and Certify Submittals

Personnel authorized to review and certify submittals other than the Site QC Manager are identified on Exhibit V-2. The Site QC Manager shall perform the final review and approval/certification for all submittals. Any additional personnel assigned to perform submittal review and certification must be approved by the Contracting Officer, prior to performance.

VI. TESTING LABORATORY ACCREDITATION

Testing laboratory accreditation requirements are addressed in the PQC P Section 1, part 4.7, Construction Testing.

VII. TESTING PLAN & LOG PREPARATION

A Testing Plan and Log has been prepared for this task order and is provided as Exhibit VII-1.

VIII. REWORK ITEMS

Rework Items will be documented on the Daily QC Report and on the Rework Items Log. This log will be used to report and track Rework Items and is provided as Exhibit VIII-1 The Rework Items Log will be submitted at the end of each month.

IX. DOCUMENTATION PROCEDURES

The Daily QC Report form and Daily Production Report form will be used to document daily activities at the site. Documentation will be completed as discussed in Section 1, Parts 4.5 and 4.9 of the PQCP.

X. QUALITY CONTROL INSPECTION PLAN

The QC Inspection Plan, Exhibit X-1, lists each specification section and definable feature of work with provisions for recording the corresponding checklist/report for each phase of the three-phase control process. As each control phase is satisfactorily performed, the Site QC Manager will record the corresponding checklist/report number and date.

Note: A definable feature of work is a task, which is separate, and distinct from other tasks and requires separate control procedures.

This list has been prepared to correspond to the activities of the project schedule. It will be maintained as provided in Section 1, Part 4.4 of the PQCP. The list will be agreed upon during the Coordination and Mutual Understanding Meeting. The list will be keyed to the construction schedule. Each preparatory, initial and follow-up phase checklist/report will reflect the construction activity number derived from the construction schedule.

XI. PERSONNEL MATRIX

The Site QC Manager will prepare and maintain the personnel matrix, Exhibit XI-1, showing each section of the task order specification with identification of who will review and certify submittals, who will perform and document the three phases of control, and who will perform and document testing. This matrix should be completed as much as possible prior to and during site mobilization. The matrix will be maintained current by the Site QC Manager and will be available for review.

FIGURES

FIGURE I-1

**QC ORGANIZATIONAL RELATIONSHIP WITH
PRODUCTION PERSONNEL
SHAW ENVIRONMENTAL INC.,
TASK ORDER NO. 0113**

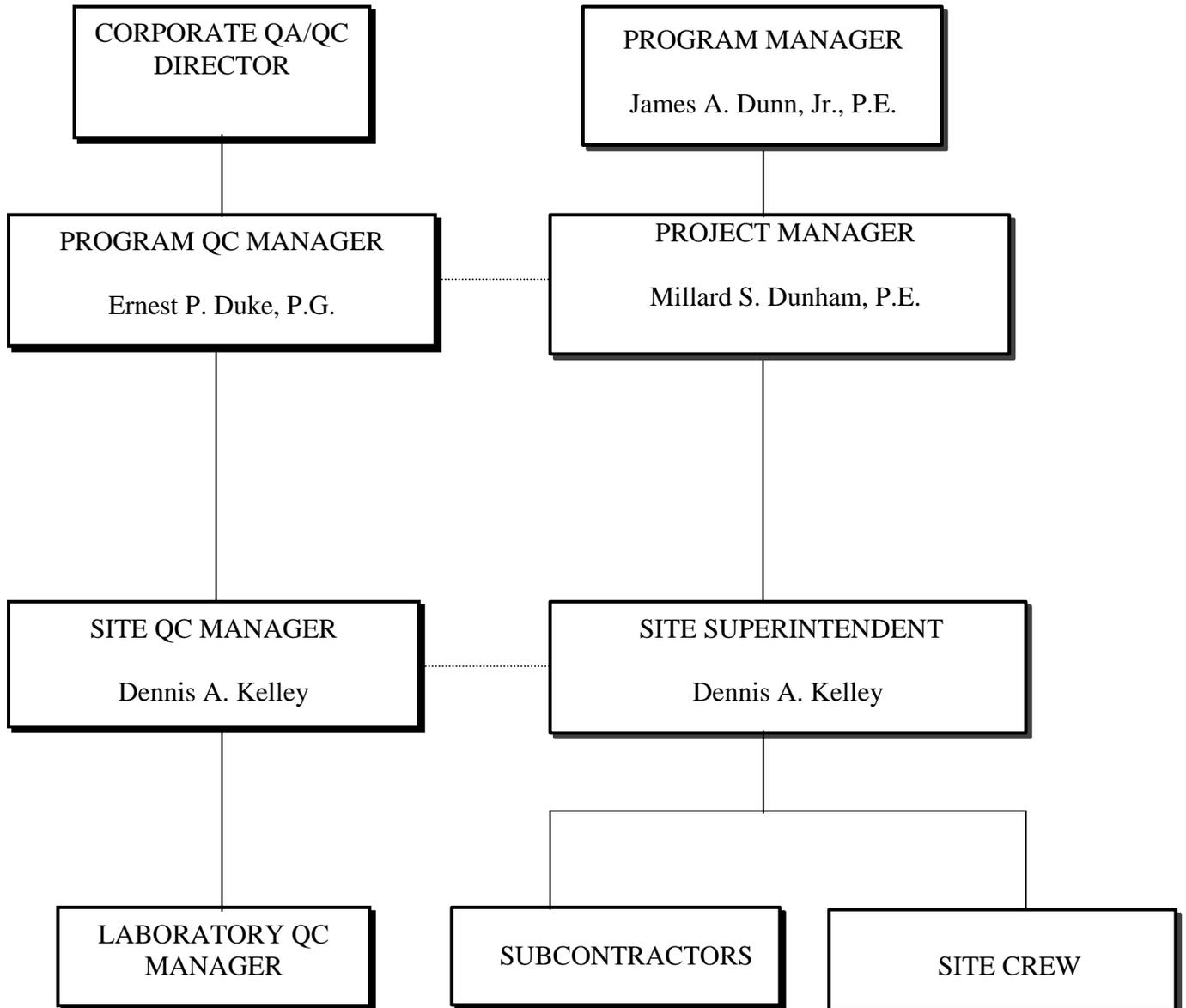


Figure II-1 Site QC Manager / Representative Resume won't be included due to it's personal nature.

Figure III-1
Site QC Manager/Representative – Letter of Appointment



January 29, 2009

Shaw Environmental, Inc.
500 E. Main Street, Suite 1630
Norfolk, VA 23510

RE: Site QC Manager
Contract N62470-02-D-3260
Task Order No. 0113

Dear Mr. Dennis A. Kelley:

This letter will serve as your appointment as the Site Quality Control Manager on the referenced project and will also clarify your duties and authority in this position. With your Construction Quality Management Certification and years of prior experience you are well suited for this position and will serve a vital role in the overall success and end-result quality of the referenced project. In this position, you will be authorized to use available resources to satisfy all applicable requirements of the Program and Task Order Quality Control Plans.

This authorization specifically gives you the authority to direct removal and replacement or correction of nonconforming materials or work and stop work authority when continuation would be unsafe to personnel, harmful to the environment, or result in a significant degradation of quality.

You will be expected to work closely with the Project Manager, and other project personnel, but you will not be directly responsible to anyone but myself for resolution of quality issues when working in the capacity of Quality Control Manager.

If you have any question in this matter, please contact me.

Respectfully,

A handwritten signature in black ink, appearing to read "Ernest P. Duke", written in a cursive style.

Ernest P. Duke
Program QC Manager
NAVFAC RAC Program

EXHIBITS

EXHIBIT IV-1

APPROVED CONSULTANT AND SUBCONTRACTOR LIST

**Shaw Environmental, Inc.
Site 11/Hot Spot Removal Action
WPNSTA Yorktown CAX
Task Order No. 0113**

COMPANY NAME AND ADDRESS	DESCRIPTION OF SERVICES PROVIDED
Base Utilities TBD (Private Contractor)	Utility Locations
TBD	Site Survey
Accutest Laboratories	Chemical Analytical Testing
TBD	Waste Transportation Services
TBD	Waste Disposal Services

Exhibit V-1 Submittal Register

Task Order No. 0113 Contract No. N62470-02-D-3260						Project No. 128068 Project Title: Site 11/Hot Spot Removal Action						Revision No. 01 Shaw Environmental, Inc.			
Spec. Sect.	SD Number and Submittal Description	Spec Paragraph Number	Approving Authority	Other Reviewers	Transmittal Control No.	Planned Submittal Date	Contractor Action			Approving Authority				Date Rcvd from Appr Auth	Remarks
							Action Code	Date of Action	Date Forwarded to Appr Auth/ from Contr	Date Forward to Other Reviewer	Date Rcvd from Other Reviewer	Action Code	Date of Action		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
	SD-01 Preconstruction														
	Work Plan		G												
	Site Specific Health and Safety Plan		G												
	Quality Control Plan Addendum		G												
	Uniform Federal Sampling and Analysis Plan Policy Addendum		G												
	Base Permits		G												
	SD-11 Closeout Submittals														
	Contractor's Closeout Report					Closeout Report									
	As-Built Survey and Records					Closeout Report									
	Status Reports					Closeout Report									
	Environmental Conditions Report					Closeout Report									
	Test Results Summary Report					Closeout Report									
	Daily Contractor Production Reports					Closeout Report									
	Daily QC Reports					Closeout Report									
	Rework Items List														
	SD-13 Certifications					Closeout Report									
	Testing Laboratory Accreditation														
	SD-10 Test Reports					Closeout Report									
	Lab Test Results of Confirmation Samples					Closeout Report									
	Lab Test Results of Backfill Soils					Closeout Report									
	Lab Test Results of Waste Soils					Closeout Report									

Exhibit V-1 Submittal Register

Task Order No. 0113 Contract No. N62470-02-D-3260				Project No. 128068 Project Title: Site 11/Hot Spot Removal Action				Revision No. 01 Shaw Environmental, Inc.							
Spec. Sect.	SD Number and Submittal Description	Spec Paragraph Number	Approving Authority	Other Reviewers	Transmittal Control No.	Planned Submittal Date	Contractor Action			Approving Authority			Date Rcvd from Appr Auth	Remarks	
							Action Code	Date of Action	Date Forwarded to Appr Auth/ from Contr	Date Forward to Other Reviewer	Date Rcvd from Other Reviewer	Action Code			Date of Action
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
	Lab Test Results of Pre-construction Samples														
	SD-08 Statements					Closeout Report									
	Disposal Facility Permits														
	SD-18 Records					Closeout Report									
	Shipment Manifests														

Notes:
 Approved By:
 G: Government
 Blank: QC Manager

ACTION CODES
 A: Approved
 AN: Approved as Noted
 NR: Not Reviewed
 RR: Disapproved; Revise and Resubmit

EXHIBIT V-2

LIST OF PERSONNEL AUTHORIZED TO REVIEW AND CERTIFY SUBMITTALS Shaw Environmental, Inc. Site 11/Hot Spot Removal Action Task Order No. 0113 WPNSTA Yorktown CAX		
	SUBMITTAL TYPE:	AUTHORIZED PERSONNEL:
Work Plan Submittals	Preconstruction	Project Manager
All Work Plan/ Addendum Sections	All Types	Site QC Manager, Program QC Manager, Project Manager and Site Engineer

EXHIBIT VII-1

<p align="center">TESTING PLAN AND LOG Shaw Environmental, Inc. Site 11/Hot Spot Removal Action, WPNSTA Yorktown CAX Task Order No. 0113</p>											
CONTRACT NUMBER N62470-02-D-3260			PROJECT TITLE: Site 11/Hot Spot Removal Action LOCATION: WPNSTA Yorktown CAX								
WORK PLAN SECTION AND PARAGRAPH NUMBER	ITEM OF WORK	TEST REQUIRED	ACCREDITED/ APPROVED LAB		SAMPLED BY	TESTED BY	LOCATION OF TEST		DATE COMPLETED	DATE FORWARDED TO CONTR. OFF.	REMARKS
			YES	NO			ON SITE	OFF SITE			
WP 3.3.10	Pre-Construction Perimeter Sampling										See UFP-SAP Worksheet #10
WP 3.3.11	Disposal Profile Sampling										See UFP-SAP Worksheet #10
WP 3.4.3	Confirmation Sampling										See UFP-SAP Worksheet #10
WP 3.5	Fill Material Testing										See UFP-SAP Worksheet #10
	Additional QC Samples	Field Duplicates, Field Blanks, Trip Blanks									See UFP-SAP Worksheet #10

EXHIBIT X-1

QUALITY CONTROL INSPECTION PLAN Shaw Environmental, Inc. Site 11/Hot Spot Removal Action, WPNSTA Yorktown CAX Task Order No. 0113									
Specification Section	Definable Feature of Work	Subtasks	Items of Work to be Verified	Control Check Verification					
				Date	Preparatory Phase Checklist/Report No.	Date	Initial Phase Checklist/Report No.	Follow-up Phase Checklist/Report No.	
WP 3.3	Mobilization, Site Preparation								
WP 3.3.1		Construction Zones	Delineate active construction zones of the site.						
WP 3.3.6		Clearing and Grubbing	Verify lines and limits of work area.						
WP 3.3.7		E&S Installation	Establish controls to prevent erosion and sedimentation, perform inspections following each runoff producing rainfall event and maintain.						
WP 3.3.8		Construct Temporary Access Road	Install culverts where needed.						
WP 3.3.10		Pre-Construction Sampling	Collected from desired area and analyzed for appropriate parameters.						Verify PRGs in UFP-SAP Worksheet #10
WP 3.3.11		Disposal Profile Sampling	Collected from desired area and analyzed for appropriate parameters.						See UFP-SAP Worksheet #10
WP 3.4	Site Remediation								
WP 3.2.4		Initial Site Survey	Survey areas that will be disturbed.						
WP 3.4.1		Soil Excavation	Verify the excavation and removal to the appropriate depth						
			Verify contaminated soil is transported to an approved off-site disposal facility.						
			Separate any debris found over one foot in length for disposal.						
			If stockpiled, the material needs to be kept within the limits of the contaminated area.						
WP 3.4.2		Concrete and Debris Removal	Demolition of debris to appropriate size for disposal.						
			Approximately 100 cubic yards of material.						

EXHIBIT X-1

QUALITY CONTROL INSPECTION PLAN Shaw Environmental, Inc. Site 11/Hot Spot Removal Action, WPNSTA Yorktown CAX Task Order No. 0113									
Specification Section	Definable Feature of Work	Subtasks	Items of Work to be Verified	Control Check Verification					
				Date	Preparatory Phase Checklist/Report No.	Date	Initial Phase Checklist/Report No.		Follow-up Phase Checklist/Report No.
WP 3.4.3		Confirmation Sampling and Analysis	Collected from desired area and analyzed for appropriate parameters.						See UFP-SAP Worksheet #10
WP 3.4.4		Post Removal Survey	Conduct a post-excavation survey and as-built survey.						
WP 3.5	Site Restoration								
WP 3.5		Backfill & Topsoil	Clean analytical, 12" lifts of backfill, 6" topsoil layer.						
			Grade to approximate original elevation.						
		Planting & Seeding	Seed and plant trees in disturbed areas.						
		Geotextile stabilization of steep areas.	Stabilize steep areas as needed.						

EXHIBIT XI-1

PERSONNEL MATRIX Shaw Environmental, Inc. Site 11/Hot Spot Removal Action Task Order No. 0113			
SPECIFICATION SECTION	SUBMITTALS TO BE REVIEWED BY:	THREE PHASE TO BE PERFORMED BY:	TESTING TO BE PERFORMED BY:
All Sections	Site QC Manager, Program QC Manager, Project Manager or Project Engineer	Site QC Manager	Chemical Analysis - Accutest Laboratories

APPENDIX D

SITE SPECIFIC HEALTH AND SAFETY PLAN



SITE SPECIFIC HEALTH AND SAFETY PLAN

**SITE 11
HOT SPOT REMOVAL ACTION
NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA**

CONTRACT NO. N62470-02-D-3260

Prepared for:

**DEPARTMENT OF THE NAVY
NAVFAC MID-ATLANTIC
9742 Maryland Avenue
Norfolk, VA 23511**

Prepared by:

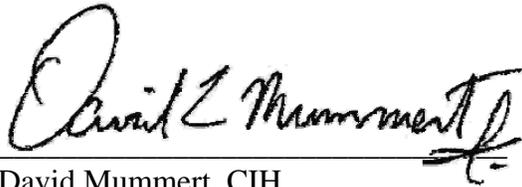
**SHAW ENVIRONMENTAL, INC.
500 East Main Street, Suite 1630
Norfolk, Virginia 23510**

**TASK ORDER 113
SHAW PROJECT NO. 128068**

FEBRUARY 2009

**Site-Specific Health and Safety Plan Approval for the
Hot Spot Removal Action, Site 11, Cheatham Annex,
Williamsburg, Virginia**

I have read and approve this site-specific health and safety plan attachment for remediation activities at the Cheatham Annex, Site 11, Williamsburg, Virginia with respect to project hazards, regulatory requirements, and Shaw procedures.



David Mummert, CIH
Program Certified Industrial Hygienist

02/02/09

Date



Skip Dunham
Project Manager

02/02/09

Date

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Appendix I	OSHA 300 Log
Appendix J	Blood Borne Pathogens Exposure Control Plan
Appendix K	Accident Reporting Forms

List of Acronyms

AHA	Activity Hazard Analyses
BAC	Blood Alcohol Concentration
CAX	Cheatham Annex
CIH	LANTDIV Certified Industrial Hygienist
CFR	Code of Federal Regulation
COPC	Contaminant of Potential Concern
CPR	Cardio Pulmonary Resuscitation
CRZ	Contamination Reduction Zone
DBA	A-Weighted Decibel
°C	Degrees Celsius
DEET	N, N-diethyl-m-toluamine
EMA	Emergency Management Agency
EMS	Emergency Response Service
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPA	Ecological Risk Assessment
ERCP	Emergency Response Contingency Plan
ev	Electron Volt
EZ	Exclusion Zone
°F	Degrees Fahrenheit
F/B	Flash/Bang
HAZWOPER	Hazard Waste Operations and Emergency Response
HzS	Hydrogen Sulfide
HSC	Health and Safety Coordinator
IAS	Initial Assessment Study
JSA	Job Safety Analysis
LEL	Lower Explosive Limit
MEC	Munitions and Explosives of Concern
mg/kg	milligrams per kilogram
mg/m ³	Milligrams per cubic meter
mph	Miles Per Hour
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health

List of Acronyms (cont.)

NRR	Noise Reduction Rating
O ₂	Oxygen
OSHA	Occupational Safety and Health Administration
PAH	Poly Aromatic Hydrocarbon
PHSM	Program Health and Safety Manager
PM	Project Manager
PPE	Personal Protection Equipment
ppm	Parts Per Million
PID	Photo Ionization Detector
RBC	Risk Based Concentration
RCRA	Resource Conservation Recovery Act
RI	Remedial Investigation
ROICC	Resident Officer In Charge of Construction
RPM	Remedial Program Manager
Shaw	Shaw Environmental, Inc.
SOP	Standard Operating Procedure
SSO	Site Safety Officer
SS	Site Superintendent
SSHSP	Site-Specific Safety and Health Plan
SVOC	Semi-volatile Organic Compound
SZ	Support Zone
TLV	Threshold Limit Value
TSCA	Toxic Substance Control Act
TWA	Time-Weight Average
UEL	Upper Explosive Limit
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
UV	Ultraviolet
VOC	Volatile Organic Compound

1.0 INTRODUCTION

1.1 OBJECTIVE

The objective of this plan is to provide a mechanism for establishing safe working conditions at the site. The safety organization, procedures, and protective equipment have been established based upon an analysis of potential hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury.

1.2 POLICY STATEMENT

The policy of Shaw Environmental, Inc. (Shaw) is to provide a safe and healthful work environment for all employees. Shaw considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency and shortcuts. At Shaw, it is believed all accidents and injuries are preventable. Shaw will take every reasonable step to reduce the possibility of injury, illness, or accident.

This Site Specific Health and Safety Plan (SSHSP) prescribe the procedures that must be followed during referenced site activities. Operational changes that could affect the health and safety of personnel or the community will not be made without the prior approval of the Project Manager (PM) and the Health and Safety Coordinator (HSC).

The provisions of this plan are mandatory for all personnel and subcontractors assigned to the project. All visitors to the work site must abide by the requirements of the plan.

1.3 REFERENCES

This SSHSP complies with applicable Occupational Safety and Health Administration (OSHA), U.S. Environmental Protection Agency (EPA), and Shaw Health & Safety policies and procedures. This SSHSP plan follows the guidelines established in the following:

- Standard Operating Safety Guides, EPA (Publication 9285.1-03, June 1992).
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute for Occupational Safety and Health (NIOSH), OSHA, United States Coast Guard (USCG), EPA (86-116, November 1985).
- Title 29 of the Code of Federal Regulations (CFR), Part 1910.
- Title 29 of the CFR, Part 1926.

- United States Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1.
- Shaw Health and Safety Procedures HS001 through HS999 (current).

1.4 DISCLAIMER

The enclosed SSHSP has been designed for the methods presently contemplated by Shaw for execution of the proposed work. Therefore, the SSHSP may not be appropriate if the work is not performed by or using the methods presently contemplated by Shaw and/or Shaw, or if the scope of work is modified. Each company or contractor is responsible for the safety and health of their personnel, for their actions, and for the work they perform. It is highly recommended that each company or contractor working at the CAX Site 11 perform their work under the supervision of their internal health and safety professionals.

2.0 SITE HISTORY/SCOPE OF WORK

2.1 BACKGROUND

Site 11 encompasses an estimated 2.7-acre area located approximately 250 feet south of Antrim Road and the Public Works facility. Although the Initial Assessment Study (IAS) reported that the site area was approximately eight acres, it does not appear that this area determination was based on site-specific mapping or a detailed survey.

Site 11 consists of an open, overgrown, grassy field surrounded by mixed-hardwood woodlands. Old building foundations, concrete pads, and low retaining walls litter the site, both inside and outside the wooded areas. Most of these structures are overgrown with grasses and weeds. Two creeks running eastward to Penniman Lake drain Site 11 and border the site to the north and south. Access to the site is from the north via a dirt road off of Antrim Road.

Site 11 was reportedly used between 1940 and 1978 to store containers of waste-oil and tar as well as asphalt and other scrap materials on the ground. Oil, asphalt, gasoline, and other, unspecified materials have been identified in the disposal area. Baker Environmental, Inc. prepared a Remedial Investigation (RI) report including baseline human health risk assessment and screening-level Ecological Risk Assessment (ERA) including Step 3a refinement in April 2007. Prior to finalizing the RI report, the results were presented to the Partnering Team at the March 2007 meeting. At that meeting, the Navy recommended that, prior to proceeding to Step 3b of the baseline ERA, a hot spot removal action would be initiated to remove hot spots associated with sampling locations 11SS01, 11SS13, 11SS16, and 11SS17.

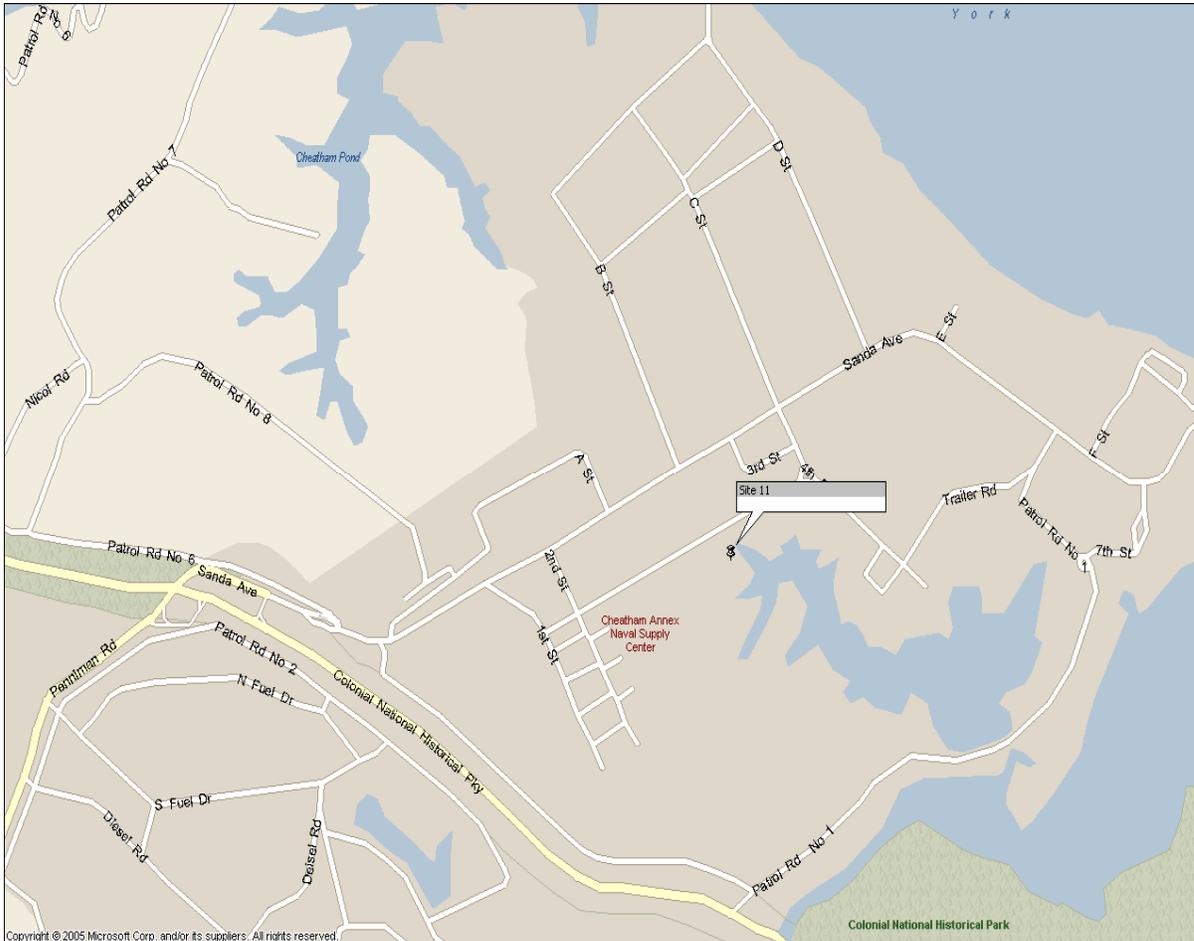
2.2 SCOPE OF WORK

This task order encompasses the implementation of the recommendation for the removal and disposal of soil from several hot spots, as a non-time critical removal action. The principle field tasks to be conducted consist of:

- Clearing and Grubbing,
- Pre and Post Removal Site Survey,
- Excavation,
- Site Restoration.

All site activities have been analyzed for potential hazards for which control measures are provided in **Appendix C**, Activity Hazard Analyses (AHA).

Figure 2.1
Site Location



3.0 KEY PERSONNEL AND MANAGEMENT

The PM, Site Superintendent/Site Safety Officer (SS/SSO), HSC, LANTDIV Program Certified Industrial Hygienist (CIH) and Naval Facilities Engineering Command Mid-Atlantic (NAVFAC MIDLANT) Program Health and Safety Manager (HSM) are responsible for formulating and enforcing health and safety requirements, and for implementing this SSHSP. The following subsections summarize the health and safety responsibilities of the site management.

3.1 PROJECT SAFETY RESPONSIBILITIES

The PM has the overall responsibility for the project and to assure that the requirements of the contract are attained in a manner consistent with the SSHSP requirements. The PM will coordinate with the SS/SSO, and the HSC to assure that the work is completed in a manner consistent with the SSHSP. The SS/SSO are responsible for field implementation of the SSHSP. The SS/SSO will be the main contact in any on-site emergency situation and will insure off-site emergency agencies have been contacted prior to the start of work. The PM, CIH, HSM, SS/SSO and HSC are authorized to administer this SSHSP. All site personnel are authorized to stop work when an imminent health or safety risk exists. The PM and CIH are responsible for reviewing the SSHSP and ensuring that the SSHSP is complete and accurate. The HSC and HSM will also provide technical and administrative support for the Health and Safety Program and will be available for consultation when required. Each employee is responsible for personal safety as well as the safety of others in the work area.

3.2 KEY SAFETY PERSONNEL

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

Shaw Project Manager	Skip Dunham (757) 640-6921 (office)
Shaw Site Superintendent	Dennis Kelly (757) 869-7700
Shaw Site Safety Office	Jim Greer (865) 466-5409

Navy Public Works	William Wells (757) 887-7952
Navy Remedial Project Manager	Christopher Murray (757) 444-3811
Contracting Officers Representative NAVFAC Atlantic	Zane Perry (757) 322-4777 (office) (757) 619-4611 (cell)
Shaw Certified Industrial Hygienist	David Mummert, CIH (419) 425-6129 (office) (419) 348-1544 (cellular)
Program Health and Safety Manager	Kym Edelman, CSP (757) 640-6950 (office) (757) 435-5384 (cellular)

4.0 ACTIVITY HAZARDS

4.1 CHEMICAL HAZARDS

Site 11 was reportedly used between 1940 and 1978 to store containers of waste-oil and tar as well as asphalt and other scrap materials on the ground. Oil, asphalt, gasoline, and other, unspecified materials have been identified in the disposal area.

As presented in the CAX Site 11 Final RI, completed by Baker Environmental, April 2007, limited Volatile Organic Compounds (VOCs) were detected in surface and subsurface soil samples. The analytical data show that Poly Aromatic Hydrocarbons (PAHs) are present in surface and subsurface soil samples. The locations of PAH detections in subsurface soil coincide with PAH exceedances in surface soil. This is expected based on the past disposal activities at the site. Groundwater does not appear to be substantially affected by soil in the area. Evidence of this is shown in that only one VOC, three Semi Volatile Organic Compounds (SVOCs), and two pesticide compounds were detected in groundwater samples collected at the site. VOCs and SVOCs detected in surface water samples are likely due to common laboratory contaminants (e.g., acetone, methylene chloride, toluene, and phthalates).

There were no VOCs detected in the surface soil from Site 11 at concentrations above corresponding residential soil Risk Based Concentration values. Therefore, VOCs were not retained as contaminant of potential concern (COPCs).

Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were detected at concentrations above their respective residential soil RBC values and were retained as COPCs for surface soil. Benzo(k)fluoranthene, carbazole, and chrysene were detected at concentrations less than their respective residential soil RBC values but were retained as COPCs for surface soil because of the possible additive effects of cPAH exposure. 4-Chloro-3-methylphenol was retained as a COPC as a conservative measure because it does not have screening criteria with which to quantitatively evaluate it.

4,4'-DDD, 4,4'-DDE and dieldrin were detected at concentrations above corresponding residential soil RBC values and were retained as COPCs for surface soil.

Aroclor-1254 was detected in the surface soil at Site 11 at concentrations exceeding corresponding residential soil RBC values and was retained as a COPC.

There were no explosives detected in the surface soil at Site 11 at concentrations above corresponding residential soil RBCs. Therefore, explosives were not retained as COPCs.

Inorganics were detected in all surface soil samples at Site 11. Aluminum, antimony, arsenic, cadmium, chromium, iron, lead, manganese, mercury, thallium, and vanadium were detected at concentrations greater than residential soil RBC values and were retained as COPCs for surface soil.

Of the inorganics detected in the surface soil samples, only eight locations exceeded the background concentrations for arsenic. These eight locations are in the area south of Building 269, north of the southern stream. Of these eight locations, only one location (11SS16) has a subsurface soil sample, which exceeds the background concentration for arsenic in subsurface soil. Arsenic was detected in groundwater and surface water samples and may be indicative of background conditions.

There were no carcinogenic risks or adverse health hazards calculated that exceeded EPA's acceptable criteria for the current on-site adult and adolescent trespassers or recreational receptors and on-site worker upon exposure to surface soil via accidental ingestion, dermal contact, and inhalation of fugitive dusts, and surface water and sediment (streams adjacent to Site 11 only) via accidental ingestion and dermal contact. It is unlikely that adverse health effects would occur for these receptors upon exposure to Site 11 media.

Chemicals that have been identified on this site are listed below in **Table 4.1**. However, based on the information provided in the RI, the risk for exposure via inhalation or dermal contact is very limited and is expected to be sufficiently controlled by general dust suppression.

Table 4.1 Summary of Site Contaminants

CHEMICAL	Maximum Soil Concentration Mg/kg	EXPOSURE ROUTES	Exposure Limit	HEALTH HAZARDS/ INCOMPATIBLES
Aluminum	13,900 Milligrams per Kilogram (mg/kg)	inhalation, skin and/or eye contact	10 milligrams per cubic meter (mg/m ³)	<ul style="list-style-type: none"> • Irritation eyes, skin, respiratory system • Strong oxidizers & acids, halogenated hydrocarbons [Note: Corrodes in contact with acids & other metals. Ignition may occur if powders are mixed with halogens, carbon disulfide, or methyl chloride.]
Antimony	0.83	inhalation, ingestion, skin and/or eye contact	0.5 mg/m ³	<ul style="list-style-type: none"> • Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly • Strong oxidizers, acids, halogenated acids

CHEMICAL	Maximum Soil Concentration Mg/kg	EXPOSURE ROUTES	Exposure Limit	HEALTH HAZARDS/ INCOMPATIBLES
				[Note: Stibine is formed when antimony is exposed to nascent (freshly formed) hydrogen.]
Arsenic	14.7	inhalation, skin absorption, skin and/or eye contact ingestion	0.010 mg/m ³	<ul style="list-style-type: none"> Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, [potential occupational carcinogen] Strong oxidizers, bromine azide [Note: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.]
Chromium	4.2	inhalation, ingestion, skin and/or eye contact	0.5 mg/m ³	<ul style="list-style-type: none"> Irritation eyes, skin; lung fibrosis (histologic) Strong oxidizers (such as hydrogen peroxide), alkalis
Copper	3.16	Inhalation, ingestion, skin and/or eye contact	1 mg/m ³	<ul style="list-style-type: none"> Irritation eyes, respiratory system, cough, dyspnea (breathing difficulty), Wheezing Oxidizers, alkalis, sodium azide, acetylene
Iron	37,000	inhalation	5 mg/m ³	<ul style="list-style-type: none"> Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis) Calcium hypochlorite
Lead	37.5	inhalation, ingestion, skin and/or eye contact	0.050 mg/m ³	<ul style="list-style-type: none"> Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension Strong oxidizers, hydrogen peroxide, acids
Manganese	71.7	inhalation, ingestion	0.20 mg/m ³	<ul style="list-style-type: none"> Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage Oxidizers [Note: Will react with water or steam to produce hydrogen.]
Mercury	0.19	inhalation, skin absorption, ingestion, skin and/or eye contact	0.025 mg/m ³	<ul style="list-style-type: none"> Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

CHEMICAL	Maximum Soil Concentration Mg/kg	EXPOSURE ROUTES	Exposure Limit	HEALTH HAZARDS/ INCOMPATIBLES
Selenium	2.1	inhalation, ingestion, skin and/or eye contact	0.2 mg/m ³	<ul style="list-style-type: none"> Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage Acids, strong oxidizers, chromium trioxide, potassium bromate, cadmium
Zinc	155.0	inhalation	5 mg/m ³	<ul style="list-style-type: none"> Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function Chlorinated rubber (at 419°F), water [Note: Slowly decomposed by water.]
Oil	Not provided	Skin contact	5.0 mg/m ³ (mineral oil mist)	<ul style="list-style-type: none"> Skin and eye irritation. At elevated temperatures, product mist or vapors can cause irritation of mucous membranes. Strong oxidizers
Coal Tar Pitches	0.290	inhalation, skin and/or eye contact	0.2 mg/m ³	<ul style="list-style-type: none"> Dermatitis, bronchitis, [potential occupational carcinogen] Strong oxidizers
Gasoline	Not provided	inhalation, skin absorption, ingestion, skin and/or eye contact	300 ppm	<ul style="list-style-type: none"> Irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen] Strong oxidizers such as peroxides, nitric acid & perchlorates
Dieldrin	0.0033	inhalation, skin absorption, ingestion, skin and/or eye contact	0.25 mg/m ³	<ul style="list-style-type: none"> Headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; [potential occupational carcinogen]; in animals: liver, kidney damage Strong oxidizers, active metals such as sodium, strong acids, phenols
Aroclor 1254	2.50	inhalation, skin absorption, ingestion, skin and/or eye contact	0.5 mg/m ³	<ul style="list-style-type: none"> Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen] Strong oxidizers

CHEMICAL	Maximum Soil Concentration Mg/kg	EXPOSURE ROUTES	Exposure Limit	HEALTH HAZARDS/ INCOMPATIBLES
4,4-DDD 4,4-DDE	0.018	inhalation, skin absorption, ingestion, skin and/or eye contact (as DDT)	1 mg/m ³ (as DDT)	<ul style="list-style-type: none"> • Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen] • Strong oxidizers, alkalis

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

- Loss of appetite,
- Weakness in wrists or ankles,
- Dizziness or stupor,
- Nausea, headaches, or cramps,
- Irritation of the eyes, nose, or throat,
- Chest pains and coughing,
- Rashes or burns.

4.2 HAZARD COMMUNICATION

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are transmitted (communicated) according to 29 CFR 1910.1200 to all personnel and subcontractors. Hazard communication will include:

4.2.1 Container Labeling

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

4.2.2 Material Safety Data Sheets

There will be a Material Safety Data Sheet (MSDS) located on site for all site contaminants and each hazardous chemical known to be used on site. MSDSs are located in **Appendix A** of the SSHSP.

4.2.3 Employee Information and Training

Training employees on chemical hazards is accomplished through an ongoing corporate training program. All site employees shall maintain their Hazardous Waste Operations and Emergency Response (HAZWOPER) training, in accordance with 29 CFR 1910.120. Additionally, chemical hazards are communicated to employees through daily safety meetings held at Shaw field projects and by an initial site orientation program.

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

- An in-depth review of the soil and surface contaminants of concern identified and listed in **Section 4.1**.
- OSHA regulated 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 MSDS's for hazardous substances found on Shaw sites.
- Emergency spill procedures.
- Proper storage and labeling.

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

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

4.3 PHYSICAL HAZARDS

To minimize physical hazards, Shaw has developed standard safety protocols that will be followed at all times. AHA located in **Appendix C**, have been developed for each principle activity and identify all major hazards to which employees may be exposed.

The SS/SSO will observe the general work practices of each crewmember and equipment operator, and enforce safe procedures. The crew leaders and SS/SSO will inspect the work areas. All hazards will be corrected in a timely manner. A variety of physical hazards may be encountered during work activities at this site. 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. Failure to follow safety protocols will result in removal of an employee from the site and appropriate disciplinary actions.

This SSHSP does not address Munitions and Explosives of Concern (MEC). In the event MEC are encountered, work will cease until the appropriate UXO Safety plans can be implemented.

4.4 ENVIRONMENTAL HAZARDS

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

4.4.1 Exposure to Cold

With outdoor work in the winter months, the potential exists for hypothermia and frostbite. Several forms of cold stress as well as preventative measures are described in this section of the SSHP.

4.4.1.1 *Cold Stress Conditions and Symptoms*

Typical cold stress conditions are included in the tables (**Table 4.4.A thru 4.4.D**) below, including symptoms and first aid precautions. If cold stress conditions develop, professional medical attention will be sought.

Table 4.4.A Cold Weather Injuries

COLD WEATHER INJURIES		
CAUSE	SYMPTOMS	FIRST AID
FROSTBITE		
Freezing of tissue, normally due to exposure below 32°F	Numbness in affected area. Tingling, blistered, swollen or tender areas. Pale, yellowish waxy-looking skin.	Warm affected area with direct body heat. Consult with medical personnel ASAP. Do not thaw frozen area if treatment will be delayed. Do not massage or rub affected area. Do not wet area or rub with snow or ice.
CHILBLAIN		
Repeated exposure of bare skin for prolonged periods to temperatures 20° to 60°F (for those not acclimated to cold weather).	Swollen, red skin. Tender, hot skin, usually accompanied by itching.	Warm affected area with direct body heat. Do not massage or rub. Do not wet area or rub with snow or ice. Do not expose affected area to open fire, stove or any other intense heat source.
IMMERSION FOOT (TRENCH FOOT)		
Prolonged exposure of the feet to wet conditions at temperatures between 32° to 50°F. Inactivity and damp socks (or tightly laced boots that impair circulation) speed onset and severity.	Cold numb feet may progress to hot with shooting pains. Swelling redness and bleeding.	Re-warm feet by exposing them to warm air. Evacuate victim to a medical facility. Do not massage, rub, moisten or expose affected area to extreme heat source.
DEHYDRATION		
Depletion of body fluids.	Dizziness. Weakness.	Replace lost water. Water should be sipped not gulped. Get medical treatment.
HYPOTHERMIA		
Prolonged cold exposure and body heat loss. May occur at well above freezing, especially when a person is immersed in water.	Lack of shivering. Drowsiness, mental slowness, lack of coordination. Can progress to unconsciousness, irregular heartbeat and death.	Strip off clothing and wrap victim in blankets or a sleeping bag. Get victim to a heated location and medical treatment as soon as possible.

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.

4.4.1.2 Monitoring and Preventative Actions

Typical cold stress monitoring procedures are included in the tables below, including temperatures to initiate monitoring, protective clothing uses and administrative practices to prevent or reduce the potential for cold stress related injury/illness. For weather conditions below – 43 degrees Celsius (°C) or -45 degrees Fahrenheit (°F) with no wind and/or similar conditions (see **Table 4.4.E**) all work will cease.

Table 4.4.B Cold Stress Prevention*

	TEMPERATURE	PREVENTATIVE ACTION
1	<61°F	Use thermometer to measure ambient temperature.
2	<40°F	Cold weather protective clothing available; check core body temperature at breaks using oral or ear canal thermometer. Maintain core body temperature above 96.8°F to avoid hypothermia.
3	<30°F	Record ambient temperature and wind speed every 4 hours; compare to wind chill chart when below 19.4°F.
4	<19°F	Provide and use heated warming shelters for work breaks and when cold stress symptoms appear.
5	<10°F	Constant observation of workers, i.e. "buddy system"; rest in heated shelters (see work-rest schedule); dry clothing available for changeout; acclimate new workers.
6	<0°F/ >5 mph winds	Obtain medical certification for workers subject to hypothermia risk.

* Based on "1998 ACGIH Threshold Limit Values... for Physical Agents."

Note: refer to wind-chill and work-warm-up charts attached.

Table 4.4.C Cold Weather Clothing

COLD WEATHER CLOTHING REQUIREMENTS	
1	If wind chill is a factor at a work location, the cooling effect of the wind shall be reduced by shielding the work area or providing employees an outer windbreak layer garment.
2	Extremities, ears, toes, and nose shall be protected from extreme cold by protective clothing and employees performing light work whose clothing may become wet shall wear an outer layer of clothing which is impermeable to water..
3	Employees performing moderate to heavy work whose clothing may become wet shall wear an outer layer of clothing which is impermeable to water.
4	Outer garments must provide for ventilation to prevent wetting of inner clothing by sweat, or if not possible, a heated shelter for warming/drying clothing, or a change of clothing, shall be provided prior to returning to work in a cold environment.

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.

Employees *will be instructed to use 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 necessitates immediate return to the shelter.

Table 4.4.D Cooling Power of Wind on Exposed Flesh Expressed

Estimated Wind Speed (in MPH)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind Speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security			INCREASING DANGER Danger of freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.				
Trenchfoot and immersion foot may occur at any point on this chart.												

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA. (Shaded area) Equivalent chill temperature requiring dry clothing to maintain core body temperature above 36 °C (98.6 °F) per cold stress TLV.

Table 4.4.E TLVs Work/Warm-Up Schedule

Air Temperature -- Sunny Sky		No Noticeable Wind		5 mph wind		10 mph wind		15 mph wind		20 mph wind	
C (appx.)	F (appx.)	Max. Work Period	No. of Breaks								
-26 to -28	-15 to -19	Normal	1	Normal	1	75 min	2	55 min	3	40 min	4
-29 to -31	-20 to -24	Normal	1	75 min	2	55 min	3	40 min	4	30 min	5
-32 to -34	-25 to -29	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35 to -37	-30 to -34	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38 to -39	-35 to -39	40 min	4	30 min	5	Non-emergency work should cease					
-40 to -42	-40 to -44	30 min	5	Non-emergency work should cease							
≤ -43	≤ -45	Non-emergency work should cease									

*Adapted from Occupational Health and Safety Division, Saskatchewan Department of Labor

4.4.2 Heat Stress

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

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

Heat stress prevention is outlined in Shaw Health and Safety procedure HS400, Working in Hot Environments. This information will be reviewed during safety meetings. Workers are encouraged to increase consumption of water and electrolyte-containing beverages; e.g., Gatorade. Heat stress can be prevented by assuring an adequate work/rest schedule. Guidelines are presented below and should be used in conjunction with HS400.

In addition, workers are encouraged to take rests and report symptoms whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased based on worker recommendation to the SS/SSO. Heat stress can be prevented by assuring an adequate work/rest schedule and adequate fluid consumption. A guide for work/rest schedules for various protection levels are given below in **Table 4.4.F**. The number of hours before a work/rest period is based on experience with similar work. The time periods should be considered maximum. It must also be remembered that individual physical variability's and differences in physical work activities may require revisions to site plans. This table should be used as a guide. Professional judgment of the SS/SSO is necessary to assure a fully protective plan to prevent heat stress disorders.

Table 4.4.F Guidelines for Work-Rest Periods

Temperature	Protection Level			
	Level D	Level C	Level B	Level A
90+ F*	2.0	1.5	1.0	0.5
87.5 F	2.5	2.0	1.5	1.0
82.5 F	3.0	2.5	2.0	1.5
77.5 F	3.5	3.0	2.5	1.5
72.5	4.0	3.5	2.5	1.5

**Work above 100° F will be reviewed with the Project HSC to determine specific requirements.*

Alternately the work/rest schedule can be calculated based on heat stress monitoring results. Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate exceeds 75% of their calculated maximum heart rate (MHR = 200 – age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75% of their calculated maximum heart rate.

Body temperature, measured orally or through the ear canal, may also be monitored to assess heat stress. Workers should not be permitted to continue work when their body temperature exceeds 100.4 oF or 38 oC. Monitoring should be conducted at the beginning of each break period as noted above.

Monitoring for heat stress will begin when the ambient temperature reaches or exceeds 70 oF when wearing chemical protective clothing (Level C, B, A), or 80 oF for site activities performed with no chemical protective clothing (Level D). Monitoring will include pulse rate, weight loss, oral/ or ear canal temperature, signs and symptoms of heat stress and fluid intake.

4.4.3 Noise

Hearing protection is required for workers operating or working near heavy equipment, where the noise level is greater than 85 A-weighted decibel (dBA) (Time Weighted Average [TWA]) as well as personnel working around heavy equipment. The HSC will determine the need and appropriate testing procedures (i.e., sound level meter and/or dosimeter) for noise measurement in accordance with Shaw Health and Safety procedure HS402 Hearing Conservation Program.

Noise monitoring should be conducted during the beginning of each activity, as well as, any time modifications lead to increased noise levels (e.g., adding additional equipment). A sound level meter will be used to measure noise levels at selected locations in the work area and on the site perimeter when treatment equipment is operating normally. When used, noise-monitoring equipment must be calibrated before and after each shift.

If continuous noise levels are found to exceed 85 dBA at any location within the work area, warning signs will be posted. Workers and visitors will be notified that hearing protection is required. Appropriate hearing protection (e.g., ear plugs) will be worn whenever personnel

are working or visitors are present in that location. A supply of earplugs will be maintained on site.

Action levels in **Table 4.4.G** will trigger the use of appropriate hearing protection (plugs or muffs). Hearing protection must be able to attenuate noise below 90 dBA (8-hour TWA). Each hearing protection or device has a Noise Reduction Rating (NRR) assigned by the EPA. The calculation for a hearing protection device’s effectiveness is: noise reading dBA – (NRR – 7dB) < 90 dBA.

Table 4.4.G Action Levels and Hearing Protection

Instrument	Measurement	Action
Type I or Type II Sound Level Meter or dosimeter	>80 dBA → 85 dBA	Hearing protection recommended. Limit work duration to 8-hour shifts.
	>85 dBA → 90 dBA	Hearing protection required. Limit work duration to 8-hour shifts.
	>90 dBA → 115 dBA	Hearing protection required. Investigate use of engineering controls. Limit work duration to 8 hour shifts.
	>115 dBA	Stop work. Consult Project HSM

4.4.4 Biological Hazards

4.4.4.1 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.

A barrier cream (e.g., IvyBlock®) should be applied to the exposed skin before entering and working in areas with possible poisonous plants.

4.4.4.2 *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 4.4**).

Figure 4.4

Poisonous Plants

	<p>COMMON POISON IVY (RHUS RADICANS)</p> <ul style="list-style-type: none">• Grows as a small plant, a vine, and a shrub.• Grows everywhere in the United States except California and parts of adjacent states. Eastern oak leaf poison ivy is one of its varieties.• Leaves always consist of three glossy leaflets.• Also known as three-leaf ivy, poison creeper, climbing sumac, poison oak, markweed, picry, and mercury.
<p>WESTERN POISON OAK (RHUS DIVERSILOBA)</p> <ul style="list-style-type: none">• Grows in shrub and sometimes vine form.• Grows in California and parts of adjacent states.• Sometimes called poison ivy, or yera.• Leaves always consist of three leaflets.	
	<p>POISON SUMAC (RHUS VERNIX)</p> <ul style="list-style-type: none">• Grows as a woody shrub or small tree from 5 to 25 feet tall.• Grows in most of eastern third of United States.• Also known as swamp sumac, poison elder, poison ash, poison dogwood, and thunderwood.

First Aid

- Remove contaminated clothing; wash all exposed areas thoroughly with soap and water, followed by rubbing alcohol. A one percent hydrocortisone cream (over-the-counter) will aid in healing and reducing itch.
- Apply calamine or other soothing lotion if rash is mild.
- Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity.

4.4.4.3 Contaminated Clothing

The irritating substances emitted by poison ivy group plants will remain on clothing for prolonged periods of time - up to weeks or months, if not washed thoroughly. It may be necessary to wash contaminated clothing separately and more than once before reusing.

4.4.4.4 Ticks.

Heavily vegetated areas of a site may have ticks. It is highly recommended that all personnel walking through such areas wear a minimum of a Tyvek® and latex boot covers. The ticks will stand out against the light colors. A tick or insect repellent containing N, N-diethyl-m-toluamine (DEET) is also 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.

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.

First Aid

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

4.4.4.5 *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.

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 November 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. It's 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 Lyme 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 Lyme disease, report it to your Superintendent and seek medical attention.

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 heartbeat. 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.

4.4.4.6 *West Nile Virus and West Nile Encephalitis*

West Nile Virus/West Nile Encephalitis is rapidly becoming a health concern in the United States. West Nile Virus was first identified in the U.S. in the New York area in 1999 and is closely related to the St. Louis Encephalitis Virus, which is routinely found in the United States.

"Encephalitis" means an inflammation of the brain and it can be caused by viral and bacterial infections. West Nile Encephalitis can be a serious or even fatal illness although this is rare in humans. This illness develops in approximately one of every 150 infections and is generally confined to older and physically compromised individuals.

West Nile Encephalitis is a viral infection of the brain transmitted through the bite of a mosquito, which has previously fed on birds and/or horses that were infected with West Nile Virus. Dead birds in an area may mean that West Nile Virus is circulating between the birds and the mosquitoes in that area. West Nile Virus is not transmitted from one person to another. Human illness from West Nile Virus is rare, even in areas where the virus has been reported.

Symptoms of Exposure Most people who become infected with West Nile Virus will have either no symptoms or only mild ones. Symptoms of West Nile Encephalitis include high fever, headache, confusion, muscle aches and weakness, seizures, or paralysis. At its most serious, the infection can result in coma, permanent neurological damage, and death. Symptoms usually occur five to fifteen days following the bite of an infected mosquito. Because West Nile Encephalitis is a viral infection, antibiotics are not effective and there is no specific treatment available other than general support therapy.

Protective Measures at Projects There is no vaccine to protect humans against West Nile Virus. Individuals at project sites can reduce their risk from being infected with West Nile Virus by taking the following actions to protect against mosquito bites:

- Review the hazards of West Nile Virus periodically in morning safety meetings.
- Increase protective measures when working at dawn, dusk, and in the early evening.
- Reduce the area of exposed skin when working outdoors. Long-sleeved shirts with sleeves rolled down are recommended. Understand that mosquitoes may bite through thin clothing, so personnel should evaluate the actual Level D Personal Protective Equipment (PPE), e.g., heavy long sleeve work shirts and heavy jeans may be indicated. Also, the risk or threat of mosquito bites is reduced for those activities that require the use of disposable coveralls.
- For activities where only Level D PPE is specified, consider using disposable coveralls when working in wooded, highly vegetated, or swampy areas.
- Use an insect repellent containing approximately 25% DEET. DEET in concentrations greater than 25% provides no additional protection but repel insects longer. However, at some point there is no direct correlation between concentration and repellency. For example, 50% DEET provides about four hours of protection against mosquitoes, but increasing the concentration to 100% provides only one additional hour of protection. Use the repellent according to the manufacturer's directions provided on the container. Use just enough repellent to cover exposed skin and clothing. Do not treat unexposed skin. Frequent re-application is unnecessary for effectiveness. Avoid prolonged and excessive use of DEET.
- After returning from outdoor field activities, wash treated skin with soap and water.
 - Personnel should report flu-like symptoms to the SSO.

DEET is safe for pregnant and lactating women and is generally safe for children. You should avoid applying it to open wounds and irritated skin as it may further irritate the skin or cause discomfort.

Sweating, perspiration and getting wet may wash away the repellent and may require that DEET containing repellent be re-applied.

To remove the breeding places on a project, the following precautions will be followed as practical:

- Cut tall grass and weeds,
- Drain accumulated water in such items as drums, buckets, pools and plastic containers,
- Repair holes in door and window screens,
- Eliminate stagnate water puddles as practical,
- Limit outdoor activities at dawn, dusk and early evening, when mosquitoes are most active, as practical.

4.4.4.7 *Lightning*

The procedures provided below will be used to protect site personnel from lightning related injuries.

Training. A tailgate safety meeting will be conducted to increase awareness to the hazards and prevention of lightning related incidents.

Detection of Lightning. The SS/SSO will be proactive in monitoring conditions that may produce thunderstorms and lightning. A daily and weekly weather forecast will be tracked and communicated to site personnel. When signs of impending storms, i.e., increasing wind, darkening skies, or lightning appear, local weather monitoring will be increased. The National Weather Service (www.nws.noaa.gov/) should be consulted frequently. Personnel will be notified when thunderstorms may impact the site.

The "flash/bang" (f/b) technique of measuring the distance to lightning will be reviewed with all personnel. The f/b technique is defined as: for each five seconds from the time of observing the lightning flash to hearing the associated thunder, the lightning is one mile away.

Suspension/Resumption of Activities. All outside activities will be suspended when a lightning flash is immediately in the area or a f/b of 20 seconds (4 miles away) is noted. Personnel may continue indoor work activities. Outdoor activities will resume when 30 minutes has passed since the last observable f/b is 20 seconds or greater.

Lightning Protection. When notification is given, all outside work activities will stop and personnel will gather in the support zone for a head count and further instructions. Indoor

work will continue, except for the use of electrical equipment, telephones and computers. When a safe location is not present and personnel are caught by a sudden lightning event, employees should seek the lowest possible area, away from large objects which might attract lightning or fall over, e.g., trees, utility poles. The employee should assume a crouching position with their head lowered and hands over their ears. **AVOID: WATER, HIGH GROUNDS, HEAVY EQUIPMENT AND TALL, ISOLATED OBJECTS.**

First Aid. An employee that is struck by lightning needs immediate assistance (call 911). The body will not carry an electrical charge, but receives an electrical shock and may be burned. Personnel certified in first-aid/ cardiopulmonary resuscitation (CPR) should inspect for shock and burns around fingers, toes, buckles and jewelry. Stay with the injured employee until medical help arrives.

4.5 VEHICLE AND HEAVY EQUIPMENT SAFETY MANAGEMENT

4.5.1 Vehicle Safety

Motor vehicle incidents are the number one cause of occupational fatalities, accounting for one in three deaths. Fifty percent or more of vehicle safety incidents occur while backing up. Shaw employees involved in the operation and use of Shaw and/or leased or rented vehicles will comply with the Shaw Health and Safety procedures HS800 Motor Vehicle Operation: General Requirements and HS810 Commercial Vehicle Operation and Maintenance. Shaw requires employees to use seat belts at all times when traveling in Shaw owned or leased/rented vehicles. The SS/SSO will develop a parking area plan, including backing vehicles into parking spaces, using spotters for backing vehicles and policy mandated vehicle inspections.

Shaw employees are expected to incorporate safe actions and preparations to avoid vehicle accidents and personal injury during work and off-hours. Breaks should be planned into lengthy job mobilizations and demobilizations, including rotation of drivers at regular intervals. If parking areas are busy or crowded and more than one worker is traveling in the same vehicle, one worker should remain outside the vehicle as it leaves the parking space to assist the driver with traffic observation. Vehicles traveling before dawn and at dusk in rural or wooded areas should be prepared to brake for wildlife, e.g. Deer crossing roadways.

Shaw employees arriving at work areas should park vehicles away from delivery, heavy equipment and vehicle loading/unloading locations to prevent parked vehicles from damage

by various deliveries. Heavy equipment operators should inspect areas and request vehicles to be moved or spotters used if necessary, to maneuver equipment in tight areas. Employees who observe near misses or potential risks to parked or moving vehicles must report these to the SS/SSO immediately.

Shaw employees are expected to use the vehicle inspection form and check/test the safety systems on the vehicle on a daily basis. Check the following: brakes, mirrors, seat belts, tires, leakage from the undercarriage, lights and turn signals. Vehicles with safety deficiencies must be reported immediately and not driven until properly repaired. Vehicles running errands from different project sites should have telephone numbers of the job site in the vehicle in case calls for assistance are required.

Because of the different ways alcohol can affect behavior, even in very small amounts, the best and safest course is not to drink before driving. At Shaw, a driver with Blood Alcohol Concentration (BAC) over 0.04 % is considered to be under the influence and subject to disciplinary action. Personnel involved in motor vehicle incidents are subject to drug and alcohol testing.

Weather conditions can have a profound effect on driving. On slippery roads, drive more slowly. Stop and turn with care. Keep several car lengths from other vehicles. At speeds in excess of 35 Miles per Hour (mph), the chances of hydroplaning increase with speed. In general, keep back one car length for every 10 mph to prevent striking the car ahead.

Vehicles will be operated in accordance with the requirements listed below:

- Seatbelt use is mandatory for all passengers,
- Personnel may not ride in the back of cargo vehicles,
- The driver must make a 360 degree walk around the assigned vehicle prior to vehicle movement,
- A ground guide is used to back up any vehicle,
- Vehicle speed is limited to the posted speed limits for developed roadways, 25 mph maximum on dirt roads and 10 mph maximum off-road (based on conditions),
- Vehicle driven in four wheel low and low gear when on dirt roads or off road driving where steep grades dictate,

- All operators must possess a valid drivers license,
- Fuel or gasoline are not to be transported inside the passenger compartment,
- No vehicle is left running when unattended,
- Parking brakes are used when vehicles are parked.

In the event of a vehicle incident, notify your PM *immediately* and complete all required reports.

4.5.2 Heavy Equipment Safety

Forklifts, excavators, loaders other material handling equipment present various physical hazards on remediation sites. The following critical safety practices shall be followed to prevent safety incidents during heavy equipment operation.

- All equipment will be inspected prior to each use.
- All operators will have training or equivalent experience to be permitted to operate heavy equipment.
- Spotters will be used to back-up equipment and direct traffic in all “blind” areas.
- Standard hand signals will be used to communicate between operators and ground crew.
- All heavy equipment will have operable back-up alarms.
- Heavy equipment will be parked in areas where operators will not be exposed to strains or slip/trip/fall hazards during mounting and dismounting of equipment.
- All heavy equipment will be equipped with operable seat belts; belts will be used by all operators.
- Written lifting plans will be developed and reviewed for all critical lifts.

4.6 MANUAL MATERIAL LIFTING

Many different types of objects may be handled manually during site operations. Care should be taken when lifting and handling heavy or bulky items because they are the cause of many back injuries. The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs more than 60 pounds. Multiple employees or the use of mechanical lifting devices are required for objects over the 60-pound limit.
- The anticipated path to be taken by the lifter should be inspected for the presence of slip, trip, and fall hazards.
- The feet shall be placed far enough apart for good balance and stability (typically shoulder width). THE FOOTING SHALL BE SOLID.
- The worker shall get as close to the load as possible. The legs shall be bent at the knees.
- The back shall be kept as straight as possible and abdominal muscles should be tightened.
- To lift the object, the legs are straightened from their bending position.
- A worker shall never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

When two or more workers are required to handle the same object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. In handling bulky or heavy items, the following guidelines shall be followed to avoid injury to the hands and fingers:

- A firm grip on the object is essential; leather gloves shall be used if necessary.
- The hands and object shall be free of oil, grease, and water that might prevent a firm grip, and the fingers shall be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.
- The item shall be inspected for metal slivers, jagged edges, burrs, and rough or slippery surfaces prior to being lifted.

4.7 MUNITIONS AND EXPLOSIVES OF CONCERN

Munitions and Explosives of Concern (MEC) are not anticipated to be encountered during this project. Past activities at this site indicate MEC have been removed. However, as a precaution, employees will be briefed on types of MEC that were identified and removed during past operations, for awareness purposes only. In the unlikely event, a suspect item is encountered, work will cease and the Navy Remedial Project Manager (RPM) will be contacted for further action. All operations in the vicinity of the item will cease until the

item is identified as non-MEC by base Explosive Ordnance Disposal (EOD). In the event the item is determined by base EOD as MEC, work will cease until the item is properly handled by base EOD, and it is determined safe to continue operations.

4.8 ACTIVITY HAZARD ANALYSES

Appendix C contains AHA for primary site tasks. They contain detailed information on physical and chemical hazards, and provide control measures for these hazards. The AHA's will be field checked by the SS/SSO on an ongoing basis and revised as necessary. All revisions will be communicated to the work crew. In addition to the AHAs, a Job Safety Analysis (JSA) must be completed daily in accordance with Shaw Health and Safety Procedure HS045. (See **Appendix B**)

5.0 WORK AND SUPPORT AREAS

No chemical contamination is currently identified on this project. However, due to the nature of the project, if suspect items are encountered, the site will be treated as if it were a hazardous site and appropriate zones will be set as specified below.

5.1 SUPPORT ZONE

The uncontaminated Support Zone (SZ), or clean zone, will be located upwind, in an area outside the Exclusion Zone (EZ) and Contamination Reduction Zone (CRZ) and within the geographic perimeters of the site. The area is used for material staging, vehicle parking, office facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the EZ. All personnel arriving in the SZ will, upon arrival, report to the HSC and sign the site visitor log.

5.2 CONTAMINATION REDUCTION ZONE

Personnel and equipment decontamination will be performed in the CRZ that is adjacent to the EZ. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination and for the purpose of accountability. Personal protective outer garments and respiratory protection will be removed in the CRZ and properly labeled. All water generated from equipment and personal decontamination will be contained on site and disposed of in an appropriate manner.

5.3 EXCLUSION ZONE

The EZ will be the area around the excavation activities. These areas have the highest potential for exposure to contamination by contact, ingestion, or inhalation. All employees will use proper PPE when working in these areas. The location of the EZ will be identified by fencing or other appropriate means primarily around the excavation areas and the stockpiles. A daily entry log records the time of entry and exit from the EZ for each person.

A log of all personnel visiting, entering or working on the site shall be maintained by the SS/SSO. Visitors will attend a site orientation given by the SS/SSO and sign the SSHSP.

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

- Eating, drinking, chewing gum or tobacco, smoking is prohibited in the EZ/CRZ's.
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco and smoking.
- A buddy system will be used. Hand signals will be established to maintain communication.
- During site operations, each worker will consider himself as a safety backup to his partner. Off-site personnel provide emergency assistance.
- Visual contact will be maintained between buddies on site when performing hazardous duties.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SS/SSO, 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.

6.0 PROTECTIVE EQUIPMENT

This section specifies the levels of PPE, which is required for each principle activity performed at this site. All site personnel must be trained in the use of all PPE utilized. The PPE procedures outlined in Shaw Health and Safety procedures (**Appendix B**) HS600 Personal Protective Equipment and HS601 Respiratory Protection Program will be applied to project activities.

6.1 ANTICIPATED PROTECTION LEVELS

The following protection levels have been established for the site work activities. **Table 6.1**

Table 6.1 Anticipated Protection Levels

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
Clearing and Grubbing	Modified Level 'D'	Not Anticipated	Tyvek® coverall and inner Nitrile surgical type gloves to protect against poisonous insect and poisonous plant contact, tape ankles and wrists; Leather work gloves	None	Hard-hat, steel-toe work boots, safety glasses and hearing protection >85 DBA. Face shield, hearing protection, and chaps when operating chain saws
Excavation	Level D	Modified 'D'*	Leather Work Gloves; Upgrade: Tyvek® coverall, inner latex sample gloves, outer nitrile gloves, latex boot covers in the event contamination or poisonous insect/plant hazards are encountered	None	Hard-hat, steel-toe work boots and hearing protection >85 dBA.
Pre and Post Removal Site Survey	Level D	Not Anticipated	Tyvek® coverall and gloves to protect against poisonous insect and poisonous plant contact, tape	None	Hard-hat, steel-toe work boots, safety glasses and hearing protection >85 dBA.

Task	Initial PPE Level	Upgrade PPE Level	Skin Protection	Respiratory Protection	Other PPE
			ankles and wrists;		
Site Restoration	Level D	Not Anticipated	None	None	Hard-hat, steel-toe boots, safety glasses and hearing protection >85dBA.

* If direct contact with soil/materials is required.

6.2 PROTECTION LEVELS DESCRIPTIONS

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

6.2.1 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,
- Leather work gloves,
- Cut resistant gloves when handling sharp objects,
- Reflective vests for ground personnel working around heavy equipment or roadways,
- Hearing protection in areas >85 dBA.

6.2.2 Modified Level D

Modified Level D consists of the following:

- Safety glasses with side shields,
- Hard hat,
- Steel-toed work boots,
- Poly-coated Tyvek® coverall or PVC rain suit (when handling wet materials) ,
- Kleenguard or Tyvek® coverall for dry material,
- Nitrile surgical type inner gloves,

- Leather outer work gloves,
- Hearing protection in areas >85 dBA,
- Full-face shield when splash hazards are present,
- Metatarsal and shin guard, full face shield and goggles for pressure sprayer operations.

6.3 SITE- SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

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

The SS/SSO will be responsible for monitoring all aspects of the PPE program. This includes donning and doffing, temperature related stress monitoring, inspection, and decontamination. PPE selection is identified in **Table 6.1** for each specified task. The HSC, in consultation with the HSC, and the HSM will direct changes in PPE based on changing conditions. The SSHSP will serve as written certification that the workplace was evaluated concerning PPE requirements.

7.0 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.

7.1 PERSONNEL DECONTAMINATION

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

7.1.1 Modified Level D Decontamination

1. Go to end of EZ,
2. Remove and discard latex booties,
3. Remove outer gloves and discard,
4. Remove protective suit,
5. Remove inner sample gloves and discard,
6. Wash face and hands.

7.1.2 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 based on the degree of injury.

7.1.3 Personal Hygiene

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

7.2 EQUIPMENT DECONTAMINATION

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

7.3 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.

7.4 SUSPECTED CONTAMINATION

Any employee suspected of sustaining skin contact with chemical materials will remove clothing, shower, don clean clothing, and immediately be taken to the first-aid station. Medical attention will be provided based on the degree of injury.

8.0 AIR MONITORING

As presented in the CAX Site 11 Final Remedial Investigation, completed by Baker Environmental, April 2007:

- Site 11 was reportedly used between 1940 and 1978 to store containers of waste-oil and tar as well as asphalt and other scrap materials on the ground. Oil, asphalt, gasoline, and other, unspecified materials have been identified in the disposal area.
- There were no carcinogenic risks or adverse health hazards calculated that exceeded USEPA's acceptable criteria for the current on-site adult and adolescent trespassers or recreational receptors and on-site worker upon exposure to surface soil via accidental ingestion, dermal contact, and inhalation of fugitive dusts, and surface water and sediment (streams adjacent to Site 11 only) via accidental ingestion and dermal contact. It is unlikely that adverse health effects would occur for these receptors upon exposure to Site 11 media.

Therefore, air monitoring will be conducted in order to monitor work areas for potential volatile organic vapors, explosive gases and to monitor fugitive emissions from nuisance particulates.

8.1 HAZARD ASSESSMENT OF POTENTIAL EXPOSURE TO SITE CONTAMINANTS

A fugitive dust action level of 2.5 mg/m³ based on respirable nuisance particulates should protect workers against unintended exposures to nuisance particulates without consideration of respiratory protection.

In addition, action levels for potential volatile organic vapors and explosive gases that could be encountered are identified in **Table 8.1**.

8.2 WORK AREA AIR MONITORING

Work area air monitoring will be by direct reading methods. Nuisance particulates will be monitored utilizing a DataRam. Due to the potential for volatile organics, a multigas detector and a Photo Ionization Detector (PID), equipped with a 10.6 electronic volt (ev) lamp will be utilized to monitor the excavation area and breathing zones of the employees. Air monitoring results will be used to determine the effectiveness and/or need for PPE or other control methods and to trigger action levels as specified in **Table 8.1**.

Table 8.1 Direct Reading Air Monitoring Requirements

Monitoring Device	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	ACTION
Data Ram	Excavation Area and Breathing Zone of Employees	Continuous	<2.5 mg/m ³ > 2.5 mg/m ³	Level D Stop work and contact HSM for direction.
Multi-gas Detector	Excavation Area and Breathing Zone of Employees	Continuous	>10% LEL <20.8% O ₂	Stop work; Evacuate area; determine source of readings and take corrective actions
PID	Excavation Area and Breathing Zone of Employees	Continuous	<5.0 ppm* >5.0 ppm*	Level D Stop work and contact HSM for direction.

*Sustained levels above background for 5 minutes in the breathing zone.

8.2.1 Integrated Air Monitoring

No integrated air sampling for personnel exposure characterization will be performed.

8.3 INSTRUMENTATION

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

8.3.1 Photo Ionization Detector Photovac 2020 or Equivalent

The PID Photovac 2020 is designed for trace gas analysis in ambient air and is calibrated with certified standards of benzene, vinyl chloride, and isobutylene. Other optional calibrations are available (e.g., ammonia, ethylene oxide, H₂S, etc.).

The SSO will use a PID with a 10.6 eV lamp. This lamp has been determined to be most responsive to the contaminants on site. Optional probes containing lamps of 9.5 and 11.7 eV is interchangeable in use within individual read-out assemblies for different applications.

The SSO will record and log calibration information into an air monitoring notebook. Maintenance of the Photovac 2020 consists of changing pre-filters, cleaning the lamp and ion chamber, and replacement of the lamp or other component parts or subassemblies.

8.3.2 Types and Operational Aspects

MSA Watchman Lower Exposure Level/Oxygen/Hydrogen Sulfide Meter or equivalent

8.3.2.1 *Principle of Operation*

- O₂ detector uses an electrochemical sensor; produces a minute electric current proportional to the oxygen content.
- Combustible gas indicators use a combustion chamber containing a filament that ignites flammable vapors; filament is heated or coated with a catalyst (platinum) to facilitate combustion.
- H₂S monitors are required to measure personnel breathing zones when site personnel are potentially exposed to H₂S during site remedial operations. An action level of 2.5 parts per million (ppm) for 5 minutes requires an upgrade to Level B protection because air-purifying respirators are not appropriate respiratory protection for H₂S exposures.
- Filament is part of a balanced resistor circuit; combustion in the chamber causes the filament temperature to increase; results in increased filament resistance.
- Change in the filament's resistance causes an imbalance in the circuit proportional to the percent of the LEL.
- Concentrations greater than the LEL and lower than the Upper Explosive Limit (UEL) will indicate that a combustible atmosphere is present.
- Concentrations greater than the UEL will read above 100% LEL then return to zero. (NOTE: Some devices have catchment mechanisms which will cause the needle to remain at 100% until the meter is reset.) This type of response indicates the gas mixture is too rich to burn and is not combustible. The danger is that the addition of air to the gas mixture could dilute it and allow the concentration to enter the flammable range (less than the UEL).
- O₂ meter set at the factory to alarm at 19.5% (oxygen deficient atmosphere) combustible gas meter set by the user to alarm at 10% LEL.

8.3.2.2 *Calibration Methods/Frequencies*

Before the calibration of the combustible gas indicator can be checked, the unit must be in operating condition. The combustible gas indicator (LEL) is normally calibrated on pentane as being representative of the flammability characteristics of most commonly encountered combustible gases. The meter scale is calibrated from zero to 100% LEL, which corresponds in actual volume concentrations of 0 to approximately 14% pentane in air. A booklet of response curves is supplied with the Watchman Meter. These curves may be used to interpret meter readings when sampling combustible gases other than pentane.

It is recommended that calibration be checked before and after using each time. For hydrogen sulfide, ensure proper function of the sensor response by checking with a known concentration of H₂S prior to each use. The SS/SSO will record and log such calibration information into an air monitoring notebook.

8.3.2.3 *Preventative Maintenance*

The primary maintenance of the unit is the rechargeable 2.4 volt nickel cadmium battery. Recommended charging time is 16 hours. It may be left on charge for longer periods without damaging the battery. The battery sometimes will not supply full power capacity after repeated partial use between charging. Therefore, it is recommended that the battery be exercised at least once a month by running for eight to 10 hours and recharged. If the instrument has not been used for 30 days, the battery should be charged prior to use.

8.3.2.4 *Principle of Operation*

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

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

8.3.2.5 *Calibration*

The device is calibrated at the factory against an air sampling filter/gravimetric analysis reference method.

8.3.2.6 *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.

8.4 AIR MONITORING LOG

The HSC will ensure that all air-monitoring data is logged into a notebook. Data will include instrument used, wind direction, work process, etc. The Program CIH will periodically review this data.

8.5 CALIBRATION REQUIRMENTS

The personal air sampling pumps will be calibrated daily before and after use and the DataRAM will be zeroed before use. A separate log will be kept by the HSC detailing date, time, span gas, or other standard, and name of person performing the calibration.

8.6 AIR MONITORING RESULTS

Air monitoring results will be available for personnel inspection, and will be discussed during morning safety meetings. Personal air sampling results will be forwarded to the Corporate Health and Safety Manager for Medical Surveillance, to be incorporated into the employee(s)' medical records.

9.0 EMERGENCY RESPONSE

9.1 PRE-EMERGENCY PLANNING

Prior to engaging in remediation activities at the site, Shaw 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	<ul style="list-style-type: none"> • 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.
Natural Disaster	<ul style="list-style-type: none"> • A rainstorm exceeds the flash flood level. • The facility is in a projected tornado path or a tornado has damaged facility property. • Severe wind gusts are forecasted or have occurred and have caused damage to the facility. • Hurricanes
Medical Emergency	<ul style="list-style-type: none"> • 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). • 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 SS to brief the on-site response team on anticipated hazards at the site. The Emergency Coordinator shall also be responsible for anticipating and requesting equipment that will be needed for response activities.
- Emergency response activities will be coordinated with the Local Emergency Management Agency (EMA) in compliance with SARA Title III requirements.

Communications will be established prior to commencement of any activities at the remediation site. Communication will be established so that all responders on site have availability to all pertinent information to allow them to conduct their activities in a safe and healthful manner. The primary communication device will be air horns.

9.2 EMERGENCY RECOGNITION AND PREVENTION

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

Chemical Hazards	<ul style="list-style-type: none"> • Materials at the site • Materials brought to the site
Physical Hazards	<ul style="list-style-type: none"> • Fire/explosion • Slip/trip/fall • Excessive noise
Mechanical Hazards	<ul style="list-style-type: none"> • Pinch points • Vehicle traffic
Environmental Hazards	<ul style="list-style-type: none"> • Electrical Storms • High winds • Heavy Rain/Snow • Temperature Extremes (Heat/Cold Stress) • Poisonous Plants/Animals

Once a hazard has been recognized, the SS/SSO and the HSC 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,
- PPE selection/use,
- Following all Shaw Standard Operating Procedures (SOPs).

Table 9.1 Emergency Telephone Numbers

<u>Local Agencies</u> : On Base Emergencies	
Ambulance	(757) 887-4911
Fire	(757) 887-4911
Police	(757) 887-7103
<u>Hospital:</u>	
Williamsburg Community Hospital 100 Sentara Circle Williamsburg, VA 23188	(757) 984-6000
<u>Health Resources Clinic:</u>	
Sentara Medical Center 747 J. Clyde Morris Blvd. Newport News, Virginia	(757) 599-6117
Virginia Dept. of the Environment Regional Poison Control Center	(804) 367-0080 (800) 282-5846
<u>Federal Agencies</u>	
Agency for Toxic Substances and Disease Registry	(404) 639-0615 (24 hr.)
EPA Region Branch Response Center	(215) 587-8800
National Response Center	(800) 424-8802
U.S. Coast Guard	(804) 484-8192
Public Works – Willie Wells	(757) 847-7952
RPM- Christopher Murray	(757) 444-3811
COR- Zane Perry	(757) 322-4777 (office) (757) 619-4611 (cell)
<u>SHAW E&I Personnel</u>	
Project Manager – Skip Dunham	(757) 640-6921 (office)
Site Manager –Dennis Kelly	(757) 869-7700 (cell)
SSO- Jim Greer	(865) 466-5409 (cell)
Program Health & Safety Manager – Kym Edelman, CSP	(757) 435-5384 (cell)
Program Certified Industrial Hygienist- David Mummert, CIH	(419) 425-6129 (office) (419) 348-1544 (cell)
SHAW E&I Corporation Help Desk (24 hour)	(866) 299-3445
Additional Phone #'s in Section 3 this SSHSP	

9.3 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 SSO or the highest-ranking

employee on site will serve as the Emergency Coordinator until the SS 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.

9.3.1 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. Shaw will follow procedures as directed by the Fire Department, LEPC, State and Federal agencies as required. Shaw 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.

9.3.2 On-Site Emergency Coordinator Duties

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

- Identify the source and character of the incident, type and quantity of any release. Assess possible hazards to human health or the environment that may result directly from the problem or its control.
- Discontinue operations in the vicinity of the incident if necessary to ensure that fires, explosions, or spills do not recur or spread to other parts of the site.
- Notify the Navy. The Navy will contact the local Emergency Response Teams if their help is necessary to control the incident. **Table 9.1** provides telephone numbers for emergency assistance.

- Direct on-site personnel to control the incident until, if necessary, outside help arrives.
- Ensure that the building or area where the incident occurred and the surrounding area are evacuated, and shut off possible ignition sources, if appropriate. The Emergency Response Team is responsible for directing site personnel such that they avoid the area of the incident and leave emergency control procedures unobstructed.
- If fire or explosion is involved, notify facility Fire Department.
- Notify Shaw PM
- Notify Navy
- 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 maybe necessary and, if so, notify the Navy. The Navy will contact the local Police Department and the Office of Emergency Management.

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

- Waste is collected and contained.
- Containers of waste are removed or isolated from the immediate site of the emergency.
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.
- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.
- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

9.3.3 Safe Distances and Places of Refuge

The Emergency Coordinator for all activities will be the SS/SSO. No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies that 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 CRZ. 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 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. Emergency response equipment will be located in the support area and adjacent to high risk areas such as fuel storage locations. Locations will be identified on the site layout map posted upon mobilization.

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 designee, will inform the proper agencies in the event that this is necessary. Telephone numbers are listed in **Table 9.1**.

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,
- Medical emergency,
- Hazardous weather.

In general, evacuation will be made to the main entrance to the Shaw site, 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.

9.3.4 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.

9.3.5 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. The crew Superintendent will have a two-way radio. Only the Emergency Coordinator will initiate total site evacuation, however, if absent, decision to preserve the health and safety of employees will take precedence.

9.3.6 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 SZ will assemble at the entrance to the site for a head count and await further instruction from the Emergency Coordinator.
- ALL persons in the EZ and CRZ 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.
- The Emergency Coordinator, or designee, will make a final tally of persons. No attempt to find persons not accounted for will involve endangering lives of Shaw 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 SS.

- Personnel will be assigned by the Emergency Coordinator to be available to direct and brief emergency responders.
- Re-entry into the site will be made only after the Emergency Coordinator gives clearance. At his direction, a signal or other notification will be given for re-entry into the facility.
- Drills will be held annually, at a minimum, to practice all of these procedures and will be treated with the same seriousness as an actual emergency.

9.4 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 9.1** provide a quick reference guide to follow in the event of a major spill.

9.4.1 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.

9.4.2 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.

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

The Emergency Coordinator will notify the Navy 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,
- Sorbent materials,
- Personal safety equipment,
- Steel drums,
- Miscellaneous hand tools.

As called for in regulations developed under the Comprehensive Environmental Response Compensation Liability Act of 1980 (Superfund), Shaw 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 Toxic Substance Control Act (TCSA). Shaw 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 Resource Conservation Recovery Act (RCRA).

Clean up personnel will take the following measures:

1. Make sure all unnecessary persons are removed from the hazard area.
2. Put on protective clothing and equipment.
3. If a flammable material is involved, remove all ignition sources, and use spark and explosion proof equipment for recovery of material.
4. 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.
5. 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.
6. 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.
7. Spray the spill area with foam, if available, if volatile emissions may occur.
8. Apply appropriate spill control media (e.g., clay, sand, lime, etc.) to absorb discharged liquids.
9. 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.

9.4.3 Emergency Response Equipment

The following equipment will be staged in the SZ 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.

9.4.4 Emergency Spill Response Clean-Up Materials and Equipment

A sufficient supply of appropriate emergency response clean-up and PPE 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 SZ. Small amounts will be placed on pallets and located in the active work areas.

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

9.4.5 Medical Emergency Contingency Measures

The procedures listed in sections 9.4.6 and 9.4.7 will be used to respond to medical emergencies. The HSC will contact the local hospital and inform them of the site hazards and potential emergency situations. A minimum of two first-aid/CPR trained personnel will be maintained on site.

9.4.6 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 Superintendent will be summoned.

The work crew Superintendent will immediately make radio contact with the on-site Emergency Coordinator to alert a medical emergency situation. The crew Superintendent will advise the following information:

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

The Emergency Coordinator will notify the SSO. 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 Superintendent 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 to meet and escort the EMS and have him/her quickly taken to the victim. Any injury within the EZ will be evacuated by Shaw 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.

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

If decontamination can be performed, 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.

An accident/injury/illness report will be completely and properly filled out and submitted to the Program Health and Safety /Project CIH, in accordance with Shaw reporting procedures.

A list of emergency telephone numbers is given in **Table 9.1**.

Non Life-Threatening Incident. All injuries, no matter how small, will be reported to the SS/SSO and HSC. If it is determined that no threat to life is present, the SS will direct the injured person through decontamination procedures 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 SS.

9.4.7 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
- Notify Shaw PM
- Notify Navy

9.4.8 Fire Contingency Measures

Shaw 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.
- “No smoking” signs will be conspicuously posted in areas where flammable materials are present and throughout the EZ and CRZ.
- Fire extinguishers will be located in all Shaw site dedicated vehicles and 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.

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

- Anyone who sees a fire will notify the crew Superintendent 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 worker has extinguished a small fire, the Emergency Coordinator will be notified.

9.5 HAZARDOUS WEATHER CONTINGENCY MEASURES

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

- Lightning,
- Heavy Rains,
- High Winds.

9.5.1 Response

- All equipment will be shut down and secured to prevent damage.
- Personnel will be moved to safe refuge. 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.

9.5.2 Notification

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

- Shaw employees and subcontractors,
- Notify Shaw PM,
- Notify ROICC.

10.0 TRAINING REQUIREMENTS

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

All personnel entering the EZ will be trained in the provisions of the SSHSP and be required to sign the SSHSP Acknowledgment page in **Appendix H**.

Site-specific training for activities at CAX will include potential site contaminants Hazard Communication, as per 29 CFR 1926.59, site physical and environmental hazards, emergency response and evacuation procedures, and emergency telephone numbers will be held at the site location by the SS/SSO before any site work activities begin.

Outlines of the orientation for Shaw personnel and subcontract personnel and visitors are presented below:

Shaw/SUBCONTRACTORS	VISITOR ORIENTATION
<ul style="list-style-type: none"> • SSHSP sign off • Sign in/out procedures • Site background • Chain of command • Rules and regulations • Hours of work • Absences • Equipment • Emergency Information • Emergency signal • Gathering point • Responsibilities/roles • Emergency phone numbers • Work Zones • Contaminants, MSDS's [Hazard Communication Program] • AHA's (Activity Hazard Analyses) • Forms, site-specific Incident Reporting 	<ul style="list-style-type: none"> • SSHSP signoff • Review of Site map • Work Zones in progress • Hazard Communication • Emergency plan/signals • Training/medical requirements • Zones/areas open to visitors

11.0 MEDICAL SURVEILLANCE PROGRAM

All Shaw 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 Shaw's worker medical profile is shown below. This program was developed in conjunction with a consultant toxicologist and Shaw's occupational health physician. Other medical consultants are retained when additional expertise is required.

All field personnel performing activities in a designated EZ or CRZ shall within the past 12 months, or as otherwise required by their role, have completed a comprehensive medical examination that meets the requirements of OSHA regulations 29 CFR 1910.120 and 29 CFR 1926.65. The periodic medical includes the following elements:

- Medical and occupational history questionnaire
- Physical examination
- Complete blood count, with differential
- Liver enzyme profile
- Chest x-ray, once every 3 years, for non-asbestos workers
- Pulmonary function test
- Audiogram
- Electrocardiogram for persons older than 35 years of age, or if indicated during the physical examination
- Visual acuity
- Follow-up examinations, at the discretion of the examining physician or the corporate medical director.

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

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

The Shaw Medical Director is:

Dr. Jerry H. Berke
MD, MPH
Health Resources
600 West Cumming Park
Suite 3400
Woburn, Mass 01801-6350
781-935-8581 (direct dial)
800-350-4511 (toll free)

The Following Health Resource Clinic will be used for all non life-threatening medical emergencies:

Health Resource Clinic
Sentara Medical Center
747 J. Clyde Morris Blvd.
Newport News, Virginia
(757) 599-6117

The Shaw Medical Director and the HSM will be immediately notified of any suspected exposures to hazardous materials/wastes

APPENDIX A INTERNATIONAL SAFETY CARDS & MATERIAL SAFETY DATA SHEETS (MSDS's)

International Safety Cards for site contaminants are included in this section, as well as MSDS's for chemicals that may be brought to the site.

Site Contaminants

Aluminum

Antimony

Arsenic

Copper

Chromium

Iron

Lead

Manganese

Mercury

Selenium

Zinc

Oil

Coal Tar Pitches

Gasoline

Dieldrin

Aroclor 1254

DDD and DDE (as DDT)

Materials which may be brought to the site:

Gasoline

Diesel



CITGO CITGARD® 500 Engine Oil, SAE 15W - 40

Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210

MSDS No. 622315001
Revision Date 5/1/2007

IMPORTANT: This MSDS is prepared in accordance with 29 CFR 1910.1200. Read this MSDS before transporting, handling, storing or disposing of this product and forward this information to employees, customers and users of this product.

Hazard Rankings		
	HMIS	NFPA
Health Hazard	1	1
Fire Hazard	1	1
Reactivity	0	0

* = Chronic Health Hazard

Emergency Overview

Physical State Liquid.
Color Amber to dark amber **Odor** Mild petroleum odor

CAUTION:
Hot oil can cause thermal burns on contact.
"Used" motor oil has been associated with skin cancer in laboratory animals following extended contact.
Spills may create a slipping hazard.

Protective Equipment

Minimum Recommended
See Section 8 for Details



SECTION 1. PRODUCT IDENTIFICATION

Trade Name	CITGO CITGARD® 500 Engine Oil, SAE 15W - 40	Technical Contact	(800) 248-4684
Product Number	622315001	Medical Emergency	(832) 486-4700
CAS Number	Mixture.	CHEMTREC Emergency (United States Only)	(800) 424-9300
Product Family	Motor oil		
Synonyms	Heavy duty motor oil; CITGO® Material Code: 622315001		

SECTION 2. COMPOSITION

Highly-refined petroleum lubricant oils, (CAS No.: Mixture), Conc. 60 to 100

The concentrations of the individual base oils will vary. The individual concentration ranges are as follows:

- Distillates, petroleum, hydrotreated heavy paraffinic, (CAS No. 64742-54-7) Conc. 0 - 90%;
- Distillates, petroleum, solvent-refined heavy paraffinic, (CAS No. 64741-88-4) Conc. 0 - 90%;
- Distillates, petroleum, solvent-dewaxed light paraffinic, (CAS No. 64742-56-9) Conc. 1 - 5%;

Component Name(s)	CAS Registry No.	Concentration (%)
Proprietary Ingredients	Proprietary Mixture	5 - 10
Phosphorodithioic acid, O,O-di-C1-14-alkyl esters, zinc salts	68649-42-3	<2

SECTION 3. HAZARDS IDENTIFICATION

Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.

Major Route(s) of Entry Skin contact.

Signs and Symptoms of Acute Exposure

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Inhalation	At elevated temperatures or in enclosed spaces, product mist or vapors may irritate the mucous membranes of the nose, the throat, bronchi, and lungs.
Eye Contact	This product can cause transient mild eye irritation with short-term contact with liquid sprays or mists. Symptoms include stinging, watering, redness, and swelling.
Skin Contact	This product can cause mild, transient skin irritation. Skin contact with hot material may result in severe burns.
Ingestion	If swallowed, this material can cause a laxative effect.
Chronic Health Effects Summary	This product contains a petroleum-based mineral oil. Prolonged or repeated skin contact can cause mild irritation and inflammation characterized by drying, cracking, (dermatitis) or oil acne. Repeated or prolonged inhalation of petroleum-based mineral oil mists at concentrations above applicable workplace exposure levels can cause respiratory irritation or other pulmonary effects.
Conditions Aggravated by Exposure	Disorders of the following organs or organ systems that may be aggravated by significant exposure to this material or its components include: Skin
Target Organs	May cause damage to the following organs: skin.
Carcinogenic Potential	This product is not known to contain any components at concentrations above 0.1% which are considered carcinogenic by OSHA, IARC or NTP.

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).							
OSHA Health Hazard Classification				OSHA Physical Hazard Classification			
Irritant <input type="checkbox"/>	Sensitizer <input type="checkbox"/>	Combustible <input type="checkbox"/>	Explosive <input type="checkbox"/>	Pyrophoric <input type="checkbox"/>	Toxic <input type="checkbox"/>	Highly Toxic <input type="checkbox"/>	Flammable <input type="checkbox"/>
Corrosive <input type="checkbox"/>	Carcinogenic <input type="checkbox"/>	Compressed Gas <input type="checkbox"/>	Organic Peroxide <input type="checkbox"/>	Water-reactive <input type="checkbox"/>	Unstable <input type="checkbox"/>		

SECTION 4. FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

Inhalation	Vaporization is not expected at ambient temperatures. This material is not expected to cause inhalation-related disorders under anticipated conditions of use. In case of overexposure, move the person to fresh air.
Eye Contact	Check for and remove contact lenses. Flush eyes with cool, clean, low-pressure water while occasionally lifting and lowering eyelids. Seek medical attention if excessive tearing, redness, or pain persists.
Skin Contact	If burned by hot material, cool skin by quenching with large amounts of cool water. For contact with product at ambient temperatures, remove contaminated shoes and clothing. Wipe off excess material. Wash exposed skin with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists. Thoroughly clean contaminated clothing before reuse. Clean or discard contaminated leather goods. If material is injected under the skin, seek medical attention immediately.
Ingestion	Do not induce vomiting unless directed to by a physician. Do not give anything to drink unless directed to by a physician. Never give anything by mouth to a person who is not fully conscious. Seek medical attention immediately.
Notes to Physician	INGESTION: The viscosity range of the product(s) represented by this MSDS is greater than 100 SUS at 100°F. There is a low risk of aspiration upon ingestion. Careful gastric lavage or emesis may be considered to evacuate large quantities of material.

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SECTION 5. FIRE FIGHTING MEASURES

NFPA Flammability Classification	NFPA Class-IIIB combustible material.	
Flash Point	CLOSED CUP: 212°C (414°F). (Pensky-Martens (ASTM D-93)) OPEN CUP: 248°C (478°F) (Cleveland.).	
Lower Flammable Limit	No data.	Upper Flammable Limit No data.
Autoignition Temperature	Not available.	
Hazardous Combustion Products	Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons and oxides of sulfur, phosphorus, zinc and/or nitrogen.	
Special Properties	This material can burn but will not readily ignite. This material will release vapors when heated above the flash point temperature that can ignite when exposed to a source of ignition. In enclosed spaces, heated vapor can ignite with explosive force. Mists or sprays may burn at temperatures below the flash point.	
Extinguishing Media	Use dry chemical, foam, carbon dioxide or water fog. Water or foam may cause frothing. Carbon dioxide and inert gas can displace oxygen. Use caution when applying carbon dioxide or inert gas in confined spaces.	
Protection of Fire Fighters	Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies.	

SECTION 6. ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Do not touch damaged containers or spilled material unless wearing appropriate protective equipment. Slipping hazard; do not walk through spilled material. Stop leak if you can do so without risk. For small spills, absorb or cover with dry earth, sand, or other inert non-combustible absorbent material and place into waste containers for later disposal. Contain large spills to maximize product recovery or disposal. Prevent entry into waterways or sewers. In urban area, cleanup spill as soon as possible. In natural environments, seek cleanup advice from specialists to minimize physical habitat damage. This material will float on water. Absorbent pads and similar materials can be used. Comply with all laws and regulations.

SECTION 7. HANDLING AND STORAGE

Handling	Avoid contamination and extreme temperatures to minimize product degradation. Empty containers may contain product residues that can ignite with explosive force. Do not pressurize, cut, weld, braze solder, drill, grind or expose containers to flames, sparks, heat or other potential ignition sources. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling or disposing of empty containers and/or waste residues of this product.
Storage	Keep container closed. Do not store with strong oxidizing agents. Do not store at elevated temperatures. Avoid storing product in direct sunlight for extended periods of time. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling or disposing of empty containers or waste residues of this product.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of mists and/or vapors below the recommended exposure limits (see below). An eye wash station and safety shower should be located near the work-station.

Personal Protective Equipment Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.



Eye Protection Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Wear goggles if splashing or spraying is anticipated. Wear goggles and face shield if material is heated above 125°F (51°C). Have suitable eye wash water available.

Hand Protection None required for incidental contact. Use gloves constructed of chemical resistant materials such as heavy nitrile rubber if frequent or prolonged contact is expected. Use heat-protective gloves when handling product at elevated temperatures.

Body Protection Avoid prolonged or repeated skin contact. Use clean protective clothing if splashing or spraying conditions are present such as long-sleeved garment. Remove oil contaminated clothing and launder before reuse. Heavily contaminated clothing and leather goods should be removed promptly and cleaned or discarded.

Respiratory Protection The need for respiratory protection is not anticipated under normal use conditions and with adequate ventilation. If elevated airborne concentrations above applicable workplace exposure levels are anticipated, a NIOSH-approved organic vapor respirator equipped with a dust/mist prefilter should be used. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134).

General Comments Use good personal hygiene practices. Wash hands and other exposed skin areas with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities, or leaving work. DO NOT use gasoline, kerosene, solvents or harsh abrasives as skin cleaners. Since specific exposure standards/control limits have not been established for this product, the "Oil Mist, Mineral" exposure limits shown below are suggested as minimum control guidelines.

Occupational Exposure Guidelines

Substance	Applicable Workplace Exposure Levels
Oil Mist, Mineral	ACGIH (United States). TWA: 5 mg/m ³ STEL: 10 mg/m ³ OSHA (United States). TWA: 5 mg/m ³

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

Physical State	Liquid.	Color	Amber to dark amber	Odor	Mild petroleum odor
Specific Gravity	0.88 (Water = 1)	pH	Not applicable	Vapor Density	>1 (Air = 1)
Boiling Range					Not available.

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	Not available.	Melting/Freezing Point	
Vapor Pressure	<0.01 mm of Hg (@ 20°C)	Volatility	Negligible volatility.
Solubility in Water	Negligible solubility in cold water.	Viscosity (cSt @ 40°C)	120
Flash Point	CLOSED CUP: 212°C (414°F). (Pensky-Martens (ASTM D-93)) OPEN CUP: 248°C (478°F) (Cleveland.).		
Additional Properties	Gravity, °API (ASTM D287) = AP 29.0 @ 60° F Density = AP 7.35 Lbs/gal. Viscosity (ASTM D2161) = AP 600 SUS @ 100° F		

SECTION 10. STABILITY AND REACTIVITY

Chemical Stability	Stable.	Hazardous Polymerization	Not expected to occur.
Conditions to Avoid	Keep away from extreme heat, sparks, open flame, and strongly oxidizing conditions.		
Materials Incompatibility	Strong oxidizers.		
Hazardous Decomposition Products	No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS.		

SECTION 11. TOXICOLOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.

Toxicity Data	Distillates, petroleum, solvent-refined heavy paraffinic	
	ORAL (LD50):	Acute: >5000 mg/kg [Rat].
	DERMAL (LD50):	Acute: >2000 mg/kg [Rabbit].

Mineral oil mists derived from highly refined oils are reported to have low acute and sub-acute toxicities in animals. Effects from single and short-term repeated exposures to high concentrations of mineral oil mists well above applicable workplace exposure levels include lung inflammatory reaction, lipoid granuloma formation and lipoid pneumonia. In acute and sub-acute studies involving exposures to lower concentrations of mineral oil mists at or near current work place exposure levels produced no significant toxicological effects. In long term studies (up to two years) no carcinogenic effects have been reported in any animal species tested.

	Distillates, petroleum, hydrotreated heavy paraffinic	
	ORAL (LD50):	Acute: >5000 mg/kg [Rat].
	DERMAL (LD50):	Acute: >2000 mg/kg [Rabbit].

Mineral oil mists derived from highly refined oils are reported to have low acute and sub-acute toxicities in animals. Effects from single and short-term repeated exposures to high concentrations of mineral oil mists well above applicable workplace exposure levels include lung inflammatory reaction, lipoid granuloma formation and lipoid pneumonia. In acute and sub-acute studies involving exposures to lower concentrations of mineral oil mists at or near current work place exposure levels produced no significant toxicological effects. In long term studies (up to two years) no carcinogenic effects have been reported in any animal species tested.

	Distillates, petroleum, solvent-dewaxed light paraffinic	
	ORAL (LD50):	Acute: >5000 mg/kg [Rat].
	DERMAL (LD50):	Acute: >2000 mg/kg [Rabbit].

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Mineral oil mists derived from highly refined oils are reported to have low acute and sub-acute toxicities in animals. Effects from single and short-term repeated exposures to high concentrations of mineral oil mists well above applicable workplace exposure levels include lung inflammatory reaction, lipoid granuloma formation and lipoid pneumonia. In acute and sub-acute studies involving exposures to lower concentrations of mineral oil mists at or near current work place exposure levels produced no significant toxicological effects. In long term studies (up to two years) no carcinogenic effects have been reported in any animal species tested.

Phosphorodithioic acid, O,O-di-C1-14-alkyl esters, zinc salts

ORAL (LD50): Acute: >2000 mg/kg [Rabbit]. >2890 mg/kg [Rat].
DERMAL (LD50): Acute: >2000 mg/kg [Rabbit].

INHALATION (LC50), Acute: > 1310 mg/L (Rat screen level)(4 hours).

DRAIZE EYE, Acute: Moderate to severe eye irritant. (Rabbit).

DRAIZE DERMAL, Acute: Mild to moderate skin irritant. (Rabbit).

BUEHLER DERMAL, Acute: Non-sensitizing. (Guinea Pig).

28-Day DERMAL, Sub-Chronic: Severe skin irritant. (Rabbit). Reported reduced food consumption resulting in weight loss and testicular atrophy.

Engine oil

Used motor oil was associated with cancer in lifetime skin painting studies with laboratory animals. Avoid prolonged or repeated contact with used motor oil. Use of good hygiene practices will reduce the likelihood of potential health effects.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Analysis for ecological effects has not been conducted on this product. However, if spilled, this product and any contaminated soil or water may be harmful to human, animal, and aquatic life. Also, the coating action associated with petroleum and petroleum products can be harmful or fatal to aquatic life and waterfowl.

Environmental Fate

An environmental fate analysis is not available for this specific product. Plants and animals may experience harmful or fatal effects when coated with petroleum products. Petroleum-based (mineral) lubricating oils normally will float on water. In stagnant or slow-flowing waterways, an oil layer can cover a large surface area. As a result, this oil layer might limit or eliminate natural atmospheric oxygen transport into the water. With time, if not removed, oxygen depletion in the waterway may be sufficient to cause a fish kill or create an anaerobic environment. This material contains phosphorus which is a controlled element for disposal in effluent waters in most sections of North America. Phosphorus is known to enhance the formation of algae. Severe algae growth can reduce oxygen content in the water possibly below levels necessary to support marine life.

SECTION 13. DISPOSAL CONSIDERATIONS

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Conditions of use may cause this material to become a "hazardous waste", as defined by federal or state regulations. It is the responsibility of the user to determine if the material is a "hazardous waste" at the time of disposal. Transportation, treatment, storage, and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR 260 through 40 CFR 271). State and/or local regulations may be more restrictive. Contact your regional US EPA office for guidance concerning case specific disposal issues. Empty drums and pails retain residue. DO NOT pressurize, cut, weld, braze, solder, drill, grind, or expose this product's empty container to heat, flame, or other ignition sources. DO NOT attempt to clean it. Empty drums and pails should be drained completely, properly bunged or sealed, and promptly sent to a reconditioner.

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SECTION 14. TRANSPORT INFORMATION

The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.

US DOT Status	Not regulated by the U.S. Department of Transportation as a hazardous material.		
Proper Shipping Name	Not regulated.		
Hazard Class	Not regulated.	Packing Group(s)	Not applicable.
		UN/NA Number	Not regulated.
Reportable Quantity	A Reportable Quantity (RQ) has not been established for this material.		
Placard(s)		Emergency Response Guide No.	Not applicable.
		MARPOL III Status	Not a DOT "Marine Pollutant" per 49 CFR 171.8.

SECTION 15. REGULATORY INFORMATION

TSCA Inventory	This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory.
SARA 302/304 Emergency Planning and Notification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified.
SARA 311/312 Hazard Identification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories: No SARA 311/312 hazard categories identified.
SARA 313 Toxic Chemical Notification and Release Reporting	This product contains the following components in concentrations above <i>de minimis</i> levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA: Zinc and Zinc Compounds, Concentration: <2%
CERCLA	The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are: Zinc and Zinc Compounds, Concentration: <2%
Clean Water Act (CWA)	This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.
California Proposition 65	

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This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):
Toluene: <0.002%

**New Jersey
Right-to-Know Label**

Motor oil

Additional Remarks No additional regulatory remarks.

SECTION 16. OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

REVISION INFORMATION

Version Number 5.0
Revision Date 5/1/2007

ABBREVIATIONS

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established
ACGIH: American Conference of Governmental Industrial Hygienists AIHA: American Industrial Hygiene Association
IARC: International Agency for Research on Cancer NTP: National Toxicology Program
NIOSH: National Institute of Occupational Safety and Health OSHA: Occupational Safety and Health Administration
NPCA: National Paint and Coating Manufacturers Association HMIS: Hazardous Materials Information System
NFPA: National Fire Protection Association EPA: US Environmental Protection Agency

DISCLAIMER OF LIABILITY

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.

THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

***** END OF MSDS *****



CITGO Gasolines, All Grades Unleaded Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210

MSDS No. UNLEAD
Revision Date 05/23/2005

IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.

Hazard Rankings		
	HMIS	NFPA
Health Hazard	* 2	1
Fire Hazard	3	3
Reactivity	0	0

* = Chronic Health Hazard

Emergency Overview			
Physical State	Liquid.		
Color	Transparent, clear to amber or red.	Odor	Pungent, characteristic gasoline.
DANGER:			
Extremely flammable liquid; vapor may cause flash fire or explosion.			
Vapor may travel considerable distance to source of ignition and flash back.			
Use Only as a Motor Fuel. Do Not Siphon by Mouth.			
Harmful or fatal if swallowed - Can enter lungs and cause damage.			
High concentrations of vapor reduce oxygen available for breathing and may cause suffocation.			
May be harmful if inhaled or absorbed through the skin.			
Mist or vapor may irritate the eyes, mucous membranes, and respiratory tract.			
Liquid contact may cause eye and skin irritation.			
Overexposures may cause central nervous system (CNS) depression and target organ effects (See Section 3).			
Harmful or fatal if swallowed - Can enter lung and cause damage.			
Inhalation overexposure can increase the heart's susceptibility to arrhythmias (irregular beats).			
Contains Benzene - Cancer Hazard.			
Long term exposure to gasoline vapor has caused cancer in laboratory animals.			
Avoid Spills. Spills may present both a physical and an environmental hazard.			

Protective Equipment
Minimum Recommended See Section 8 for Details
  

SECTION 1. PRODUCT IDENTIFICATION

Trade Name	CITGO Gasolines, All Grades Unleaded	Technical Contact	(800) 248-4684
Product Number	Various	Medical Emergency	(832) 486-4700
CAS Number	Mixture.	CHEMTREC Emergency (United States Only)	(800) 424-9300

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Product Family	Motor fuels.
Synonyms	Unleaded Gasolines; Motor Gasolines; Petroi; Automobile Motor Fuels; Finished Gasolines; Gasoline, Regular Unleaded; Gasoline, Mid-grade Unleaded; Gasoline, Premium Unleaded; Reformulated Gasolines (RFG); Reformulated Motor Fuels; Oxygenated Motor Spirits; Gasoline, Regular Reformulated; Gasoline, Mid-grade Reformulated; Gasoline, Premium Reformulated.

SECTION 2. COMPOSITION

Gasoline is a complex and variable mixture that originates from finished refinery streams. These streams can contain the hydrocarbons and oxygenated chemicals (oxygenates) listed below that are regulated or are associated with certain potential health effects. The typical concentration of oxygenates in gasoline does not exceed 18% (v/v).

Component Name(s)	CAS Registry No.	Concentration (%)
Methyl tertiary-Butyl Ether (MTBE)	1634-04-4	0 - 15
Tertiary-Amyl Methyl Ether (TAME)	994-05-8	0 - 15
Ethyl tertiary Butyl Ether (ETBE)	637-92-3	0 - 15
Tertiary-Amyl Ethyl Ether (TAEE)	919-94-8	0 - 15
Diisopropyl Ether (DIPE)	108-20-3	0 - 15
Ethanol	64-17-5	0 - 10
Toluene	108-88-3	<20
Xylene, all isomers	1330-20-7	<18
n-Hexane	110-54-3	<8
Trimethylbenzenes, all isomers	25551-13-7	<5
Benzene	71-43-2	<5
Cumene	98-82-8	<4
Ethylbenzene	100-41-4	<4
Cyclohexane	110-82-7	<3
Naphthalene	91-20-3	<2
Styrene	100-42-5	<1

SECTION 3. HAZARDS IDENTIFICATION

Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.

Major Route(s) of Entry Skin contact. Eye contact. Inhalation. Ingestion.

Signs and Symptoms of Acute Exposure

Inhalation	Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness, or unconsciousness. Breathing high concentrations of this material, for example, in an enclosed space or by intentional abuse, can cause irregular heartbeats which can cause death.
Eye Contact	This product can cause eye irritation with short-term contact with liquid, mists or vapor. Symptoms include stinging, watering, redness, and swelling. In severe cases, permanent eye damage can result.
Skin Contact	This material can cause skin irritation. The severity of irritation will depend on the amount of material that is applied to the skin and the speed and thoroughness that it is removed. It is likely that some components of this material are able to pass into the body through the skin and may cause similar effects as from breathing or swallowing it. If the skin is damaged, absorption increases.
Ingestion	

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If swallowed, this material may irritate the mucous membranes of the mouth, throat, and esophagus. It can be readily absorbed by the stomach and intestinal tract. Symptoms include a burning sensation of the mouth and esophagus, nausea, vomiting, dizziness, staggered gait, drowsiness, loss of consciousness and delirium, as well as additional central nervous system (CNS) effects.

Due to its light viscosity, there is a danger of aspiration into the lungs during swallowing and subsequent vomiting. Aspiration can result in severe lung damage or death. Cardiovascular effects include shallow rapid pulse with pallor (loss of color in the face) followed by flushing (redness of the face). Also, progressive CNS depression, respiratory insufficiency and ventricular fibrillation leads to death.

Chronic Health Effects Summary

Intentional misuse by deliberately concentrating and inhaling gasoline can be harmful or fatal. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage ("Petrol Sniffers Encephalopathy"), delirium, seizures and sudden death are associated with repeated abuse of gasoline or naphtha.

Chronic effects of ingestion and subsequent aspiration into the lungs may include pneumatocele (lung cavity) formation and chronic lung dysfunction.

Benzene, a component of this product, causes blood disorders and damages the bone marrow (certain types of anemia, leukemia, and lymphoma). It is also capable of causing changes in living cells' genetic material (chromosomes). Benzene is considered to be a mutagen and a cancer-causing agent (leukemogen).

Repeated and prolonged overexposure to n-hexane has been associated with peripheral nerve tissue damage. Adverse effects include numbness, tingling, pain, and loss of muscle control in the extremities, disorientation, impaired vision and reflexes, decline in motor function and paralysis.

Prolonged or repeated overexposure to toluene, a component of this product, has been associated with reproductive effects in experimental animals and in long-term chemical abuse situations. Long-term overexposure to toluene has been associated with impaired color vision. Also, long-term overexposure to toluene in occupational environments have been associated with hearing damage.

Prolonged or repeated overexposure to xylene, a component of this product, has been associated with hearing damage in laboratory animals. Repeated overexposure may cause injury to bone marrow, blood cells, kidney, and liver.

Refer to Section 11 of this MSDS for additional health-related information.

Conditions Aggravated by Exposure

Disorders of the following organs or organ systems that may be aggravated by significant exposure to this material or its components include: Skin, Respiratory System, Liver, Kidneys, Central Nervous System (CNS), Cardiovascular System, Blood-forming system

Target Organs

May cause damage to the following organs: blood, kidneys, lungs, the reproductive system, liver, mucous membranes, heart, peripheral nervous system, cardiovascular system, upper respiratory tract, skin, auditory system, bone marrow, central nervous system (CNS), eye, lens or cornea.

Carcinogenic Potential

This material may contain benzene, ethylbenzene, naphthalene or styrene at concentrations above 0.1%. Benzene is considered to be a known human carcinogen by OSHA, IARC and NTP. IARC has identified ethylbenzene, styrene, naphthalene, gasoline and gasoline engine exhaust as possibly carcinogenic to humans (Group 2B) based on laboratory animal studies.

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OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).					
OSHA Health Hazard Classification			OSHA Physical Hazard Classification		
Irritant	<input checked="" type="checkbox"/>	Sensitizer	<input type="checkbox"/>	Combustible	<input type="checkbox"/>
Toxic	<input type="checkbox"/>	Highly Toxic	<input type="checkbox"/>	Flammable	<input checked="" type="checkbox"/>
Corrosive	<input type="checkbox"/>	Carcinogenic	<input checked="" type="checkbox"/>	Compressed Gas	<input type="checkbox"/>
				Explosive	<input type="checkbox"/>
				Oxidizer	<input type="checkbox"/>
				Organic Peroxide	<input type="checkbox"/>
				Pyrophoric	<input type="checkbox"/>
				Water-reactive	<input type="checkbox"/>
				Unstable	<input type="checkbox"/>

SECTION 4. FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

Inhalation Immediately move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. If exposed to benzene in an emergency situation, a medical evaluation should be completed at the end of the work-shift in accordance with OSHA requirements.

Eye Contact Flush eyes with cool, clean, low-pressure water for at least 15 minutes. Hold eyelids apart to ensure complete irrigation of the eye and eyelid tissue. If easily accomplished, check for and remove contact lenses. If contact lenses cannot be removed, seek immediate medical attention. Do not use eye ointment. Seek medical attention.

Skin Contact Remove contaminated shoes and clothing. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. Do not use ointments. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists.

Ingestion Do not induce vomiting. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Never give anything by mouth to a person who is not fully conscious. Do not leave victim unattended. Seek medical attention immediately.

Notes to Physician INHALATION: Inhalation overexposure can produce toxic effects. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Administer supplemental oxygen with assisted ventilation, as required.

This material (or a component) sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

INGESTION: If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

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SECTION 5. FIRE FIGHTING MEASURES

NFPA Flammability Classification	NFPA Class-IB flammable liquid.		
Flash Point	Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56])		
Lower Flammable Limit	AP 1.4 %	Upper Flammable Limit	AP 7.6 %
Autoignition Temperature	280°C (536°F)		
Hazardous Combustion Products	Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons, aldehydes and other products of incomplete combustion.		
Special Properties	Flammable Liquid! This material releases vapors at or below ambient temperatures. When mixed with air in certain proportions and exposed to an ignition source, its vapor can cause a flash fire. Use only with adequate ventilation. Vapors are heavier than air and may travel long distances along the ground to an ignition source and flash back. A vapor and air mixture can create an explosion hazard in confined spaces such as sewers. If container is not properly cooled, it can rupture in the heat of a fire.		
Extinguishing Media	SMALL FIRE: Use dry chemicals, carbon dioxide, foam, or inert gas (nitrogen). Carbon dioxide and inert gas can displace oxygen. Use caution when applying carbon dioxide or inert gas in confined spaces. LARGE FIRE: Use foam, water fog, or water spray. Water May Be Ineffective. Water may not extinguish the fire. Water fog and spray are effective in cooling containers and adjacent structures. However, water can be used to cool the external walls of vessels to prevent excessive pressure, autoignition or explosion. DO NOT use a solid stream of water directly on the fire as the water may spread the fire to a larger area.		
Protection of Fire Fighters	Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles. Cover pooling liquid with foam. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines. Be aware that burning liquid will float on water. Notify appropriate authorities of potential fire and explosion hazard if liquid enter sewers or waterways.		

SECTION 6. ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Flammable Liquid! Release causes an immediate fire or explosion hazard. Evacuate all non-essential personnel from immediate area and establish a "regulated zone" with site control and security. A vapor-suppressing foam may be used to reduce vapors. Eliminate all ignition sources. All equipment used when handling this material must be grounded. Stop the leak if it can be done without risk. Do not touch or walk through spilled material. Remove spillage immediately from hard, smooth walking areas. Prevent spilled material from entering waterways, sewers, basements, or confined areas. Absorb or cover with dry earth, sand, or other non-combustible material and transfer to appropriate waste containers. Use clean, non-sparking tools to collect absorbed material.

For large spills, secure the area and control access. Prevent spilled material from entering sewers, storm drains, other drainage systems, and natural waterways. Dike far ahead of a

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liquid spill to ensure complete collection. Water mist or spray may be used to reduce or disperse vapors; but, it may not prevent ignition in closed spaces. This material will float on water and its run-off may create an explosion or fire hazard. Verify that responders are properly HAZWOPER-trained and wearing appropriate respiratory equipment and fire-resistant protective clothing during cleanup operations. In an urban area, cleanup spill as soon as possible; in natural environments, cleanup on advice from specialists. Pick up free liquid for recycle and/or disposal if it can be accomplished safely with explosion-proof equipment. Collect any excess material with absorbant pads, sand, or other inert non-combustible absorbent materials. Place into appropriate waste containers for later disposal. Comply with all applicable local, state and federal laws and regulations.

SECTION 7. HANDLING AND STORAGE

Handling

FLAMMABLE LIQUID AND VAPOR. **USE ONLY as a motor fuel.** DO NOT siphon by mouth. DO NOT use as a lighter fluid, solvent or cleaning fluid. Prior to handling or refueling, stop all engines and auxiliary equipment. Turn off all electronic equipment including cellular telephones. DO NOT leave nozzle unattended during filling or refueling a vehicle. DO NOT re-enter vehicle while refueling. Keep nozzle spout in contact with the container during the entire filling operations.

A static electrical charge can accumulate when this material is flowing through pipes, nozzles or filters and when it is agitated. A static spark discharge can ignite accumulated vapors particularly during dry weather conditions. Always bond receiving containers to the fill pipe before and during loading. Always keep nozzle in contact with the container throughout the loading process. Do not fill any portable container in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously contained middle distillates or similar products).

A spill or leak can cause an immediate fire hazard. Keep containers closed and do not handle or store near heat, sparks, or any other potential ignition sources. Do not contact with oxidizable materials. Do not breathe vapor. Use only with adequate ventilation and personal protection. Never siphon by mouth. Avoid contact with eyes, skin, and clothing. Prevent contact with food and tobacco products. Do not take internally.

When performing repairs and maintenance on contaminated equipment, keep unnecessary persons away from the area. Eliminate all potential ignition sources. Drain and purge equipment, as necessary, to remove material residues. Follow proper entry procedures, including compliance with 29 CFR 1910.146 prior to entering confined spaces such as tanks or pits. Use gloves constructed of impervious materials and protective clothing if direct contact is anticipated. Provide ventilation to maintain exposure potential below applicable exposure limits. Use appropriate respiratory protection when concentrations exceed any established occupational exposure level (See Section 8). Promptly remove contaminated clothing. Wash exposed skin thoroughly with soap and water after handling.

Protect the environment from releases of this material. Prevent discharges to surface waters and groundwater. Maintain handling, transfer and storage equipment in proper working order.

Misuse of empty containers can be dangerous. Empty containers may contain material residues which can ignite with explosive force. **Cutting or welding of empty containers can cause fire, explosion, or release of toxic fumes from residues.** Do not pressurize or expose empty containers to open flame, sparks, or heat. Keep container closed and drum bungs in place. All label warnings and precautions must be observed. Return empty drums to a qualified reconditioner. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling, or disposing of empty containers and/or waste residues of this material.

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Storage Store and transport in accordance with all applicable laws. Keep containers tightly closed. Store in a cool, dry, well-ventilated place. Clearly label all containers. Do not allow containers to be kept in enclosed vehicles. Keep away from all ignition sources. Ground all equipment containing this material. Containers must be able to withstand pressures that are created from changes in product temperature. Product samples and other small containers of this flammable liquid should be stored in a separate safety cabinet or room. All electrical equipment in areas where this material is stored or handled should be installed and operated in accordance with applicable regulatory requirements and the National Electrical Code.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits indicated below. All electrical equipment should comply with the National Electric Code. An emergency eye wash station and safety shower should be located near the work-station.

Personal Protective Equipment Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.



Eye Protection Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. A suitable emergency eye wash water and safety shower should be located near the work station.

Hand Protection Avoid skin contact. Use gloves (e.g., disposable PVC, neoprene, nitrile, vinyl, or PVC/NBR). Wash hands with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities or leaving work. DO NOT use this material as a skin cleaner.

Body Protection Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discard contaminated leather goods.

Respiratory Protection For known vapor concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator if adequate protection is provided. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134). For airborne vapor concentrations that exceed the recommended protection factors for organic vapor respirators, use a full-face, positive-pressure, supplied air respirator. Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 10% of the lower flammable limit of this product.

General Comments Warning! Use of this material in spaces without adequate ventilation may result in generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

Occupational Exposure Guidelines

Substance	Applicable Workplace Exposure Levels
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Gasoline	<p>ACGIH (United States). TWA: 300 ppm 8 hour(s).</p>
Toluene	<p>STEL: 500 ppm 15 minute(s). ACGIH (United States). Skin TWA: 50 ppm 8 hour(s). OSHA (United States). TWA: 200 ppm 8 hour(s). CEIL: 300 ppm PEAK: 500 ppm</p>
Xylene, all isomers	<p>ACGIH (United States). TWA: 100 ppm 8 hour(s). STEL: 150 ppm 15 minute(s). OSHA (United States). TWA: 100 ppm 8 hour(s).</p>
Tertiary-Amyl Methyl Ether (TAME)	<p>ACGIH TLV (United States). TWA: 20 ppm 8 hour(s).</p>
Methyl tertiary-Butyl Ether (MTBE)	<p>ACGIH (United States). TWA: 50 ppm 8 hour(s).</p>
Ethyl tertiary Butyl Ether (ETBE)	<p>ACGIH TLV (United States). TWA: 5 ppm 8 hour(s).</p>
n-Hexane	<p>ACGIH (United States). Skin TWA: 50 ppm 8 hour(s). OSHA (United States). TWA: 500 ppm 8 hour(s).</p>
Cumene	<p>ACGIH (United States). TWA: 50 ppm 8 hour(s). OSHA (United States). Skin TWA: 50 ppm 8 hour(s).</p>
Trimethylbenzenes, all isomers	<p>ACGIH (United States). TWA: 25 ppm 8 hour(s).</p>
Benzene	<p>ACGIH (United States). Skin TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s). OSHA (United States). Skin Notes: See Table Z-2 for exclusions in 20 CFR 1910.1028 to the PEL. TWA: 1 ppm 8 hour(s). STEL: 5 ppm 15 minute(s).</p>
Ethylbenzene	<p>ACGIH (United States). TWA: 100 ppm 8 hour(s). STEL: 125 ppm 15 minute(s). OSHA (United States). TWA: 100 ppm 8 hour(s).</p>
Cyclohexane	<p>ACGIH (United States). TWA: 100 ppm 8 hour(s). OSHA (United States). TWA: 300 ppm 8 hour(s).</p>
Naphthalene	<p>ACGIH (United States). Skin TWA: 10 ppm 8 hour(s). STEL: 15 ppm 15 minute(s). OSHA (United States). TWA: 10 ppm 8 hour(s).</p>
Styrene	<p>ACGIH (United States). TWA: 20 ppm 8 hour(s). STEL: 40 ppm 15 minute(s). OSHA (United States). TWA: 100 ppm 8 hour(s). STEL: 200 ppm 15 minute(s). PEAK: 600 ppm</p>

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SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

Physical State	Liquid.	Color	Transparent, clear to amber or red.	Odor	Pungent, characteristic gasoline.
Specific Gravity	0.72 - 0.77 (Water = 1)	pH	Not applicable	Vapor Density	3 to 4 (Air = 1)
Boiling Range	38 to 204°C (100 to 400°F)			Melting/Freezing Point	Not available.
Vapor Pressure	220 to 450 mm Hg at 20°C (68°F) or 6 to 15 Reid-psia at 37.8°C (100°F).			Volatility	720 to 770 g/l VOC (w/v)
Solubility in Water	Hydrocarbon components of gasoline are slightly soluble in water. Oxygenate components, such as MTBE, are more soluble than the hydrocarbon components. Ethanol has greater solubility in water than hydrocarbon components or other oxygenate components.			Viscosity (cSt @ 40°C)	<1
Flash Point	Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56])				
Additional Properties	Average Density at 60°F = 6.0 to 6.4 lbs./gal. (ASTM D-2161)				

SECTION 10. STABILITY AND REACTIVITY

Chemical Stability	Stable.	Hazardous Polymerization	Not expected to occur.
Conditions to Avoid	Keep away from heat, flame and other potential ignition sources. Keep away from strong oxidizing conditions and agents.		
Materials Incompatibility	Strong acids, alkalis and oxidizers such as liquid chlorine, other halogens, hydrogen peroxide and oxygen.		
Hazardous Decomposition Products	No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS.		

SECTION 11. TOXICOLOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.

Toxicity Data	Gasoline: VAPOR (TELo) Acute: 140 ppm (Human) (8 hours) - Mild eye irritant. VAPOR (TELo) Acute: 500 ppm (Human) (1 hour) - Moderate eye irritant. INHALATION (TCLo) Acute: 900 ppm (Human) (1 hour) - CNS and pulmonary effects. DERMAL (TDLo) Acute: 53 mg/kg (Human) - Skin allergy effects. INHALATION (LC50) Acute: 101,200 ppm (Rat, Mouse, & Guinea Pig) (5 minutes).
	Gasoline Containing 15% MTBE: ORAL (LD50) Acute: >5,000 mg/kg (Rat screen level). DERMAL (LD50) Acute: >2,000 mg/kg (Rabbit screen level). INHALATION (LC50) Acute: >5,200 ppm (Rat screen level) (8 hours). DRAIZE EYE Acute: Mild eye irritant. (Rabbit).

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DRAIZE DERMAL Acute: Moderate skin irritant. (Rabbit).
BUEHLER DERMAL Acute: Non-sensitizing. (Guinea Pig).
28-Day DERMAL Sub-Chronic: Severe skin irritant. (Rabbit).

A major epidemiological study concluded that there was no increased risk of kidney cancer associated with gasoline exposures for petroleum refinery employees or neighboring residents. Another study identified a slight trend in kidney cancers among service station employees following a 30-year latency period. Two-year inhalation toxicity studies with fully vaporized unleaded gasoline (at concentrations of 67, 292 and 2,056 ppm in air) produced kidney damage and kidney tumors in male rats, but not in female rats or mice of either sex. Results from subsequent scientific studies suggest that the kidney damage, and probably the kidney tumor response, is limited to the male rat. The kidney tumors apparently were the result of the formation of alpha-2u-globulin, a protein unique to male rats. This finding is not considered relevant to human exposure. Under conditions of the study, there was no evidence that exposure to unleaded gasoline vapor is associated with developmental toxicity. Experimental studies with laboratory animals did suggest that overexposure to gasoline may adversely effect male reproductive performance. Also, in laboratory studies with rats, the maternal and developmental "no observable adverse effect level" (NOAEL) was determined to be 9,000 ppm (75% of the LEL value). Female mice developed a slightly higher incidence of liver tumors compared to controls at the highest concentration. In a four week inhalation study of Sprague Dawley® rats, gasoline vapor condensate was determined to induce sister chromatid exchanges in peripheral lymphocytes. IARC has listed gasoline as possibly carcinogenic to humans (Group 2B).

Pentanes, all isomers:

Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

Toluene:

Effects from Acute Exposure:

Deliberate inhalation of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system and can cause CNS depression, cardiac arrhythmias and death. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects.

Effects from Repeated or Prolonged Exposure:

Studies of workers indicate long-term exposure may be related to impaired color vision and hearing. Some studies of workers suggest long-term exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest long-term exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals were largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

Heptane, all isomers:

n-Heptane was not mutagenic in the Salmonella/microsome (Ames) assay and is not considered to be carcinogenic.

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Xylene, all isomers:

Effects from Acute Exposure:

ORAL (LD₅₀), Acute: 4,300 mg/kg [Rat].

INHALATION (LC₅₀), Acute: 4,550 ppm for four hours [Rat].

DERMAL (LD₅₀), Acute: 14,100 uL/kg [Rabbit].

Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross over-exposure.

Effects from Prolonged or Repeated Exposure:

Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

Ethyl tertiary Butyl Ether (ETBE):

ETBE can cause eye, skin and mucous membrane irritation. In a four week inhalation study, moderate ataxia was observed in rats at the highest dose level (4,000 ppm). The test animals appeared normal within 15 minutes of termination of exposure. A no observed adverse effect level (NOAEL) of 500 ppm was indicated by the study authors based on neurotoxic effects. In two unpublished 90 day inhalation studies, rats and mice were exposed six hour/day, five days/week at concentrations of 0, 500, 1750 and 5000 ppm of ETBE vapor. The male rats exhibited time and concentration-dependent nephropathy consistent with alpha-2μ-globulin formation. An ETBE NOAEL for male rats of 500 ppm was suggested based on a finding of testicular lesions. In human studies with eight males, slight, but significant (p<0.05) decreases in objective pulmonary function measures after exposure to ETBE at concentrations of 25 and 50 ppm for two hours.

Tertiary-Amyl Methyl Ether (TAME):

TAME was found to be negative for the induction of structural chromosome aberrations (both metabolically-activated and non-activated) in Chinese hamster ovary (CHO) cells. Inhalation of TAME vapors at concentrations above 250 ppm produced reversible CNS depression in rats and mice. In a four week inhalation study, increases in liver weights with no tissue injury were observed in rats exposed to a TAME concentration of 500 ppm. Birth defects in mice and fetotoxicity in both rats and mice were observed after inhalation exposures to maternally toxic concentrations of TAME.

Methyl tertiary-Butyl Ether (MTBE):

Acute symptoms associated with human exposure to MTBE appear to be mild and transient. In laboratory studies, rats and mice exposed to high doses of MTBE exhibited blood chemistry changes and liver and kidney abnormalities. In laboratory studies, MTBE vapor exposure at the high dose concentration was associated with an increased incidence of liver tumors in female mice. Also, at high dose concentration exposures, MTBE was associated with an increased incidence of kidney and testicular (Leydig cell) tumors in male rats. Additional oncogenicity studies on rats resulted in testicular tumors following administration by ingestion. These data are not generally considered relevant to humans. NTP has not identified MTBE as either a known carcinogen or reasonably anticipated to be carcinogenic to humans. In animal studies, developmental and reproductive toxicity related to MTBE inhalation exposures was observed only at concentrations that were maternally toxic. MTBE was shown to be maternally toxic at 4,000 and 8,000 ppm levels when mice were exposed for six hours per day during their pregnancy. Also, a decrease in the number of successful pregnancies and a reduction in birth weights were observed at these exposure levels. Birth defects (cleft palate) were observed at the high dose level. These data suggest that the risk of developmental and reproductive toxicity in humans is negligible as a result of anticipated

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exposures to MTBE.

Diisopropyl Ether (DIPE):

Increased kidney and liver weights were observed in rats and mice in subchronic and chronic inhalation studies of DIPE. Also, evidence of microscopic changes (hyaline droplets) were reported in liver tissue and kidney tubules of rabbits and male rats exposed to DIPE at concentrations of 7,100 ppm. These findings were similar those found in gasoline studies. Overexposure by inhalation of pregnant rats to DIPE at concentrations of 3,095 and 6,745 ppm increased the frequency of rudimentary 14th ribs in the offspring. This effect was not observed at exposure concentrations of 430 ppm. The significance of these findings to human exposure is unclear.

Ethanol:

Inhalation exposure to ethanol vapor at concentrations above applicable workplace exposure levels is expected to produce eye and mucus membrane irritation. Human exposure at concentrations from 1000 to 5000 ppm produced symptoms of narcosis, stupor and unconsciousness. Subjects exposed to ethanol vapor in concentrations between 500 and 10,000 ppm experienced coughing and smarting of the eyes and nose. At 15,000 ppm there was continuous lacrimation and coughing. While extensive acute and chronic effects can be expected with ethanol consumption, ingestion is not expected to be a significant route of exposure to this product.

Butane, all isomers:

Studies in laboratory animals indicate exposure to extremely high levels of butanes (1-10 or higher vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

n-Hexane:

This material contains n-hexane. Long-term or repeated exposure to n-hexane can cause permanent peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. Co-exposure to methylethyl ketone or methyl isobutyl ketone increases the neurotoxic properties of n-hexane. In laboratory studies, prolonged exposure to elevated concentrations of n-hexane was associated with decreased sperm count and degenerative changes in the testicles of rats.

Cumene:

Effects from Acute Exposure:

Overexposure to cumene may cause upper respiratory tract irritation and severe CNS depression.

Effects from Prolonged or Repeated Exposure:

Studies in laboratory animals indicate evidence of adverse effects on the kidney and adrenal glands following high level exposure. The relevance of these findings to humans is not clear at this time.

Trimethylbenzenes, all isomers:

Studies of Workers:

Levels of total hydrocarbon vapors present in the breathing atmosphere of these workers ranged from 10 to 60 ppm. The TCLo for humans is 10 ppm, with somnolence and respiratory tract irritation noted.

Studies in Laboratory Animals:

In inhalation studies with rats, four of ten animals died after exposures of 2400 ppm for 24 hours. An oral dose of 5 mL/kg resulted in death in one of ten rats. Minimum lethal intraperitoneal doses were 1.5 to 2.0 mL/kg in rats and 1.13 to 12 mL/kg in guinea pigs. Mesitylene (1, 3, 5 Trimethylbenzene) inhalation at concentrations of 1.5, 3.0, and 6.0 mg/L for six hours was associated with dose-related changes in white blood cell counts in rats. No significant effects on the complete blood count were noted with six hours per day exposure

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for five weeks, but elevations of alkaline phosphatase and SGOT were observed. Central nervous system depression and ataxia were noted in rats exposed to 5,100 to 9,180 ppm for two hours.

Benzene:

ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse].

INHALATION (LC50):

(VAPOR): Acute: 10000 ppm 7 hour(s) [Rat]. 9980 ppm 8 hour(s) [Mouse].

Studies of Workers Over-Exposed to Benzene:

Studies of workers exposed to benzene show clear evidence that over-exposure can cause cancer of the blood forming organs (acute myelogenous leukemia) and aplastic anemia, an often fatal disease. Studies also suggest over-exposure to benzene may be associated with other types of leukemia and other blood disorders. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of aplastic anemia have been reported in the offspring of persons severely over-exposed to benzene.

Studies in Laboratory Animals:

Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and skeletal variations.

Ethylbenzene:

Effects from Acute Exposure:

ORAL (LD50), Acute: 3,500 mg/kg [Rat].

DERMAL (LD50), Acute: 17,800 uL/kg [Rabbit].

INTRAPERITONEAL (LD50), Acute: 2,624 mg/kg [Rat].

Effects from Prolonged or Repeated Exposure:

Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). Also, the incidence of tumors was elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

Cyclohexane:

Cyclohexane can cause eye, skin and mucous membrane irritation, CNS depressant and narcosis at elevated concentrations. In experimental animals exposed to lethal concentrations by inhalation or oral route, generalized vascular damage and degenerative changes in the heart, lungs, liver, kidneys and brain were identified.

Cyclohexane has been the focus of substantial testing in laboratory animals. Cyclohexane was not found to be genotoxic in several tests including unscheduled DNA synthesis, bacterial and mammalian cell mutation assays, and in vivo chromosomal aberration. An increase in chromosomal aberrations in bone marrow cells of rats exposed to cyclohexane

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was reported in the 1980's. However, a careful re-evaluation of slides from this study by the laboratory which conducted the study indicates these findings were in error, and that no significant chromosomal effects were observed in animals exposed to cyclohexane. Findings indicate long-term exposure to cyclohexane does not promote dermal tumorigenesis.

Naphthalene:

Studies in Humans Overexposed to Naphthalene:

Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from over-exposure to naphthalene. Persons with Glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have also been reported from over-exposure to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect.

Studies in Laboratory Animals:

Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) *in vitro*.

Styrene:

Neurological injury associated with chronic styrene exposure include distal hypesthesia, decreased nerve conduction velocity, and altered psychomotor performance. These effects did not occur with exposures to airborne concentrations that were less than 100 ppm. Increased deaths from degenerative neurological disorders were found in a comprehensive epidemiological study of Danish reinforced plastics workers. These workers were reported to have a 2.5-fold increased risk for myeloid leukemia with clonal chromosome aberrations. Also, there are several studies that suggest potential reproductive effects in humans and experimental animals from overexposure to styrene. Styrene was not mutagenic in the standard (liquid phase) Ames Salmonella/microsome assay, but was weakly positive when tested in the vapor phase. IARC has listed styrene as possibly carcinogenic to humans (Group 2B).

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Unleaded gasoline is potentially toxic to freshwater and saltwater ecosystems. Various grades of gasoline exhibited range of lethal toxicity (LC₁₀₀) from 40 PPM to 100 PPM in ambient stream water with Rainbow Trout (*Salmo irideus*). A 24-hour TL_m (Median Toxic Limit) was calculated to be 90 PPM with juvenile American Shad (*Squalius cephalus*). In Bluegill Sunfish (*Lepomis macrochirus*), Grey Mullet (*Chelon labrosus*) and Gulf Menhaden (*Brevoortia patronus*), gasoline exhibited a 96-hour LC₅₀ of 8 PPM, 2 PPM, and 2 PPM, respectively.

The aquatic toxicity of Methyl tertiary-Butyl Ether (MTBE) is considered to be relatively low. In the crustacean Harpacticoid Copepods (*Nitocra spinipes*), MTBE exhibited an LC₅₀ (96-hour) of 1,000 PPM to 10,000 PPM depending upon various water temperatures. In Bleak Fish (*Alburnus alburnus*), MTBE exhibited an LC₅₀ (24-hour) of 1,700 PPM and an LC₅₀ (96-hour) of 1,000 PPM at 10° C. In Golden Orfe Fish (*Leuciscus idus melanotus*), MTBE exhibited an LC₅₀ (48-hour) of 1,000 PPM and an LC₁₀₀ of 2,000 PPM.

Environmental Fate

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Avoid spilling gasoline. Spilled gasoline can result in environmental damage. Spilled gasoline can penetrate soil and contaminate ground water. Although gasoline is biodegradable, it may persist for prolonged time periods, particularly where oxygen levels are reduced. The hydrocarbon components of gasoline are slightly soluble in water. Gasoline hydrocarbon components do not readily dissolve in water but can be adsorbed to soils.

Gasoline contains components that are potentially toxic to freshwater and saltwater ecosystems. It will normally float on water. The components of gasoline will evaporate rapidly. Evaporated hydrocarbon components may contribute to atmospheric smog.

MTBE and other oxygenates are more soluble than other gasoline components. In addition, oxygenates such as MTBE do not adsorb to soils, sediments or suspended particulate matter as readily as other gasoline components. MTBE does not degrade as readily as other gasoline components once in ground water or subsoil. MTBE is not expected to bioconcentrate in the aquatic environment.

SECTION 13. DISPOSAL CONSIDERATIONS

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Maximize material recovery for reuse or recycling. Recovered non-usable material may be regulated by US EPA as a hazardous waste due to its ignitibility (D001) and/or its toxic (D018) characteristics. Conditions of use may cause this material to become a "hazardous waste", as defined by federal or state regulations. It is the responsibility of the user to determine if the material is a RCRA "hazardous waste" at the time of disposal. Transportation, treatment, storage and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR 260 through 40 CFR 271). State and/or local regulations may be more restrictive. Contact your regional US EPA office for guidance concerning case specific disposal issues.

SECTION 14. TRANSPORT INFORMATION

The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.

US DOT Status	A U.S. Department of Transportation regulated material.		
Proper Shipping Name	Gasoline, 3, UN 1203, PG II Gasohol, 3, NA 1203, PGII (Use only for gasoline blended with less than 20% ethanol)		
Hazard Class	3 DOT Class: Flammable liquid.	Packing Group(s)	II
		UN/NA Number	UN1203 or NA1203
Reportable Quantity	A Reportable Quantity (RQ) has not been established for this material.		
Placard(s)		Emergency Response Guide No.	128
		MARPOL III Status	Not a DOT "Marine Pollutant" per 49 CFR 171.8.

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SECTION 15. REGULATORY INFORMATION

TSCA Inventory	This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory.
SARA 302/304 Emergency Planning and Notification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified.
SARA 311/312 Hazard Identification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories: fire, Acute (Immediate) Health Hazard, Chronic (Delayed) Health Hazard
SARA 313 Toxic Chemical Notification and Release Reporting	This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA: Toluene [CAS No.: 108-88-3] Concentration: <20% Xylene, all isomers [CAS No.: 1330-20-7] Concentration: <18% Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] Concentration: <15% n-Hexane [CAS No.: 110-54-3] Concentration: <8% Cumene [CAS No.: 98-82-8] Concentration: <4% Benzene [CAS No.: 71-43-2] Concentration: <5% Ethylbenzene [CAS No.: 100-41-4] Concentration: <4% 1, 2, 4 Trimethylbenzene [CAS No.: 95-63-6] Concentration: <4% Cyclohexane [CAS No.: 110-82-7] Concentration: <3% Naphthalene [CAS No.: 91-20-3] Concentration: <2% Styrene [CAS No.: 100-42-5] Concentration: <1%
CERCLA	The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are: Toluene [CAS No.: 108-88-3] RQ = 1000 lbs. (453.6 kg) Concentration: <20% Xylene, all isomers [CAS No.: 1330-20-7] RQ = 100 lbs. (45.36 kg) Concentration: <18% Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] RQ = 1000 lbs. (453.6 kg) Concentration: <15% n-Hexane [CAS No.: 110-54-3] RQ = 5000 lbs. (2268 kg) Concentration: <8% 2,2,4-Trimethylpentane [CAS No.: 540-84-1] RQ = 1000 lbs. (453.6 kg) Concentration: <5% Benzene [CAS No.: 71-43-2] RQ = 10 lbs. (4.536 kg) Concentration: <5% Cumene [CAS No.: 98-82-8] RQ = 5000 lbs. (2268 kg) Concentration: <4% Ethylbenzene [CAS No.: 100-41-4] RQ = 1000 lbs. (453.6 kg) Concentration: <4% Cyclohexane [CAS No.: 110-82-7] RQ = 1000 lbs. (453.6 kg) Concentration: <3% Naphthalene [CAS No.: 91-20-3] RQ = 100 lbs. (45.36 kg) Concentration: <2% Styrene [CAS No.: 100-42-5] RQ = 1000 lbs. (453.6 kg) Concentration: <1%
Clean Water Act (CWA)	This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.
California Proposition 65	

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This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): Gasoline (Wholly Vaporized and Engine Exhaust), Benzene [CAS No. 71-43-3], Toluene [CAS No. 108-88-3], Ethylbenzene [CAS No.100-41-4] and Naphthalene [CAS No.91-20-3]

New Jersey
Right-to-Know Label

Gasoline [NJDEP CAS No. 8006-61-9]

Additional Regulatory
Remarks

As minimum requirements, CITGO recommends that the following advisory information be displayed on equipment used to dispense gasoline in motor vehicles. Additional warnings specified by various regulatory authorities may be required: "DANGER: Extremely Flammable. Use as a Motor Fuel Only. No Smoking. Stop Engine. Turn Off All Electronic Equipment including Cellular Telephones. Do Not Overfill Tank. Keep Away from Heat and Flames. Do Not leave nozzle unattended during refueling. **Static Sparks Can Cause a Fire, especially when filling portable containers.** Containers must be metal or other material approved for storing gasoline. PLACE CONTAINER ON GROUND. DO NOT FILL ANY PORTABLE CONTAINER IN OR ON A VEHICLE. Keep nozzle spout in contact with the container during the entire filling operation. **Harmful or Fatal if Swallowed. Long-Exposure Has Caused Cancer in Laboratory Animals.** Avoid prolonged breathing of vapors. Keep face away from nozzle and gas tank. Never siphon by mouth."

WHMIS Class B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

WHMIS Class D-2B: Material causing other toxic effects (TOXIC).

SECTION 16. OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

REVISION INFORMATION

Version Number 7.0
Revision Date 05/23/2005
Print Date Printed on 05/23/2005.

ABBREVIATIONS

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established
ACGIH: American Conference of Governmental Industrial Hygienists AIHA: American Industrial Hygiene Association
IARC: International Agency for Research on Cancer NTP: National Toxicology Program
NIOSH: National Institute of Occupational Safety and Health OSHA: Occupational Safety and Health Administration
NPCA: National Paint and Coating Manufacturers Association HMIS: Hazardous Materials Information System
NFPA: National Fire Protection Association EPA: US Environmental Protection Agency

DISCLAIMER OF LIABILITY

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.

THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

CITGO Gasolines, All Grades Unleaded

***** END OF MSDS *****



CITGO No. 1 Diesel Fuel, All Grades

Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210

MSDS No. AG1DF
Revision Date 5/31/2006

IMPORTANT: This MSDS is prepared in accordance with 29 CFR 1910.1200. Read this MSDS before transporting, handling, storing or disposing of this product and forward this information to employees, customers and users of this product.

Hazard Rankings		
	HMIS	NFPA
Health Hazard	* 1	0
Fire Hazard	2	2
Reactivity	0	0

* = Chronic Health Hazard

Emergency Overview

Physical State Liquid.
Color Clear to light amber. **Odor** Characteristic, kerosene-like.

WARNING!
Combustible liquid; vapor may cause flash fire.
Harmful or fatal if swallowed - can enter lungs and cause damage.
Mist or vapor can irritate the respiratory tract.
Liquid contact can cause eye or skin irritation.
May be harmful if inhaled or absorbed through the skin.
Overexposure can cause central nervous system (CNS) depression and/or other target organ effects.
Diesel engine exhaust can cause upper respiratory tract irritation and reversible pulmonary effects.
Spills may create a slipping hazard.

Protective Equipment

Minimum Recommended
See Section 8 for Details



SECTION 1. PRODUCT IDENTIFICATION

Trade Name	CITGO No. 1 Diesel Fuel, All Grades	Technical Contact	(832) 486-5940 or (918) 495-5939
Product Number	Various	Medical Emergency	(832) 486-4700
CAS Number	8008-20-6	CHEMTREC Emergency (United States Only)	(800) 424-9300
Product Family	Fuels.		
Synonyms	None		

SECTION 2. COMPOSITION

This product may be composed, in whole or in part, of any of the following refinery streams:

- Kerosene [CAS No.: 8008-20-6]
- Hydrodesulfurized Kerosine (Petroleum) [CAS No.: 64742-81-0]
- Hydrodesulfurized Middle Distillate (petroleum) [CAS No.: 64742-80-9]
- Straight-run Middle Distillate (Petroleum) [CAS No.: 64741-44-2]
- Hydrodesulfurized Light Catalytic Cracked Distillate (Petroleum) [CAS No.: 68333-25-5]
- Light Catalytic Cracked Distillate (Petroleum) [CAS No.: 64741-59-9]

This product contains the following chemical components:

Component Name(s)	CAS Registry No.	Concentration (%)
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Nonane, all isomers	Mixture.	20 - 30
Ethylmethylbenzenes (Ethyltoluenes)	25550-14-5	1 - 3
Naphthalene	91-20-3	0 - 3
Trimethylbenzenes, all isomers	25551-13-7	0 - 2
Biphenyl (Diphenyl)	92-52-4	0 - 2
Ethylbenzene	100-41-4	0 - 1
Xylene, all isomers	1330-20-7	0 - 1
1, 2, 4 Trimethylbenzene	95-63-6	0 - 1
Cumene	98-82-8	0 - 1

SECTION 3. HAZARDS IDENTIFICATION

Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.

Major Route(s) of Entry Skin contact. Eye contact. Inhalation.

Signs and Symptoms of Acute Exposure

Inhalation Breathing mist or vapors concentrations well above occupational exposure levels can irritate the mucous membranes of the nose, throat, bronchi, and lungs and can cause transient central nervous system (CNS) depression. Signs and symptoms of CNS depression include headache, dizziness, nausea, blurred vision, slurred speech, flushed face, confusion, weakness, fatigue or loss of consciousness depending upon the concentration and/or duration of exposure. In severe cases, overexposure by inhalation can cause convulsions, coma, or death.

Eye Contact This product can cause eye irritation with short-term contact with liquid, mists or vapor. Symptoms include stinging, watering, redness, and swelling. In severe cases, permanent eye damage can result.

Skin Contact Animal test results on similar materials suggest that this product can cause moderate to severe skin irritation. Symptoms include redness, itching, and burning of the skin. Also, certain components of this material may be absorbed through the skin and produce CNS depression effects (see "Inhalation" above). If the skin is damaged, absorption increases. Prolonged and/or repeated contact may cause severe dermatitis and/or more serious skin disorders. Chronic symptoms may include drying, swelling, scaling, blistering, cracking, and/or severe tissue damage.

Ingestion If swallowed, this material may irritate the mouth, throat, and esophagus. It can be absorbed into the blood stream through the stomach and intestinal tract. Symptoms may include a burning sensation of the mouth and esophagus, nausea and vomiting. In addition, it can cause central nervous system effects characterized by dizziness, staggering, drowsiness, delirium and/or loss of consciousness.

Because of the low viscosity, this material can enter the lungs directly by aspiration during swallowing or subsequent vomiting. Aspiration of a small amount of liquid can cause severe lung damage and/or death.

Chronic Health Effects Summary Secondary effects of ingestion and subsequent aspiration into the lungs may cause pneumatocele (lung cavity) formation and chronic lung dysfunction.

This product contains petroleum middle distillates similar to those shown to produce skin tumors on laboratory rodents following repeated application. All tumors appeared during the latter portion of the typical 2-year lifespan of the animals. Certain studies have shown that washing the exposed skin of the test animal with soap and water between treatments greatly reduces the potential tumorigenic effects. These data suggest that good personal hygiene is effective in reducing the risk of this potential adverse health effect.

This material and/or its components have been associated with developmental toxicity, reproductive toxicity, genotoxicity, immunotoxicity, and/or carcinogenicity. Refer to Section 11 of this MSDS for additional health-related information.

Conditions Aggravated by Exposure Medical conditions aggravated by exposure to this material may include skin disorders, chronic respiratory diseases, neurological conditions, liver or kidney dysfunction.

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Target Organs May cause damage to the following organs: kidneys, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

Carcinogenic Potential This material contains ethylbenzene and naphthalene at concentrations at or above 0.1%. Ethylbenzene is considered possibly carcinogenic to humans by IARC. (See Section 11.) NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen.

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

OSHA Health Hazard Classification				OSHA Physical Hazard Classification			
Irritant	<input checked="" type="checkbox"/>	Sensitizer	<input type="checkbox"/>	Combustible	<input checked="" type="checkbox"/>	Explosive	<input type="checkbox"/>
Toxic	<input type="checkbox"/>	Highly Toxic	<input type="checkbox"/>	Flammable	<input type="checkbox"/>	Oxidizer	<input type="checkbox"/>
Corrosive	<input type="checkbox"/>	Carcinogenic	<input type="checkbox"/>	Compressed Gas	<input type="checkbox"/>	Organic Peroxide	<input type="checkbox"/>
						Pyrophoric	<input type="checkbox"/>
						Water-reactive	<input type="checkbox"/>
						Unstable	<input type="checkbox"/>

SECTION 4. FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

Inhalation Move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. Keep the affected individual warm and at rest.

Eye Contact Check for and remove contact lenses. Flush eyes with cool, clean, low-pressure water for at least 15 minutes while occasionally lifting and lowering eyelids. Do not use eye ointment unless directed to by a physician. Seek medical attention if excessive tearing, irritation, or pain persists.

Skin Contact Remove contaminated shoes and clothing. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. Do not use ointments. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists.

Ingestion Do not induce vomiting. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Never give anything by mouth to a person who is not fully conscious. Do not leave victim unattended. Seek medical attention immediately.

Notes to Physician Inhalation overexposure can produce toxic effects. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Vigorous anti-inflammatory/steroid treatment may be required at first evidence of upper airway or pulmonary edema. Administer 100 percent humidified supplemental oxygen with assisted ventilation, as required.

If ingested, this material presents a significant aspiration/lipoid or chemical pneumonitis hazard. As a result, induction of emesis is not recommended. Consider administration of an aqueous slurry of activated charcoal followed by a cathartic such as magnesium citrate or sorbitol. Also, treatment may involve careful gastric lavage if performed soon after ingestion or in patients who are comatose or at risk of convulsing. Protect the airway by placement in Trendelenburg and left lateral decubitus position or by cuffed endotracheal intubation. If vital signs become abnormal or symptoms develop, obtain a chest x-ray and liver function tests. Antibiotics are indicated if pulmonary bacterial infection occurs. Monitor for cardiac function and arterial blood gases in severe exposure cases.

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SECTION 5. FIRE FIGHTING MEASURES

NFPA Flammability Classification	NFPA Class-II combustible liquid.		
Flash Point	Closed cup: 38°C (100°F). (Pensky-Martens. (Minimum))		
Lower Flammable Limit	AP 0.7 %	Upper Flammable Limit	AP 5 %
Autoignition Temperature	>254°C (489.2°F)		
Hazardous Combustion Products	Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons and oxides of sulfur and/or nitrogen.		
Special Properties	Combustible Liquid! This material releases vapors when heated above ambient temperatures. Vapors can cause a flash fire. Vapors can travel to a source of ignition and flashback. A vapor and air mixture can create an explosion hazard in confined spaces such as sewers. Use only with adequate ventilation. If container is not properly cooled, it can rupture in the heat of a fire.		
Extinguishing Media	SMALL FIRE: Use dry chemicals, carbon dioxide, foam, water fog, or inert gas (nitrogen). LARGE FIRE: Use foam, water fog, or water spray. Water fog and spray are effective in cooling containers and adjacent structures. However, water can cause frothing and/or may not extinguish the fire. Water can be used to cool the external walls of vessels to prevent excessive pressure, autoignition or explosion. DO NOT use a solid stream of water directly on the fire as the water may spread the fire to a larger area.		
Protection of Fire Fighters	Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles. Cover pooling liquid with foam. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines. Be aware that burning liquid will float on water. Notify appropriate authorities of potential fire and explosion hazard if liquid enter sewers or waterways.		

SECTION 6. ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Combustible Liquid! Release can result in a fire hazard. Evacuate all non-essential personnel from release area. Establish a regulated zone with site control and security. Eliminate all ignition sources. Stop the leak if it can be done without risk. A vapor-suppressing foam may be used to reduce vapors. Properly bond or ground all equipment used when handling this material. Avoid skin contact. Do not walk through spilled material. Verify that responders are properly trained and wearing appropriate personnel protective equipment. Dike far ahead of a liquid spill. Do not allow released material to enter waterways, sewers, basements, or confined areas. This material will float on water. Absorb or cover with dry earth, sand or other non-combustible material. Use clean, non-sparking tools to collect absorbed material. Place spent sorbent materials, free liquids and other clean-up debris into proper waste containers for appropriate disposal. Certain releases must be reported to the National Response Center (800/424-8802) and state or regulatory authorities. Comply with all laws and regulations.

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SECTION 7. HANDLING AND STORAGE

Handling

Combustible Liquid!

A static electrical charge can accumulate when this material is flowing through pipes, nozzles or filters and when it is agitated. A static spark discharge can ignite accumulated vapors particularly during dry weather conditions. Always bond receiving containers to the fill pipe before and during loading. Always keep nozzle in contact with the container throughout the loading process. Do not fill any portable container in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously containing gasoline or similar low flash point products).

Fire hazard increases as product temperature approaches its flash point. Keep container closed and drum bungs in place. Remove spillage immediately from walking areas. Do not handle or store near heat, sparks or other potential ignition sources. Do not handle or store with oxidizing agents. Avoid breathing mist or vapor. Never siphon by mouth. Do not taste or swallow. Avoid contact with eyes, skin and clothing. Use gloves constructed of impervious materials and protective clothing if direct contact is anticipated. Provide ventilation to maintain exposure potential below applicable exposure levels. Avoid water contamination. Wash thoroughly after handling. Prevent contact with food or tobacco products.

When performing repairs and maintenance on contaminated equipment, keep unnecessary persons from hazard area. Eliminate heat, flame and other potential ignition sources. Drain and purge equipment, as necessary, to remove material residues. Remove contaminated clothing. Wash exposed skin thoroughly with soap and water after handling.

Storage

Store in a cool, dry, well-ventilated place. Keep containers tightly closed. Do not store this product near heat, flame or other potential ignition sources. Do not store with oxidizers. Do not store this product in unlabeled containers. Do not puncture or incinerate containers. Ground all equipment containing this material. All electrical equipment in areas where this material is stored or handled must meet all applicable requirements of the NFPA's National Electrical Code (NEC). Store and transport in accordance with all applicable laws.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls

Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits indicated below. All electrical equipment should comply with the National Electric Code. An emergency eye wash station and safety shower should be located near the work-station.

Personal Protective Equipment

Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.



Eye Protection

Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. A suitable emergency eye wash water and safety shower should be located near the work station.

Hand Protection

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Avoid skin contact. Use heavy duty gloves constructed of chemical resistant materials such as Viton® or heavy nitrile rubber. Wash hands with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities or leaving work. DO NOT use gasoline, kerosene, solvents or harsh abrasives as skin cleaners.

Body Protection

Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discarded contaminated leather goods.

Respiratory Protection

Airborne concentration will determine the level of respiratory protection required. Respiratory protection is normally not required unless the product is heated or misted. For known or anticipated vapor or mist concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator equipped with a dust/mist prefilter if adequate protection is provided. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134).

General Comments

Warning! Use of this material in spaces without adequate ventilation may result in generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

Occupational Exposure Guidelines

Substance	Applicable Workplace Exposure Levels
Nonane, all isomers	ACGIH (United States). TWA: 200 ppm 8 hour(s).
Ethylmethylbenzene, all isomers	Not available.
Naphthalene	ACGIH (United States). Skin TWA: 10 ppm 8 hour(s). STEL: 15 ppm 15 minute(s).
Trimethylbenzenes, all isomers	OSHA (United States). TWA: 10 ppm 8 hour(s).
Biphenyl (Diphenyl)	ACGIH (United States). TWA: 25 ppm 8 hour(s).
Ethylbenzene	ACGIH TLV (United States). TWA: 0.2 ppm 8 hour(s). OSHA PEL Z2 (United States). TWA: 0.2 ppm 8 hour(s).
Xylene, all isomers	ACGIH (United States). TWA: 100 ppm 8 hour(s). STEL: 125 ppm 15 minute(s).
1, 2, 4 Trimethylbenzene	OSHA (United States). TWA: 100 ppm 8 hour(s).
Cumene	ACGIH (United States). TWA: 100 ppm 8 hour(s). STEL: 150 ppm 15 minute(s).
Sulfur	OSHA (United States). TWA: 100 ppm 8 hour(s). Not available.
Diesel exhaust particulate	ACGIH (United States). TWA: 50 ppm 8 hour(s). OSHA (United States). Skin TWA: 50 ppm 8 hour(s). ACGIH (United States, 1996). TWA: 2 ppm STEL: 5 ppm OSHA (United States). TWA: 5 ppm NIOSH TWA: 2 ppm STEL: 5 ppm ACGIH (United States, 2001).

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Toluene	TWA: 0.05 mg/m ³ ACGIH (United States). Skin TWA: 50 ppm 8 hour(s). OSHA (United States). TWA: 200 ppm 8 hour(s). CEIL: 300 ppm PEAK: 500 ppm
Benzene	ACGIH (United States). Skin TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s). OSHA (United States). Skin Notes: See Table Z-2 for exclusions in 20 CFR 1910.1028 to the PEL. TWA: 1 ppm 8 hour(s). STEL: 5 ppm 15 minute(s).
Middle distillates, petroleum Kerosene	Not available. NIOSH REL (United States). TWA: 100 mg/m ³ 8 hour(s).
Hydrodesulfurized Kerosine (Petroleum) Hydrodesulfurized middle distillate (petroleum) Straight-run middle distillate (petroleum)	Not available. Not available. ACGIH (United States, 1998). Skin TWA: 100 mg/m ³
Distillates, petroleum, hydrodesulfurized light catalytic cracked	Not available.
Distillates, petroleum, light catalytic cracked	Not available.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

Physical State	Liquid.	Color	Clear to light amber.	Odor	Characteristic, kerosene-like.
Specific Gravity	0.82 (Water = 1)	pH	Not Applicable.	Vapor Density	4 (Air = 1)
Boiling Range	AP 150° C (AP 302° F)			Melting/Freezing Point	Not available.
Vapor Pressure	<0.3 kPa (<2 mm Hg) (at 20°C)			Volatility	AP 825 g/l VOC (W%) (ASTM D2369) =
Solubility in Water	Very slightly soluble in cold water.			Viscosity (cSt @ 40°C)	AP 3
Flash Point	Closed cup: 38°C (100°F). (Pensky-Martens. (Minimum))				
Additional Properties	Density = AP 6.8 lbs/gal.; Viscosity (ASTM D2161) = 30 - 40 SUS @ 100° F				

SECTION 10. STABILITY AND REACTIVITY

Chemical Stability	Stable.	Hazardous Polymerization	Not expected to occur.
Conditions to Avoid	Keep away from heat, flame and other potential ignition sources. Keep away from strong oxidizing conditions and agents.		
Materials Incompatibility	Strong acids, alkalis, and oxidizers such as liquid chlorine, other halogens, hydrogen peroxide and oxygen.		
Hazardous Decomposition Products	No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS.		

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SECTION 11. TOXICOLOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.

Toxicity Data

Naphthalene

Studies in Humans Overexposed to Naphthalene:

Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from over-exposure to naphthalene. Persons with Glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have also been reported from over-exposure to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect.

Studies in Laboratory Animals:

Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) *in vitro*.

Trimethylbenzenes, all isomers

Studies of Workers:

Levels of total hydrocarbon vapors present in the breathing atmosphere of these workers ranged from 10 to 60 ppm. The TClO for humans is 10 ppm, with somnolence and respiratory tract irritation noted.

Studies in Laboratory Animals:

In inhalation studies with rats, four of ten animals died after exposures of 2400 ppm for 24 hours. An oral dose of 5 mL/kg resulted in death in one of ten rats. Minimum lethal intraperitoneal doses were 1.5 to 2.0 mL/kg in rats and 1.13 to 12 mL/kg in guinea pigs. Mesitylene (1, 3, 5 Trimethylbenzene) inhalation at concentrations of 1.5, 3.0, and 6.0 mg/L for six hours was associated with dose-related changes in white blood cell counts in rats. No significant effects on the complete blood count were noted with six hours per day exposure for five weeks, but elevations of alkaline phosphatase and SGOT were observed. Central nervous system depression and ataxia were noted in rats exposed to 5,100 to 9,180 ppm for two hours.

Biphenyl (Diphenyl)

Studies in Humans Overexposed to Biphenyl:

Evidence of adverse effects on the liver and the nervous system have been described in studies of workers exposed to high levels for prolonged periods.

Studies in Laboratory Animals:

Evidence of adverse effects on the kidney and liver, and changes in whole blood (reduced hematocrit and hemoglobin levels) have been observed in laboratory rodents following subchronic exposure to biphenyl.

Genotoxicity & Carcinogenicity:

Biphenyl tested negative in bacteriological systems but some evidence of positive responses have been reported in mammalian cell systems in the presence of metabolic activation. The EPA has determined human and animal data are inadequate to classify the carcinogenic potential of biphenyl.

Ethylbenzene

Effects from Acute Exposure:

ORAL (LD50), Acute: 3,500 mg/kg [Rat].

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DERMAL (LD50), Acute: 17,800 uL/kg [Rabbit].
INTRAPERITONEAL (LD50), Acute: 2,624 mg/kg [Rat].

Effects from Prolonged or Repeated Exposure:

Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). Also, the incidence of tumors was elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

Diesel exhaust particulate

Lung tumor and lymphomas were identified in rats and mice exposed to unfiltered diesel fuel exhaust in chronic inhalation studies. Further, epidemiological studies have identified increase incidences of lung cancer in US railroad workers and bladder cancer in bus and truck drivers possibly associated with exposure to diesel engine exhaust. NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen. In addition, NIOSH has identified complete diesel exhaust as a potential carcinogen.

Hydrodesulfurized middle distillate (petroleum)

INHALATION LC50, Acute: 4.6 to 7.64 mg/L for four hours [Rat] - Dyspnea, nasal discharge, alopecia and excessive salivation.

ORAL LD50, Acute >500 g/kg [Rat Screening Level] Diarrhea, hyperactivity, ptosis and somnolence.

DERMAL LD50, Acute: >2,000 mg/kg [Rabbit Screening Level]

BUEHLER DERMAL, Acute: Non-sensitizing [Guinea Pig].

14-Day DERMAL, Subchronic: 0.05 ml/kg applied 3 times per week [Mouse, Human skin grafted to Athymic nude Mice] - Irritation and epidermal hyperplasia.

62-Week DERMAL, Chronic: 0.05 ml/kg applied 3 times per week [Mouse] - Extreme skin irritation; moderate increase in contact-point skin tumors.

Straight-run middle distillate (petroleum)

INHALATION, LC50, Acute: 1.72 mg/L for four hours [Male Rat].

INHALATION, LC50, Acute: 1.82 mg/L for 4 hours [Female Rat].

ORAL, LD50, Acute: >5,000 mg/kg [Rat screening level] - Diarrhea, hypoactivity and somnolence.

DERMAL, LD50, Acute: >2,000 mg/kg [Rabbit screen].

BUEHLER DERMAL, Acute: Non-sensitizing [Guinea Pig].

28-Day DERMAL, Subchronic: Moderate irritation at 200 to 2,000 mg/kg with no other treatment-related clinical effects observed.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Freshwater Toxicity:

Concentration: 2400 ppm Exposure: 48 hrs. Species: Juven. Am. Shad (*Squalius cephalus*) Effect: TLM

Concentration: >127 ppm Exposure: 96 hrs. Species: Bluegill (*Lepomis macrochirus*) Effect: LC50

Saltwater Toxicity

Concentration: 10 ppm Exposure: 96 hrs. Species: Menhaden (*Brevoortia patronus*) Effect: LC50

Concentration: 10 ppm Exposure: 96 hrs. Species: Grass Shrimp Effect: LC50

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Environmental Fate

If spilled, this material will normally evaporate. Hydrocarbon components may contribute to atmospheric smog. If released to the subsoils, petroleum middle distillate fuels will strongly adsorb to soils. Groundwater should be considered as an exposure pathway. Liquid and vapor can migrate through the subsurface and preferential pathways (such as utility line backfill) to downgradient receptors.

Middle distillates are potentially toxic to freshwater and saltwater ecosystems. Distillate fuels will normally float on water. In stagnant or slow-flowing waterways, a hydrocarbon layer can cover a large surface area. As a result, this oil layer can limit or eliminate natural atmospheric oxygen transport into the water. With time, if not removed, oxygen depletion in the waterway can cause a fish kill or create an anaerobic environment. Also, this coating action can also kill plankton, algae, and water birds.

SECTION 13. DISPOSAL CONSIDERATIONS

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Maximize material recovery for reuse or recycling. If spilled material is introduced into a wastewater treatment system, chemical and biological oxygen demand (COD and BOD) will likely increase. Vapor emissions from a bio-oxidation process contaminated with this material might be a potential health hazard.

Recovered non-usable material may be regulated by US EPA as a hazardous waste due to its ignitibility characteristic (D001). In addition, conditions of use may cause this material to become a hazardous waste, as defined by Federal or State regulations. It is the responsibility of the user to determine if the material is a hazardous waste at the time of disposal. Transportation, treatment, storage, and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR Parts 260 through 271). Contact your regional US EPA office for guidance concerning case specific disposal issues. State and/or local regulations might be even more restrictive.

SECTION 14. TRANSPORT INFORMATION

The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.

US DOT Status A U.S. Department of Transportation (DOT) regulated material. The following U. S. DOT hazardous materials shipping description applies to bulk packaged material that is transported by highway or rail. Alternate shipping descriptions may be required for product transported by marine vessel, air or other method and for non-bulk packaged material.

Proper Shipping Name Diesel Fuel, No. 1, Combustible liquid, NA1993, PG III

Hazard Class DOT Class: Combustible liquid with a flash point greater than 37.8°C (100°F). **Packing Group(s)** III
UN/NA Number NA 1993 or UN 1202

Reportable Quantity A Reportable Quantity (RQ) has not been established for this material.

Placard(s)



Emergency Response Guide No. 128

MARPOL III Status Not a DOT "Marine Pollutant" per 49 CFR 171.8.

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SECTION 15. REGULATORY INFORMATION

TSCA Inventory	This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory.
SARA 302/304 Emergency Planning and Notification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified.
SARA 311/312 Hazard Identification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories: fire, Acute (Immediate) Health Hazard, Chronic (Delayed) Health Hazard
SARA 313 Toxic Chemical Notification and Release Reporting	This product contains the following components in concentrations above <i>de minimis</i> levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA: Naphthalene [CAS No.: 91-20-3] Concentration: 1.5% Biphenyl (Diphenyl) [CAS No.: 92-52-4] Concentration: 1% Ethylbenzene [CAS No.: 100-41-4] Concentration: 0.5%
CERCLA	The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are: Naphthalene [CAS No.: 91-20-3] RQ = 100 lbs. (45.36 kg) Concentration: 1.5% Ethylbenzene [CAS No.: 100-41-4] RQ = 1000 lbs. (453.6 kg) Concentration: 0.5% Xylene, all isomers [CAS No.: 1330-20-7] RQ = 100 lbs. (45.36 kg) Concentration: 0.5% Cumene [CAS No.: 98-82-8] RQ = 5000 lbs. (2268 kg) Concentration: 0.5% Benzene [CAS No.: 71-43-2] RQ = 10 lbs. (4.536 kg) Concentration: 0.045%
Clean Water Act (CWA)	This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.
California Proposition 65	This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): Naphthalene: 1.5% Ethylbenzene: 0.5% Diesel exhaust particulate Toluene: 0.045% Benzene: 0.045%
New Jersey Right-to-Know Label	Diesel Fuel
Additional Remarks	Federal Hazardous Substances Act, related statutes, and Consumer Product Safety Commission regulations, as defined by 16 CFR 1500.14(b)(3) and 1500.83(a)(13): This product contains "Petroleum Distillates" which may require special labeling if distributed in a manner intended or packaged in a form suitable for use in the household or by children. Precautionary label dialogue should display the following: DANGER: Contains Petroleum Distillates! Harmful or fatal if swallowed! Call Physician Immediately. KEEP OUT OF REACH OF CHILDREN!

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SECTION 16. OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

REVISION INFORMATION

Version Number 2.0
Revision Date 5/31/2006
Print Date Printed on 5/31/2006.

ABBREVIATIONS

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established
ACGIH: American Conference of Governmental Industrial Hygienists AIHA: American Industrial Hygiene Association
IARC: International Agency for Research on Cancer NTP: National Toxicology Program
NIOSH: National Institute of Occupational Safety and Health OSHA: Occupational Safety and Health Administration
NPCA: National Paint and Coating Manufacturers Association HMIS: Hazardous Materials Information System
NFPA: National Fire Protection Association EPA: US Environmental Protection Agency

DISCLAIMER OF LIABILITY

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.

THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

***** END OF MSDS *****

International Chemical Safety Cards

MERCURY

ICSC: 0056



Quicksilver
Liquid silver
Hg
Atomic mass: 200.6

ICSC # 0056
CAS # 7439-97-6
RTECS # OV4550000
UN # 2809
EC # 080-001-00-0



April 22, 2004 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION	Risk of fire and explosion.		In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Abdominal pain. Cough. Diarrhoea. Shortness of breath. Vomiting. Fever or elevated body temperature.	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work. Wash hands before eating.	Refer for medical attention.
SPILLAGE DISPOSAL		STORAGE	PACKAGING & LABELLING
Evacuate danger area in case of a large		Provision to contain effluent from fire	Special material. Do not transport with

<p>spill! Consult an expert! Ventilation. Collect leaking and spilled liquid in sealable non-metallic containers as far as possible. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Chemical protection suit including self-contained breathing apparatus.</p>	<p>extinguishing. Separated from food and feedstuffs Well closed.</p>	<p>food and feedstuffs. T symbol N symbol R: 23-33-50/53 S: 1/2-7-45-60-61 UN Hazard Class: 8 UN Packing Group: III</p>
SEE IMPORTANT INFORMATION ON BACK		
<p>ICSC: 0056 Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>		

International Chemical Safety Cards

MERCURY

ICSC: 0056

<p>I M P O R T A N T D A T A</p>	<p>PHYSICAL STATE; APPEARANCE: ODOURLESS, HEAVY AND MOBILE SILVERY LIQUID METAL.</p> <p>PHYSICAL DANGERS:</p> <p>CHEMICAL DANGERS: Upon heating, toxic fumes are formed. Reacts violently with ammonia and halogens causing fire and explosion hazard. Attacks aluminium and many other metals forming amalgams.</p> <p>OCCUPATIONAL EXPOSURE LIMITS: TLV: 0.025 mg/m³ as TWA (skin) A4 BEI issued (ACGIH 2004). MAK: 0.1 mg/m³ Sh Peak limitation category: II(8) Carcinogen category: 3B (DFG 2003). OSHA PEL†: C 0.1 mg/m³ NIOSH REL: Hg Vapor: TWA 0.05 mg/m³ skin Other: C 0.1 mg/m³ skin NIOSH IDLH: 10 mg/m³ (as Hg) See: 7439976</p>	<p>ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its vapour and through the skin , also as a vapour!</p> <p>INHALATION RISK: A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: The substance is irritating to the skin. Inhalation of the vapours may cause pneumonitis. The substance may cause effects on the central nervous system and kidneys. The effects may be delayed. Medical observation is indicated.</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: The substance may have effects on the central nervous system kidneys , resulting in irritability, emotional instability, tremor, mental and memory disturbances, speech disorders. Danger of cumulative effects. Animal tests show that this substance possibly causes toxic effects upon human reproduction.</p>
PHYSICAL PROPERTIES	<p>Boiling point: 357°C Melting point: -39°C Relative density (water = 1): 13.5 Solubility in water: none</p>	<p>Vapour pressure, Pa at 20°C: 0.26 Relative vapour density (air = 1): 6.93 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.009</p>
ENVIRONMENTAL DATA	<p>The substance is very toxic to aquatic organisms. In the food chain important to humans, bioaccumulation takes place, specifically in fish.</p>	
NOTES		



Depending on the degree of exposure, periodic medical examination is indicated. No odour warning if toxic concentrations are present. Do NOT take working clothes home.

Transport Emergency Card: TEC (R)-80GC9-II+III

ADDITIONAL INFORMATION

ICSC: 0056

MERCURY

(C) IPCS, CEC, 1994

**IMPORTANT
LEGAL
NOTICE:**

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International Chemical Safety Cards

ALUMINIUM OXIDE

ICSC: 0351



alpha-Aluminum oxide
 Alumina
 Aluminum trioxide
 Al_2O_3
 Molecular mass: 101.9

ICSC # 0351
 CAS # 1344-28-1
 RTECS # [BD1200000](#)
 February 10, 2000 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Rinse and then wash skin with water and soap.
•EYES	Redness.	Safety goggles, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	

Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Wash away remainder with plenty of water. (Extra personal protection: P1 filter respirator for inert particles).

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0351

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ALUMINIUM OXIDE

ICSC: 0351

I M P O R T A N T A T A	PHYSICAL STATE; APPEARANCE: WHITE POWDER.	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol.
	PHYSICAL DANGERS:	INHALATION RISK: Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.
	CHEMICAL DANGERS:	EFFECTS OF SHORT-TERM EXPOSURE: Inhalation of high concentrations of dusts of this substance may cause eyes and upper respiratory tract irritation.
	OCCUPATIONAL EXPOSURE LIMITS: TLV: 10 mg/m ³ (as TWA) A4, for particulate matter containing no asbestos and < 1% crystalline silica (ACGIH 2000). MAK: 1.5 mg/m ³ (Respirable fraction) 4 mg/m ³ (Inhalable fraction) Pregnancy risk group: D (DFG 2006). OSHA PEL [†] : TWA 15 mg/m ³ (total) TWA 5 mg/m ³ (resp) NIOSH REL: See Appendix D NIOSH IDLH: N.D. See: IDLH INDEX	EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: The substance may have effects on the central nervous system

ENVIRONMENTAL DATA	
NOTES	
<p>There is a different and hard crystalline form of aluminium oxide which occurs abundantly in nature under the name corundum (CAS 1302-74-5). Other melting points: 2015°C (approx.) (corundum). Occurs also as the minerals: bauxite, bayerite, boehmite, diaspore, gibbsite. Card has been partly updated in October 2006. See section Occupational Exposure Limits.</p>	
ADDITIONAL INFORMATION	
ICSC: 0351	ALUMINIUM OXIDE

IMPORTANT LEGAL NOTICE:	<p>Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>
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International Chemical Safety Cards

ANTIMONY

ICSC: 0775



Antimony black
 Antimony regulus
 Stibium
 Sb
 Atomic mass: 121.8

ICSC # 0775
 CAS # 7440-36-0
 RTECS # [CC4025000](#)
 UN # 2871
 October 12, 2006 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with oxidants, halogens, acid(s).	water spray, foam, powder, carbon dioxide
EXPLOSION	Finely dispersed particles form explosive mixtures in air. Risk of fire and explosion on contact with	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough. (See Ingestion).	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.

•INGESTION	Abdominal pain. Vomiting. Diarrhoea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention if you feel unwell.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Personal protection: P2 filter respirator for harmful particles. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting.	Separated from oxidants acids, halogens food and feedstuffs.	Do not transport with food and feedstuffs. UN Hazard Class: 6.1 UN Packing Group: III	
SEE IMPORTANT INFORMATION ON BACK			
ICSC: 0775		Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

International Chemical Safety Cards

ANTIMONY

ICSC: 0775

I M P O R T A N T	<p>PHYSICAL STATE; APPEARANCE: SILVER-WHITE, LUSTROUS, HARD, BRITTLE LUMPS OR DARK GRAY POWDER</p> <p>PHYSICAL DANGERS: Dust explosion possible if in powder or granular form, mixed with air.</p> <p>CHEMICAL DANGERS: On combustion, forms toxic fumes (antimony oxides; see ICSC 0012). Reacts violently with oxidants, , causing fire and explosion hazard. On contact with acids may emit toxic gas (stibine; see ICSC 0776).</p> <p>OCCUPATIONAL EXPOSURE LIMITS: TLV: 0.5 mg/m³ as TWA (ACGIH 2006). MAK: Carcinogen category: 2 Germ cell mutagen group: 3B (DFG 2006). OSHA PEL*: TWA 0.5 mg/m³ *Note: The PEL also applies to other antimony compounds (as Sb).</p>	<p>ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol.</p> <p>INHALATION RISK: A harmful concentration of airborne particles can be reached quickly when dispersed.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: May cause mechanical irritation to the eyes.</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Repeated or prolonged contact with skin may cause dermatitis, especially when exposed to fumes. The substance may have effects on the lungs , resulting in pneumoconiosis.</p>
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International Chemical Safety Cards

ARSENIC

ICSC: 0013



Grey arsenic
 As
 Atomic mass: 74.9

ICSC # 0013
 CAS # 7440-38-2
 RTECS # [CG0525000](#)
 UN # 1558
 EC # 033-001-00-X
 October 18, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with strong oxidizers. NO contact with hot surfaces.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Risk of fire and explosion is slight when exposed to hot surfaces or flames in the form of fine powder or dust.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID ALL CONTACT! AVOID EXPOSURE OF (PREGNANT) WOMEN!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Cough. Sore throat. Shortness of breath. Weakness. See Ingestion.	Closed system and ventilation.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness.	Face shield or eye protection in combination with breathing protection if	First rinse with plenty of water for several minutes (remove contact lenses if

T A	<p>NIOSH IDLH: Ca 5 mg/m³ (as As) kidney impairment Exposure above the OEL may result in death. The effects may be delayed. Medical observation is indicated.</p> <p>See: 7440382</p> <p>TLV: 0.01 mg/m³ as TWA A1 (confirmed human carcinogen); BEI issued (ACGIH 2004).</p> <p>MAK: Carcinogen category: 1; Germ cell mutagen group: 3A; (DFG 2004).</p>	<p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the mucous membranes, skin, peripheral nervous system liver bone marrow , resulting in pigmentation disorders, hyperkeratosis, perforation of nasal septum, neuropathy, liver impairment anaemia This substance is carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.</p>
	PHYSICAL PROPERTIES	<p>Sublimation point: 613°C</p> <p>Density: 5.7 g/cm³</p>
ENVIRONMENTAL DATA		<p>The substance is toxic to aquatic organisms. It is strongly advised that this substance does not enter the environment.</p>
NOTES		
<p>The substance is combustible but no flash point is available in literature. Depending on the degree of exposure, periodic medical examination is suggested. Do NOT take working clothes home. Refer also to cards for specific arsenic compounds, e.g., Arsenic pentoxide (ICSC 0377), Arsenic trichloride (ICSC 0221), Arsenic trioxide (ICSC 0378), Arsine (ICSC 0222).</p> <p style="text-align: right;">Transport Emergency Card: TEC (R)-61GT5-II</p>		
ADDITIONAL INFORMATION		
ICSC: 0013		ARSENIC
(C) IPCS, CEC, 1994		
IMPORTANT LEGAL NOTICE:	<p>Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>	

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939



Chlorobiphenyl (54% chlorine)
Chlorodiphenyl (54% chlorine)
PCB
Molecular mass: 327 (average)

ICSC # 0939
CAS # 11097-69-1
RTECS # [TQ1360000](#)
UN # 2315
EC # 602-039-00-4
October 20, 1999 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: powder, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE!	
•INHALATION		Ventilation.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES		Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.

•INGESTION	Headache. Numbness.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Separated from food and feedstuffs Cool. Dry. Keep in a well-ventilated room.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Severe marine pollutant. Note: C Xn symbol N symbol R: 33-50/53 S: 2-35-60-61 UN Hazard Class: 9 UN Packing Group: II	
SEE IMPORTANT INFORMATION ON BACK			
<p>ICSC: 0939</p> <p>Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>			

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

I M P O R T A N T D	<p>PHYSICAL STATE; APPEARANCE: LIGHT YELLOW VISCOUS LIQUID.</p> <p>PHYSICAL DANGERS:</p> <p>CHEMICAL DANGERS: The substance decomposes in a fire producing irritating and toxic gases</p> <p>OCCUPATIONAL EXPOSURE LIMITS: TLV: 0.5 mg/m³ as TWA (skin) A3 (ACGIH 2004). MAK: 0.05 ppm 0.70 mg/m³ H Peak limitation category: II(8) Carcinogen category: 3B Pregnancy risk group: B (DFG 2004).</p>	<p>ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.</p> <p>INHALATION RISK: A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE:</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the liver Animal tests show that this</p>
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<p style="text-align: center;">A T A</p>	<p>OSHA PEL: TWA 0.5 mg/m³ skin substance possibly causes toxic effects upon human reproduction. NIOSH REL*: Ca TWA 0.001 mg/m³ See Appendix A *Note: The REL also applies to other PCBs. NIOSH IDLH: Ca 5 mg/m³ See: IDLH INDEX</p>
<p style="text-align: center;">PHYSICAL PROPERTIES</p>	<p>Relative density (water = 1): 1.5 Vapour pressure, Pa at 25°C: 0.01 Solubility in water: Octanol/water partition coefficient as log Pow: 6.30 (estimated) none</p>
<p style="text-align: center;">ENVIRONMENTAL DATA</p>	<p> In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. It is strongly advised not to let the chemical enter into the environment.</p>
<p>NOTES</p>	
<p>Changes into a resinous state (pour point) at 10°C. Distillation range: 365°-390°C. Transport Emergency Card: TEC (R)-90GM2-II-L</p>	
<p>ADDITIONAL INFORMATION</p>	
<p> </p>	
<p>ICSC: 0939 POLYCHLORINATED BIPHENYL (AROCLOR 1254) (C) IPCS, CEC, 1994</p>	
<p style="text-align: center;">IMPORTANT LEGAL NOTICE:</p>	<p>Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>

International Chemical Safety Cards

CHROMIUM

ICSC: 0029



Chrome
 Cr
 Atomic mass: 52.0
 (powder)

ICSC # 0029
 CAS # 7440-47-3
 RTECS # [GB4200000](#)
 October 27, 2004 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible under specific conditions.	No open flames if in powder form.	In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION		Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest.
•SKIN		Protective gloves.	Remove contaminated clothes. Rinse skin with plenty of water or shower.
•EYES	Redness.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Personal protection: P2 filter respirator for harmful particles.		
SEE IMPORTANT INFORMATION ON BACK		
ICSC: 0029	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

International Chemical Safety Cards

CHROMIUM

ICSC: 0029

I M P O R T A N T D A T A	<p>PHYSICAL STATE; APPEARANCE: GREY POWDER</p> <p>PHYSICAL DANGERS: Dust explosion possible if in powder or granular form, mixed with air.</p> <p>CHEMICAL DANGERS: Chromium is a catalytic substance and may cause reaction in contact with many organic and inorganic substances, causing fire and explosion hazard.</p> <p>OCCUPATIONAL EXPOSURE LIMITS: TLV: (as Cr metal, Cr(III) compounds) 0.5 mg/m³ as TWA A4 (ACGIH 2004). MAK not established. OSHA PEL*: TWA 1 mg/m³ See Appendix C *Note: The PEL also applies to insoluble chromium salts. NIOSH REL: TWA 0.5 mg/m³ See Appendix C NIOSH IDLH: 250 mg/m³ (as Cr) See: 7440473</p>	<p>ROUTES OF EXPOSURE:</p> <p>INHALATION RISK: A harmful concentration of airborne particles can be reached quickly when dispersed.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: May cause mechanical irritation to the eyes and the respiratory tract.</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</p>
PHYSICAL	Boiling point: 2642°C	Solubility in water:

PROPERTIES	Melting point: 1900°C Density: 7.15 g/cm ³		none
ENVIRONMENTAL DATA			
NOTES			
The surface of the chromium particles is oxidized to chromium(III)oxide in air. See ICSC 1531 Chromium(III) oxide.			
ADDITIONAL INFORMATION			
ICSC: 0029		CHROMIUM	
(C) IPCS, CEC, 1994			
IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.		

International Chemical Safety Cards

COAL-TAR PITCH

ICSC: 1415



Pitch

ICSC # 1415
 CAS # 65996-93-2
 RTECS # [GF8655000](#)
 EC # 648-055-00-5
 July 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Foam, dry powder, carbon dioxide.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT! PREVENT DISPERSION OF DUST!	
•INHALATION	Sneezing. Cough. See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	Closed system and ventilation.	Fresh air, rest.
•SKIN	MAY BE ABSORBED! Redness. Burning sensation.	Protective gloves. Protective clothing.	Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	See EFFECTS OF LONG-TERM OR REPEATED EXPOSURE.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give plenty of water to drink. Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Sweep spilled substance into	Separated from strong oxidants.	Do not transport with food and	

sealable containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: A/P2 filter respirator for organic vapour and harmful dust.)	Separated from food and feedstuffs	feedstuffs. Note: H T symbol R: 45 S: 53-45
SEE IMPORTANT INFORMATION ON BACK		
ICSC: 1415	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

International Chemical Safety Cards

COAL-TAR PITCH

ICSC: 1415

I M P O R T A N T A D V I S I O N	<p>PHYSICAL STATE; APPEARANCE: BLACK TO BROWN PASTE</p> <p>PHYSICAL DANGERS:</p> <p>CHEMICAL DANGERS: The substance decomposes on heating above 400°C producing toxic fumes Reacts with strong oxidants</p> <p>OCCUPATIONAL EXPOSURE LIMITS: TLV: (as benzene soluble aerosol for coal tar pitch volatiles) 0.2 mg/m³ as TWA A1 (ACGIH 2001). OSHA PEL: TWA 0.2 mg/m³ (benzene-soluble fraction) 1910.1002 See Appendix C NIOSH REL: Ca TWA 0.1 mg/m³ (cyclohexane-extractable fraction) See Appendix A See Appendix C NIOSH IDLH: Ca 80 mg/m³ See: 65996932</p>	<p>ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation and through the skin and by ingestion.</p> <p>INHALATION RISK: Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed and when heated.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: The substance is irritating to the eyes the skin and the respiratory tract</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Repeated or prolonged contact with skin may cause dermatitis and hyperpigmentation of skin. This substance is carcinogenic to humans.</p>
	<p>PHYSICAL PROPERTIES</p> <p>Boiling point: >250°C Melting point: 30-180°C Density: >1 g/cm³ Solubility in water:</p>	<p>Vapour pressure, kPa at 20°C: <0.01 Flash point: >200°C o.c. Auto-ignition temperature: >500°C Octanol/water partition coefficient as log Pow: 6.04</p>

	at 20°C none		
ENVIRONMENTAL DATA	 <p>This substance may be hazardous to the environment; special attention should be given to soil contamination and aquatic organisms. The substance may cause long-term effects in the aquatic environment.</p>		
NOTES			
<p>Depending on the degree of exposure, periodic medical examination is suggested.</p> <p style="text-align: right;">NFPA Code: H0; F1; R0;</p>			
ADDITIONAL INFORMATION			
<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 50%;"></td> <td style="width: 50%;"></td> </tr> </table>			
ICSC: 1415	COAL-TAR PITCH		
(C) IPCS, CEC, 1994			
IMPORTANT LEGAL NOTICE:	<p>Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>		

International Chemical Safety Cards

DDT

ICSC: 0034



Dichlorodiphenyltrichloroethane
 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane
 2,2-bis(p-Chlorophenyl)-1,1,1-trichloroethane
 1,1'-(2,2,2-Trichloroethylidene)bis(4-chlorobenzene)
 p,p'-DDT
 $C_{14}H_9Cl_5$
 Molecular mass: 354.5

ICSC # 0034
 CAS # 50-29-3
 RTECS # [KJ3325000](#)
 UN # 2761
 EC # 602-045-00-7
 April 20, 2004 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Cough.	Local exhaust or breathing	Fresh air, rest.

•SKIN		Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Safety goggles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Tremors. Diarrhoea. Dizziness. Headache. Vomiting. Numbness. Paresthesias. Hyperexcitability. Convulsions.	Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Rest. Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Do NOT let this chemical enter the environment. Sweep spilled substance into sealable non-metallic containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: P3 filter respirator for toxic particles.	Provision to contain effluent from fire extinguishing. Separated from iron, aluminum and its salts, food and feedstuffs See Chemical Dangers.	Do not transport with food and feedstuffs. Severe marine pollutant. T symbol N symbol R: 25-40-48/25-50/53 S: 1/2-22-36/37-45-60-61 UN Hazard Class: 6.1 UN Packing Group: III	
SEE IMPORTANT INFORMATION ON BACK			

International Chemical Safety Cards

DDT

ICSC: 0034

I M P O R T A	<p>PHYSICAL STATE; APPEARANCE: COLOURLESS CRYSTALS WHITE POWDER. TECHNICAL PRODUCT IS WAXY SOLID.</p> <p>PHYSICAL DANGERS:</p> <p>CHEMICAL DANGERS: On combustion, forms toxic and corrosive fumes including hydrogen chloride. Reacts with aluminium and iron.</p>	<p>ROUTES OF EXPOSURE: The substance can be absorbed into the body by ingestion.</p> <p>INHALATION RISK: Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly especially if powdered.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: May cause mechanical irritation. The substance may cause effects on</p>
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<p style="text-align: center;">N T D A T A</p>	<p>OCCUPATIONAL EXPOSURE LIMITS: TLV: 1 mg/m³ as TWA A3 (ACGIH 2004). MAK: 1 mg/m³ H Peak limitation category: II(8) (DFG 2003). OSHA PEL: TWA 1 mg/m³ skin NIOSH REL: Ca TWA 0.5 mg/m³ See Appendix A NIOSH IDLH: Ca 500 mg/m³ See: 50293</p> <p>the central nervous system , resulting in convulsions and respiratory depression Exposure at high levels may result in death. Medical observation is indicated.</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: The substance may have effects on the central nervous system and liver. This substance is possibly carcinogenic to humans. Animal tests show that this substance possibly causes toxicity to human reproduction or development.</p>
<p style="text-align: center;">PHYSICAL PROPERTIES</p>	<p>Boiling point: 260°C Melting point: 109°C Density: 1.6 g/cm³</p> <p>Solubility in water: poor Octanol/water partition coefficient as log Pow: 6.36</p>
<p style="text-align: center;">ENVIRONMENTAL DATA</p>	 <p>The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to birds. Bioaccumulation of this chemical may occur along the food chain, for example in milk and aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be given to avoid any additional release, e.g. through inappropriate disposal.</p>
<p>NOTES</p>	
<p>Depending on the degree of exposure, periodic medical examination is indicated. Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home. Consult national legislation. Agritan, Azotox, Anofex, Ixodex, Gesapon, Gesarex, Gesarol, Guesapon, Clofenotane, Zeidane, Dicophane, Neocid are trade names.</p> <p style="text-align: right;">Transport Emergency Card: TEC (R)-61GT7-III</p>	
<p>ADDITIONAL INFORMATION</p>	
<p> </p>	
<p>ICSC: 0034</p>	<p style="text-align: right;">DDT</p> <p style="text-align: center;">(C) IPCS, CEC, 1994</p>
<p style="text-align: center;">IMPORTANT LEGAL NOTICE:</p>	<p>Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>

International Chemical Safety Cards

DIELDRIN

ICSC: 0787



1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo-1,4-exo-5,8-dimethanonaphthalene
 3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-,
 (1aalpha,2beta,2aalpha,3beta,6beta,6aalpha,7beta,7aalpha)-2,7,3,6-dimethanonaphth(2,3-b)oxirene
 HEOD
 $C_{12}H_8Cl_6O$
 Molecular mass: 380.9

ICSC # 0787
 CAS # 60-57-1
 RTECS # [IO1750000](#)
 UN # 2761
 EC # 602-049-00-9
 March 26, 1998 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Liquid formulations containing organic solvents may be flammable. Gives off irritating or toxic fumes (or gases) in a fire.		In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN!	
•INHALATION	(See Ingestion).	Ventilation (not if powder).	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! See Ingestion.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then

			wash skin with water and soap. Refer for medical attention.
•EYES		Safety goggles, or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Convulsions. Dizziness. Headache. Nausea. Vomiting. Muscle twitching.	Do not eat, drink, or smoke during work. Wash hands before eating.	Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Rest. Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Do NOT wash away into sewer. Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. (Extra personal protection: chemical protection suit including self-contained breathing apparatus).	Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs and incompatible materials: See Chemical Dangers. Well closed. Keep in a well-ventilated room. Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. Severe marine pollutant. T+ symbol N symbol R: 25-27-40-48/25-50/53 S: 1/2-22-36/37-45-60-61 UN Hazard Class: 6.1 UN Packing Group: II	
SEE IMPORTANT INFORMATION ON BACK			
ICSC: 0787	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.		

International Chemical Safety Cards

DIELDRIIN

ICSC: 0787

I	PHYSICAL STATE;	ROUTES OF EXPOSURE:
M	APPEARANCE:	The substance can be absorbed into the body through the skin and by ingestion.
P	COLOURLESS CRYSTALS	
O	PHYSICAL DANGERS:	INHALATION RISK:
R		Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly on spraying.
T	CHEMICAL DANGERS:	EFFECTS OF SHORT-TERM EXPOSURE:
A	The substance decomposes on heating producing toxic fumes including hydrogen chloride. Reacts with oxidants and acids. Attacks metal due to the slow formation of hydrogen chloride in storage.	The substance may cause effects on the central nervous system ,
N		

<p style="text-align: center;">T D A T A</p>	<p>OCCUPATIONAL EXPOSURE LIMITS: TLV (as TWA): 0.25 mg/m³, A4 (skin) (ACGIH 1997). MAK: (Inhalable fraction) 0.25 mg/m³ Peak limitation category: II(8) skin absorption (H); (DFG 2007). OSHA PEL: TWA 0.25 mg/m³ skin NIOSH REL: Ca TWA 0.25 mg/m³ skin See Appendix A NIOSH IDLH: Ca 50 mg/m³ See: 60571</p> <p>resulting in convulsions. Medical observation is indicated.</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: The substance accumulates in the human body. Cumulative effects are possible: see Acute Hazards/Symptoms.</p>
<p style="text-align: center;">PHYSICAL PROPERTIES</p>	<p>Melting point: 175-176°C Density: 1.7 g/cm³ Solubility in water: none</p> <p>Vapour pressure, Pa at 20°C: 0.0004 Octanol/water partition coefficient as log Pow: 6.2</p>
<p style="text-align: center;">ENVIRONMENTAL DATA</p>	<p> The substance is very toxic to aquatic organisms. This substance may be hazardous to the environment; special attention should be given to honey bees, birds. In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms. It is strongly advised not to let the chemical enter into the environment because it persists in the environment. The substance may cause long-term effects in the aquatic environment. Avoid release to the environment in circumstances different to normal use.</p>
<p>NOTES</p>	
<p>Depending on the degree of exposure, periodic medical examination is indicated. If the substance is formulated with solvent(s) also consult the card(s) (ICSC) of the solvent(s). Carrier solvents used in commercial formulations may change physical and toxicological properties. Do NOT take working clothes home. Alvit, Dieldrex, Dieldrite, Illoxol, Octalox, Panoram, and Quintox are trade names. Also consult ICSC #0774, Aldrin.</p> <p style="text-align: right;">Transport Emergency Card: TEC (R)-61G41b.</p> <p style="text-align: center;">Card has been partially updated in August 2007: see Storage, Occupational Exposure Limits.</p>	
<p>ADDITIONAL INFORMATION</p>	
<p>ICSC: 0787 DIELDRIN</p> <p style="text-align: center;">(C) IPCS, CEC, 1994</p>	
<p style="text-align: center;">IMPORTANT LEGAL NOTICE:</p>	<p>Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>

International Chemical Safety Cards

IRON PENTACARBONYL

ICSC: 0168



Iron carbonyl
 $C_5FeO_5 / Fe(CO)_5$
 Molecular mass: 195.9

ICSC # 0168
 CAS # 13463-40-6
 RTECS # [NO4900000](#)
 UN # 1994
 March 13, 1995 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE!	IN ALL CASES CONSULT A DOCTOR!
•INHALATION	Headache. Dizziness. Vomiting. Laboured breathing. Symptoms may be delayed (see Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	First rinse with plenty of water, then remove contaminated clothes and rinse again. Refer for medical attention.
•EYES		Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take

			to a doctor.
•INGESTION		Do not eat, drink, or smoke during work.	Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Evacuate danger area! Consult an expert! Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT absorb in saw-dust or other combustible absorbents. Personal protection: self-contained breathing apparatus.	Fireproof. Separated from strong oxidants, food and feedstuffs. Cool. Keep in the dark. Well closed. Keep under inert gas.	Airtight. Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. UN Hazard Class: 6.1 UN Subsidiary Risks: 3 UN Packing Group: I	
SEE IMPORTANT INFORMATION ON BACK			
ICSC: 0168	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.		

International Chemical Safety Cards

IRON PENTACARBONYL

ICSC: 0168

I M P O R T A N T D A	PHYSICAL STATE; APPEARANCE: COLOURLESS TO YELLOW OR DARK RED VISCOUS LIQUID.	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.
	PHYSICAL DANGERS: The vapour is heavier than air and may travel along the ground; distant ignition possible.	INHALATION RISK: A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.
	CHEMICAL DANGERS: May explode on heating. The substance may spontaneously ignite on contact with air. The substance decomposes on heating, on burning or under influence of light producing toxic gases including iron oxides and carbon monoxide (see ICSC0023). The substance is a strong reducing agent and reacts violently with oxidants.	EFFECTS OF SHORT-TERM EXPOSURE: The substance may cause effects on the lungs. Exposure far above the OEL may result in death. The effects may be delayed. Medical observation is indicated. See Notes.
		EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: The substance may have effects on

<p style="text-align: center;">T A</p>	<p>OCCUPATIONAL EXPOSURE LIMITS: the liver , resulting in impaired functions</p> <p>TLV: 0.1 ppm as TWA 0.2 ppm as STEL (ACGIH 2004). MAK: 0.1 ppm 0.81 mg/m³ Peak limitation category: II(2); Pregnancy risk group: D; (DFG 2006). OSHA PEL†: none NIOSH REL: TWA 0.1 ppm (0.23 mg/m³) ST 0.2 ppm (0.45 mg/m³) NIOSH IDLH: N.D. See: IDLH INDEX</p>										
<p style="text-align: center;">PHYSICAL PROPERTIES</p>	<table border="0"> <tr> <td>Boiling point: 103°C</td> <td>Relative vapour density (air = 1): 6.8</td> </tr> <tr> <td>Melting point: -20°C</td> <td>Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2</td> </tr> <tr> <td>Relative density (water = 1): 1.5</td> <td>Flash point: -15°C c.c.</td> </tr> <tr> <td>Solubility in water: none</td> <td>Auto-ignition temperature: 50°C</td> </tr> <tr> <td>Vapour pressure, kPa at 25°C: 4.7</td> <td>Explosive limits, vol% in air: 3.7-12.5</td> </tr> </table>	Boiling point: 103°C	Relative vapour density (air = 1): 6.8	Melting point: -20°C	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2	Relative density (water = 1): 1.5	Flash point: -15°C c.c.	Solubility in water: none	Auto-ignition temperature: 50°C	Vapour pressure, kPa at 25°C: 4.7	Explosive limits, vol% in air: 3.7-12.5
Boiling point: 103°C	Relative vapour density (air = 1): 6.8										
Melting point: -20°C	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2										
Relative density (water = 1): 1.5	Flash point: -15°C c.c.										
Solubility in water: none	Auto-ignition temperature: 50°C										
Vapour pressure, kPa at 25°C: 4.7	Explosive limits, vol% in air: 3.7-12.5										
<p style="text-align: center;">ENVIRONMENTAL DATA</p>											
<p>NOTES</p>											
<p>Environmental effects from the substance have not been investigated. The symptoms of shortness of breath, cough, cyanosis, fever do not become manifest until after 12-36 hours. No odour warning if toxic concentrations are present. Do NOT take working clothes home. Rinse contaminated clothes (fire hazard) with plenty of water.</p> <p style="text-align: right;">Transport Emergency Card: TEC (R)-61GTF1-I NFPA Code: H2; F3; R1</p> <p style="text-align: center;">Card has been partially updated in April 2005: see Occupational Exposure Limits, Emergency Response. Card has been partially updated in July 2007: see Occupational Exposure Limits.</p>											
<p>ADDITIONAL INFORMATION</p>											
<p>ICSC: 0168</p>	<p style="text-align: right;">IRON PENTACARBONYL</p> <p style="text-align: center;">(C) IPCS, CEC, 1994</p>										
<p style="text-align: center;">IMPORTANT LEGAL NOTICE:</p>	<p>Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>										



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September 2005

NIOSH Pocket Guide to Chemical Hazards

NPG Home | Introduction | Synonyms & Trade Names | Chemical Names | CAS Numbers | RTECS Numbers | Appendices | Search

Lead		CAS 7439-92-1	
Pb		RTECS OF7525000	
Synonyms & Trade Names Lead metal, Plumbum		DOT ID & Guide	
Exposure Limits	NIOSH REL*: TWA (8-hour) 0.050 mg/m ³ See Appendix C [*Note: The REL also applies to other lead compounds (as Pb) – see Appendix C.]		
	OSHA PEL*: [1910.1025] TWA 0.050 mg/m ³ See Appendix C [*Note: The PEL also applies to other lead compounds (as Pb) – see Appendix C.]		
IDLH 100 mg/m ³ (as Pb) See: 7439921		Conversion	
Physical Description A heavy, ductile, soft, gray solid.			
MW: 207.2	BP: 3164°F	MLT: 621°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 11.34
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form.			
Incompatibilities & Reactivities Strong oxidizers, hydrogen peroxide, acids			
Measurement Methods NIOSH Z082, Z105, Z300, Z301, Z303, Z700, Z701, Z702, 9100, 9102, 9105; OSHA ID121, ID125G, ID206 See: NMAM or OSHA Methods			
Personal Protection & Sanitation (See protection codes) Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap flush promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations (See Appendix E) NIOSH/OSHA			
Up to 0.5 mg/m ³ : (APF = 10) Any air-purifying respirator with an N100, R100, or P100 filter (including N100, R100, and P100 filtering facepieces) except quarter-mask respirators. Click here for information on selection of N, R, or P filters. (APF = 10) Any supplied-air respirator			
Up to 1.25 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode (APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter			
Up to 2.5 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. Click here for information on selection of N, R, or P filters. (APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode (APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter (APF = 50) Any self-contained breathing apparatus with a full facepiece (APF = 50) Any supplied-air respirator with a full facepiece			
Up to 50 mg/m ³ : (APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode			
Up to 100 mg/m ³ : (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode			
Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode			

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here for information on selection of N, R, or P filters.](#) Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension

Target Organs Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

See also: [INTRODUCTION](#) See [ICSC CARD: 0052](#) See [MEDICAL TESTS: 0127](#)

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International Chemical Safety Cards

MANGANESE

ICSC: 0174



Mn
Atomic mass: 54.9
(powder)

ICSC # 0174
CAS # 7439-96-5
RTECS # [OO9275000](#)
November 27, 2003 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Dry sand, special powder.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Cough.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN		Protective gloves.	Rinse and then wash skin with water and soap.
•EYES		Safety goggles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Nausea.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	

Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. (Extra personal protection: P2 filter respirator for harmful particles.)	Separated from acids. Dry.	
SEE IMPORTANT INFORMATION ON BACK		
ICSC: 0174	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

International Chemical Safety Cards

MANGANESE

ICSC: 0174

I M P O R T A N T D A T A	<p>PHYSICAL STATE; APPEARANCE: GREY WHITE POWDER</p> <p>PHYSICAL DANGERS: Dust explosion possible if in powder or granular form, mixed with air.</p> <p>CHEMICAL DANGERS: Reacts slowly with water and acids forming flammable/explosive gas (hydrogen - see ICSC0001) causing fire and explosion hazard.</p> <p>OCCUPATIONAL EXPOSURE LIMITS: TLV: 0.2 mg/m³ (as TWA) (ACGIH 2003). MAK: (Inhalable fraction) 0.5 mg/m³ Pregnancy risk group: C (DFG 2007). OSHA PEL*: C 5 mg/m³ *Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl and Methyl cyclopentadienyl manganese tricarbonyl. NIOSH REL*: TWA 1 mg/m³ ST 3 mg/m³ *Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl, Methyl cyclopentadienyl manganese tricarbonyl, and Manganese tetroxide.</p>	<p>ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.</p> <p>INHALATION RISK: Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: The aerosol is irritating to the respiratory tract</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: The substance may have effects on the lungs central nervous system , resulting in increased susceptibility to bronchitis, pneumonitis and neurologic, neuropsychiatric disorders (manganism). Animal tests show that this substance possibly causes toxicity to human reproduction or development.</p>
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	NIOSH IDLH: 500 mg/m ³ (as Mn) See: 7439965
PHYSICAL PROPERTIES	Boiling point: 1962°C Melting point: 1244°C Density: 7.47 g/cm ³ Solubility in water: none
ENVIRONMENTAL DATA	 This substance may be hazardous in the environment; special attention should be given to aquatic organisms.
NOTES	
Depending on the degree of exposure, periodic medical examination is suggested. The recommendations on this Card also apply to ferro manganese.	
ADDITIONAL INFORMATION	
ICSC: 0174	MANGANESE
(C) IPCS, CEC, 1994	
IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

SELENIUM

ICSC: 0072






Se
Atomic mass: 79.0
(powder)



ICSC # 0072
CAS # 7782-49-2
RTECS # VS7700000
EC # 034-001-00-2
April 26, 1993 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames. NO contact with oxidants.	Powder, AFFF, foam, carbon dioxide. NO water
EXPLOSION	Risk of fire and explosion on contact with oxidants.		
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
•INHALATION	Irritation of nose. Cough. Dizziness. Headache. Laboured breathing. Nausea. Sore throat. Vomiting. Weakness. Symptoms may be delayed (see Notes).	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness. Skin burns. Pain. Discolouration.	Protective gloves. Protective clothing.	Rinse skin with plenty of water or shower. Refer for medical attention. Remove and isolate contaminated clothes.
•EYES	Redness. Pain. Blurred vision.	Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Metallic taste. Diarrhoea. Chills. Fever. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Do NOT wash away into sewer. Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder,	Fireproof. Separated from strong oxidants, strong acids, food and feedstuffs Dry.	Airtight. Do not transport with food and feedstuffs. T symbol R: 23/25-33-53	

then remove to safe place. Personal protection: P3 filter respirator for toxic particles.		S: 1/2-20/21-28-45-61
SEE IMPORTANT INFORMATION ON BACK		
<p>ICSC: 0072 Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.</p>		

International Chemical Safety Cards

SELENIUM

ICSC: 0072

<p>I M P O R T A N T A D D I T I O N</p>	<p>PHYSICAL STATE; APPEARANCE: ODOURLESS SOLID IN VARIOUS FORMS. DARK RED-BROWN TO BLUISH-BLACK AMORPHOUS SOLID OR RED TRANSPARENT CRYSTALS OR METALLIC GREY TO BLACK CRYSTALS.</p> <p>PHYSICAL DANGERS:</p> <p>CHEMICAL DANGERS: Upon heating, toxic fumes are formed. Reacts violently with oxidants strong acids Reacts with water at 50°C forming flammable/explosive gas (hydrogen - see ICSC0001) and selenious acids. Reacts with incandescence on gentle heating with phosphorous and metals such as nickel, zinc, sodium, potassium, platinum.</p> <p>OCCUPATIONAL EXPOSURE LIMITS: TLV: 0.2 mg/m³ as TWA (ACGIH 2004). MAK: (Inhalable fraction) 0.05 mg/m³ Peak limitation category: II(4); Carcinogen category: 3B; Pregnancy risk group: C; (DFG 2004). OSHA PEL*: TWA 0.2 mg/m³ *Note: The PEL also applies to other selenium compounds (as Se) except Selenium hexafluoride. NIOSH REL*: TWA 0.2 mg/m³ *Note: The REL also applies to other selenium compounds (as Se) except Selenium hexafluoride. NIOSH IDLH: 1 mg/m³ (as Se) See: 7782492</p>	<p>ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation, through the skin and by ingestion.</p> <p>INHALATION RISK: Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: The substance is irritating to the eyes and the respiratory tract Inhalation of dust may cause lung oedema (see Notes). Inhalation of fume may cause symptoms of asphyxiation, chills and fever and bronchitis. The effects may be delayed.</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the respiratory tract, gastrointestinal tract, and skin, resulting in nausea, vomiting, cough, yellowish skin discolouration, loss of nails, garlic breath and bad teeth.</p>	
PHYSICAL PROPERTIES	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Boiling point: 685°C Melting point: 170-217°C Relative density (water = 1): 4.8</td> <td style="width: 50%;">Solubility in water: none Vapour pressure, Pa at 20°C: 0.1</td> </tr> </table>	Boiling point: 685°C Melting point: 170-217°C Relative density (water = 1): 4.8	Solubility in water: none Vapour pressure, Pa at 20°C: 0.1
Boiling point: 685°C Melting point: 170-217°C Relative density (water = 1): 4.8	Solubility in water: none Vapour pressure, Pa at 20°C: 0.1		
ENVIRONMENTAL DATA			
NOTES			
Do NOT take working clothes home.			

ADDITIONAL INFORMATION	
ICSC: 0072 SELENIUM (C) IPCS, CEC, 1994	
IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ZINC OXIDE

ICSC: 0208



Zinc white
 Zinc monoxide
 C.I. Pigment White 4
 ZnO
 Molecular mass: 81.4

ICSC # 0208
 CAS # 1314-13-2
 RTECS # ZH4810000
 EC # 030-013-00-7
 April 21, 2004 Peer reviewed

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible.		In case of fire in the surroundings: use appropriate extinguishing media.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Sore throat. Headache. Fever or elevated body temperature. Nausea. Vomiting. Weakness. Chills. Muscular pain. Symptoms may be delayed (see Notes).	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN		Protective gloves.	Rinse and then wash skin with water and soap.
•EYES		Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place. Personal protection: P2 filter respirator for harmful particles.		N symbol R: 50/53 S: 60-61	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0208

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ZINC OXIDE

ICSC: 0208

I M P O R T A N T I N F O R M A T I O N	<p>PHYSICAL STATE; APPEARANCE: WHITE POWDER</p> <p>PHYSICAL DANGERS:</p> <p>CHEMICAL DANGERS: Reacts violently with with aluminium and magnesium powders, and with chlorinated rubber on heating causing fire and explosion hazard.</p> <p>OCCUPATIONAL EXPOSURE LIMITS: TLV: (as respirable fraction) 2 mg/m³ as TWA (ACGIH 2004). TLV: (as respirable fraction) 10 mg/m³ as STEL (ACGIH 2004). MAK: (as fume) 1 mg/m³ Peak limitation category: I(1) (DFG 2003). OSHA PEL†: TWA 5 mg/m³ (fume) TWA 15 mg/m³ (total dust) TWA 5 mg/m³ (resp dust) NIOSH REL: Dust: TWA 5 mg/m³ C 15 mg/m³ Fume: TWA 5 mg/m³ ST 10 mg/m³ NIOSH IDLH: 500 mg/m³ See: 1314132</p>	<p>ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.</p> <p>INHALATION RISK: A harmful concentration of airborne particles can be reached quickly especially for zinc oxide fume particles.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: Inhalation of fumes may cause metal fume fever. The substance as a fume is irritating to the respiratory tract The effects may be delayed. See Notes.</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:</p>
	<p>PHYSICAL PROPERTIES</p> <p>Melting point: 1975°C Density: 5.6 g/cm³</p> <p>Solubility in water: none</p>	
ENVIRONMENTAL DATA		
NOTES		
The symptoms of metal fume fever do not become manifest until a few hours have passed.		
ADDITIONAL INFORMATION		
ICSC: 0208	ZINC OXIDE	
(C) IPCS, CEC, 1994		

IMPORTANT LEGAL

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NOTICE:

cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

COPPER

ICSC: 0240



Cu
Atomic mass: 63.5
(powder)

ICSC # 0240
CAS # 7440-50-8
RTECS # [GL5325000](#)
September 24, 1993 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Special powder, dry sand, NO other agents.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Cough. Headache. Shortness of breath. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Nausea. Vomiting.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.
SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING	
Sweep spilled substance into	Separated from - See Chemical		

containers. Carefully collect remainder. Then remove to safe place. (Extra personal protection: P2 filter respirator for harmful particles).	Dangers.	
SEE IMPORTANT INFORMATION ON BACK		
ICSC: 0240	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.	

International Chemical Safety Cards

COPPER

ICSC: 0240

I M P O R T A N T D A T A	PHYSICAL STATE; APPEARANCE: RED POWDER, TURNS GREEN ON EXPOSURE TO MOIST AIR.	ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation and by ingestion.
	PHYSICAL DANGERS: CHEMICAL DANGERS: Shock-sensitive compounds are formed with acetylenic compounds, ethylene oxides and azides. Reacts with strong oxidants like chlorates, bromates and iodates, causing explosion hazard.	INHALATION RISK: Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed. EFFECTS OF SHORT-TERM EXPOSURE: Inhalation of fumes may cause metal fume fever. See Notes.
OCCUPATIONAL EXPOSURE LIMITS: TLV: (Fume) 0.2 mg/m ³ TLV: (Dusts & mists as Cu) 1 mg/m ³ (ACGIH 2007). MAK: 0.1 mg/m ³ (Inhalable fraction) Peak limitation category: II(2) Pregnancy risk group: C (DFG 2007). OSHA PEL*: TWA 1 mg/m ³ *Note: The PEL also applies to other copper compounds (as Cu) except copper fume. NIOSH REL*: TWA 1 mg/m ³ *Note: The REL also applies to other copper compounds (as Cu) except Copper fume. NIOSH IDLH: 100 mg/m ³ (as Cu) See: 7440508	EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: Repeated or prolonged contact may cause skin sensitization.	

PHYSICAL PROPERTIES	Boiling point: 2595°C Melting point: 1083°C Relative density (water = 1): 8.9 Solubility in water: none
ENVIRONMENTAL DATA	
NOTES	
The symptoms of metal fume fever do not become manifest until several hours. Card has been partially updated in January 2008: see Occupational Exposure Limits.	
ADDITIONAL INFORMATION	
ICSC: 0240	COPPER
(C) IPCS, CEC, 1994	
IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

APPENDIX B

SPECIFIC HEALTH AND SAFETY PROCEDURES

NOTE: Health and safety procedures that will be utilized during the project are listed below. A copy of all the Health and Safety Procedures (HS001-999) is available on the Intranet (Insider).

HS001	Health and Safety Program Policy
HS010	Employee Health and Safety Manual
HS011	Health and Safety Rules for Contractors
HS020	Accident Prevention Program: Reporting Investigation and Review
HS021	Accident Prevention Program: Management Safety Reviews
HS045	Job Safety Analysis
HS051	Tailgate Safety Meeting
HS060	Hazard Communication Program
HS101	Drug and Alcohol Testing
HS307	Excavation and Trenching
HS308	Underground/Overhead Utility Contact Prevention
HS400	Working in Hot Environments
HS401	Cold Stress
HS402	Hearing Conservation
HS600	Personal Protection Program
HS601	Respiratory Protection Program
HS800	Motor Vehicle Operation: General Requirements
HS801	Commercial Vehicle Operation and Maintenance



PROCEDURE

Subject: ENVIRONMENTAL HEALTH & SAFETY POLICY

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

Shaw E&I Inc. is firmly committed to operating all of our facilities and projects in a safe, efficient manner and in compliance with all applicable environmental health and safety (EHS) laws, rules and regulations to which we subscribe. Through the adoption of these sustainable practices we are committed to securing a high quality of life for current and future generations, restoring and sustaining a healthy environment and increasing value for our customers, shareholders and business partners.

We expect all of our employees, clients and partners to uphold the highest EHS standards, to promote a positive and proactive safety attitude and to exhibit a heightened awareness of their surroundings both on and off the job. We must identify risks and hazards and implement appropriate controls in order to provide an injury-free work environment where people, equipment and the environment are not placed at unreasonable threat of injury or damage. We will continually strive to be good citizens in our own community, as well as in every community in which we operate.

The Environmental Health & Safety Program and the components of our Occupational Health & Safety Management System have been developed to guide us in our daily activities. We also commit ourselves to continual improvement in environmental health & safety management. Further, I ask that you include our environmental health & safety process in all aspects of your work, assist in the maintenance of our process and communicate this policy to all persons working for or on behalf of Shaw E&I with the intent that they are made aware of their individual EHS obligations.

Through compliance with this policy, we will all actively participate in this process and advocate this philosophy. Together, we can accomplish our goals and exceed the minimum requirements provided by applicable laws and regulations, thus resulting in all stakeholders being proud to be a part of a team that truly values the importance of health, safety and respect for the environment. Accordingly, we will maintain the position as a recognized leader in all of our business endeavors through a stewardship based approach for our fellow employees, the environment and the communities in which we live and work.

We are committed to the spirit and intent of this EHS policy statement and the laws, rules and regulations to which we subscribe at its foundation.

Ron Oakley
President
Shaw Environmental & Infrastructure, Inc.



The Foundation of Our Targeting Zero Environment

Mission

Shaw's E&I Group will achieve its goal of "Targeting Zero" accidents and injuries while working as a team to provide a workplace that is free from recognized hazards.

Vision

We will be recognized and respected as the leading company in our industry and as the standard by which our competitors are benchmarked by providing the leadership, guidance and operations excellence necessary to identify and control all recognized hazards in the workplace.

Values

Leadership – provide the necessary tools to identify and control all hazards in the workplace.

Commitment – we will never be satisfied that we have done enough.

Pride – all employees will own the safety process.

Dedication – to strive for continual improvement.

Appreciation – to embrace the safety of our employees.

Operating Principles

- Safety is a core value.
- We plan work to ensure it is done safely.
- We are a safety team.
- We follow good safety practices in all work that we do.
- We will actively demonstrate our commitment to safety.
- All accidents are preventable.
- We will not perform any job that cannot be performed safely.
- We will not compromise safety in the interest of time or comfort.
- We will constantly review our performance to ensure continuous improvement.
- We will encourage employees to commit to safety as a lifestyle and carry the culture of "Targeting Zero" home with them.



PROCEDURE

Subject: EMPLOYEE HEALTH AND SAFETY MANUAL

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

This procedure establishes the method of distribution for the employee health and safety manual. This manual is not intended to be an all-inclusive document, but rather an outline of general health and safety guidelines applicable to all employees. These guidelines have been developed to communicate some basic health and safety practices expected of all employees.

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
 - 3.1 Procedure Responsibility
 - 3.2 Action/Approval Responsibilities
- 4.0 Definitions
- 5.0 Text
- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

5.0 TEXT



Project and office managers are to ensure that each employee at his/her location is provided with a copy of the health and safety manual. All newly hired employees will be provided with a copy of this manual as part of their new hire orientation package. All employees are encouraged to read, ask questions of their manager or health and safety representative, and retain this manual for future reference.

A completed copy of the signature card found at the end of the manual will be collected from all employees by their manager and forwarded to the employee's respective Human Resources Department. Additional copies of this manual can be obtained through various storerooms and Human Resources Departments throughout the company.

6.0 EXCEPTION PROVISIONS

Variations and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variations.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variations

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Employee Health and Safety Manual



ATTACHMENT 1

**EMPLOYEE HEALTH AND SAFETY MANUAL
RESPONSIBILITY MATRIX**

Action	Procedure Section	Responsible Party			
		Human Resources Representative	Project/ Office Manager	Health and Safety Representative	Director of Health and Safety
Issue, Revise, and Maintain Procedure	3.1				X
Ensure Current Employees are Provided a Copy of the Manual	5.0		X		
Provide New Hires With a Copy of the Manual	5.0	X			
Answer Employee Questions Pertaining to Manual	5.0		X	X	
Forward Completed Signature Cards to Human Resources Department	5.0		X		



Procedure No.	HS010
Revision No.	0
Date of Revision	4/24/02
Last Review Date	3/24/04
Page	4 of 4

ATTACHMENT 2

EMPLOYEE HEALTH AND SAFETY MANUAL



PROCEDURE

UNCONTROLLED WHEN PRINTED

Subject: HEALTH AND SAFETY RULES FOR CONTRACTORS

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to promulgate the General Safety Rules for Contractors and the Contractor Site Safety Rules Checklist. These documents set forth in broad terms the health and safety requirements to which a contractor is expected to conform while working under contract with Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
 - 3.1 Procedure Responsibility
 - 3.2 Action/Approval Responsibilities
- 4.0 Definitions
- 5.0 Discussion
- 6.0 Text
 - 6.1 Procurement Department
 - 6.2 Document Availability
 - 6.3 Document Updates
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility. The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities. The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Contractor- As used in this procedure, means a party in either the Prime or Subcontractor role or otherwise, providing supplies/services to Shaw E & I and performing some obligations of a particular prime contract.

Contractor prequalification- The process of ensuring that an individual or firm possesses the required capabilities so that both Shaw E & I and the Contractor are protected in the event of a failure to perform, an accident, or a difference of opinion as to the terms and conditions or performance. This prequalification process is governed by Shaw E & I Procedure PR012 Subcontractor Prequalification Requirements.



5.0 DISCUSSION

The attached publications have been created for the express purpose of circulating prescribed safety and health rules for contractors working on Shaw E & I projects, whether in-house or for clients. These publications should be widely distributed to our contractors and the rules contained therein stringently enforced. These rules are supported by years of experience in the field and are considered equally applicable to our own operations as well as our contractors.

6.0 TEXT

6.1 Procurement Department

Shaw E & I procurement specialists will forward copies of the attached documents to prospective contractors as part of the contractor prequalification process prescribed by Shaw E & I Procedure PR012- Subcontractor Prequalification Requirements. They will assure completion of the General Site Safety Rules for Contractors Receipt and maintain copies with the procurement file.

6.2 Document Availability

Stocks of the attachments will be maintained in the procurement system for issuance upon submittal of a request to the Procurement Department. In addition, local health and safety personnel will maintain a small working stock of the publications for ready issue.

6.3 Document Updates

It is desired to make these safety and health documents truly functional publications. To that end, suggestions for improvement are encouraged. Recommended changes should be submitted to local health and safety personnel for transmittal to the Corporate Health and Safety Office for consideration and incorporation.

7.0 CROSS REFERENCES

Shaw E & I Procedure PR012 Subcontractor Prequalification Requirements

8.0 ATTACHMENTS

1. Responsibility Matrix
2. General Safety Rules for Contractors



**ATTACHMENT 1
HEALTH AND SAFETY RULES FOR CONTRACTORS**

Responsibility Matrix

Action	Procedure Section	Procurement Specialist	Local HS Representative	Director of HS
Issuance, revision and maintenance of this procedure	3.1			X
Distribute General Safety Rules	6.1	X		
Maintain General Safety Rules Receipts	6.1	X		
Submit Recommended Changes	6.3		X	
Update General Safety Rules	6.3			X



ATTACHMENT 2 HEALTH AND SAFETY RULES FOR CONTRACTORS



Health & Safety Office, 4171 Essen Lane, Baton Rouge, LA 70809, 225-932-2500

Introduction

The rules and requirements contained in this booklet have been written for the guidance of Contractors who are to perform work under contract with any member company of Shaw Environmental & Infrastructure, Inc. (Company). This booklet prescribes minimum requirements only. The Contractor, working in conjunction with the Company representative, will be expected to establish such additional rules and procedures as may be necessary to conduct a safe operation and comply with Company, regulatory and insurance requirements, and those of our clients. The term Contractor, as used in this booklet, shall be understood to include any and all persons, sole proprietorships, partnerships, corporations, or other business ventures under contract, oral or written, to the Company. Contractor is responsible for informing its subcontractors of these requirements, for directing and supervising work of subcontractors, and for

assuring that its subcontractors adhere to the requirements herein. The Company may request Contractor to provide proof of its subcontractor's adherence to all rules and regulations and will prohibit access to Company property or job sites or our client's property for those Contractors not in compliance.

In order to assist Contractor in following these instructions, a Company Representative will be assigned to the Contractor to act as the Company agent in all matters relative to work activities at Company facilities or job sites. Under no circumstances shall any work be started until the Company Representative has been contacted, a job orientation and Tailgate Safety meeting has been conducted, and all permits, insurance, and company, client, and regulatory pre-job requirements have been met.

General Safety Rules and Requirements

Accident Reporting

All incidents (personal and property damage) shall be reported immediately to the Company Representative. A written report shall be prepared documenting the incident and corrective measures taken to prevent recurrence.

Alcohol, Firearms, etc.

Alcoholic beverages, illegal drugs or narcotics, or guns and ammunition are not permitted on Company property or job sites. Personnel under the influence of alcohol or drugs shall not be allowed on Company property or job sites.

Approvals

The Contractor shall be required to obtain pertinent work permits or authorizations and approval from the Company Representative before:

- Working on existing pipelines or equipment.
- Entering tanks or closed vessels.
- Entering any designated high-hazard areas.
- Using torches, electrodes, electric motors, forges, soldering irons, any open flames, or any device which could produce sparks or ignition source.
- Closing walkways, roads, or restricting traffic.
- Starting excavations.
- Removing tanks from excavations.
- Backfilling excavations.
- Using utilities such as steam, water, compressed air, or electricity.
- Sandblasting, spray painting, or guniting.

- Storing flammable materials such as gasoline, oil, paints, compressed gas cylinders, etc.
- Walking or working on roofs of buildings or equipment.
- Drilling, boring, preparing test pits, or using geophysical equipment or any other exploratory equipment requiring penetration of surfaces.
- Operating cranes or similar equipment near overhead power lines, pipelines, or underground utilities.
- Opening or cutting through firewalls or beams.
- Fueling or repairing Contractor operating equipment on Company property or job sites.

Security

For security reasons, entrance to and exit of Company facilities and job sites is restricted to those areas designated as the Contractor's work area.

Speed Limits

All vehicles on Company job sites and facilities must observe a maximum speed limit of 10 mph, unless otherwise posted.

Vehicle Safety

- All vehicles must be parked in authorized areas only.
- There will be no passing of moving vehicles at job sites where there are narrow roads and short-sight distances.
- Company vehicles will only be operated by personnel with valid licenses and good driving records. (ref. Company Procedure HS800).
- Vehicles shall have all required inspection and operating permits.
- Seat belts shall be used for all drivers and passengers.

Other General Requirements

This booklet focuses on Federal and Company standards. Where State and local standards exist and are more stringent, their provisions shall be followed.

The Company has established a lifting limit of 60 pounds. Above this weight, additional personnel and/or materials handling equipment are required.

All bridges intended for vehicular traffic shall be constructed to withstand twice the load of the heaviest vehicle anticipated.

Contractors are expected to brief their employees on these requirements and enforce these rules with their employees.

All Contractor equipment, such as pipe, rebar, etc., shall be kept out of traffic lanes and access ways. Equipment shall be stored in a manner, which ensures the safety of the Company and Contractor employees at all times.

All surfaces which a person could reasonably contact should be free of splinters, nails, or protrusions which may cause injury.

Company management may stop or suspend work at any time the Contractor fails to comply with company rules and regulations.



Safe Work Practices

Confined Space Entry

Confined spaces include storage tanks, bins, sewers, in-ground vaults, degreasers, boilers, vessels, tunnels, manholes, pits, certain excavations, etc. These enclosures, because of inadequate ventilation and/or the introduction of hazardous gases and vapors, may present conditions that could produce asphyxiation or injury.

Before entering a confined space, Contractor must notify the Company Representative of intent to enter. The Company Representative will review with Contractor the safe entry requirements which include:

Permits - All confined space entries are initially considered permit-required until/unless the space meets the requirements of Company Procedure HS300 for non-permit required confined spaces.

Removal of Contents - Confined spaces must be clean; free of hazardous materials/chemicals; and, where necessary, purged by water or other equivalent means, insofar as is feasible or possible.

Isolation - All input lines that discharge into a confined space shall be disconnected, blanked, capped, or isolated. The use of a single in-line valve shut-off as the sole means of isolating the confined space from any input lines is prohibited.

Electrical Lockout - Where electrical devices located within the confined space (motors, switches, etc.) are to be repaired or worked on, the line-disconnect switches supplying the power must be tagged and locked in the "OFF" position. The lock key is to be kept by the person performing the job, and only this person is authorized to unlock the switch and remove the tag upon completion of the job. Where more than one person is working on the line, each must place a lock on the switch and retain their own key.

Where there are multiple sources of power to an electrical device that supplies power to the device through an automatic or manual bus transfer switch, lockout devices must be placed on the breaker nearest to the electrical device that is to be isolated, and an electrician shall test the power supply lines to ensure that power has been secured.

Line-disconnect switches supplying power to any mechanical apparatus in the confined space (mixers, conveyors, etc.) must also be tagged and locked in the "OFF" position. This must be done for any entry, even though work will not be performed on the apparatus itself.

Securing of Covers - All manhole and cleanout covers shall be removed and the openings maintained clear of any obstructions. When hinged doors or lids are provided, they shall be secured so they cannot be closed.

Testing Atmosphere - A qualified person (see Company Procedure HS300 or 29 CFR 1910.146) shall make appropriate tests of the atmosphere in the confined space and place a record of the test results at the entrance to the confined space. Testing shall ensure the following:

- Combustible gas and vapor concentrations do not exceed 10 percent of the lower explosive limit.
- Oxygen content is no less than 19.5 percent and no greater than 23.5 percent.
- Appropriate respiratory protective equipment and other appropriate personal protective devices have been provided for all employees when concentrations of toxic materials exceed established exposure limits.

Continuous Monitoring - If the nature of the work to be performed introduces, or has the potential to introduce, harmful

air contaminants, continuous monitoring of the atmosphere is required. If tests indicate evidence of dangerous air contaminants, and/or the oxygen content drops below 19.5 percent, or rises above 23.5 percent, all personnel shall evacuate the confined space immediately.

Personal Protective Equipment - All Contractor employees must be instructed in accordance with OSHA regulations regarding personal protective clothing, hard hats, respirators, lifelines, and harnesses. Such instructions shall be received and documented before entering any confined space.

Contractor shall arrange for confined space rescue services as required by 29 CFR 1910.146, prior to entry.

Compressed Gas Cylinders

- Valve protection caps shall be in place when compressed gas cylinders are transported, moved, or stored.
- Cylinder valves shall be closed when work is finished and when cylinders are empty or are moved.
- Compressed gas cylinders shall be secured (roped or chained), in an upright position at all times, except when cylinders are actually being hoisted or carried.
- Gas regulators shall be in proper working order while in use and shall only be of the type approved for the application.
- If a leak develops in a gas cylinder, after donning appropriate safety equipment, immediately remove it to a safe location. If the leak cannot be corrected, report it to the Company Representative.
- Cylinders shall be permanently marked or stenciled to identify the type of gas in the cylinder.
- All compressed breathing air shall meet ASTM specifications for breathing air quality.
- Oil and oily rags shall be kept away from oxygen equipment

Cranes, Hoists, and Other Heavy Equipment

- Contractor personnel will not be permitted to use hoists and powered apparatus belonging to the Company unless approval is obtained in each instance from the Company Representative.
- Roll over protection shall be used when conditions or regulations call for such use.
- Documentation of operator qualifications shall be on file.
- Subcontractor shall present to the Company site supervisor for review the documentation for permits, testing and inspection on cranes and heavy equipment; and shall make maintenance records available as requested.

Cutting or Welding

- "Hot work" authorization must be obtained from the Company Representative before any welding, cutting, or other "hot work" is done. "Hot work" permits and results of tests are to be submitted to the Company Representative at the completion of the job or at the end of each workday.
- Noncombustible or flameproof shields or screens must be provided to protect welder or others who might be harmed by direct rays of arc.
- Goggles, gloves, aprons, and other personal protective equipment appropriate to the job shall be used.

High Fire-Hazard Areas

- Contractor personnel are responsible to see that a fire watch is maintained and all adjacent combustible materials are protected or removed as designated by the Company Representative.



Safe Work Practices

- Contractor shall provide their own calibrated combustible gas meter or other instruments for checking areas before beginning hot work.
- Documentation of instrument calibration shall be submitted to the Company Representative
- Contractor is responsible for all testing and monitoring required by applicable regulations, assuring work place safety, and providing test results to the Company.
- The Company shall have the right, not the responsibility, to perform additional testing. Company testing shall not be in lieu of Contractor's requirement.
- Contractor shall provide fire extinguisher(s) for welding and cutting, as designated by the Company Representative.
- Contractor shall provide a fire watch for 30 minutes AFTER cutting is completed.

Electrical Safety

- All noncurrent-carrying metal parts of fixed, portable, or plug-connected equipment shall be grounded. Since ground wires can break, they shall be tested with an electrical resistance meter to assure conductivity as often as necessary to assure safety.
- Extension cords shall be the three-wire type for grounded tools and shall be protected from damage; do not fasten with staples or extend across an aisleway or walkway. Worn or frayed cords shall not be used. Cords shall not be run through doorways where the door could cut or damage them.
- Exposed bulbs on temporary lights shall be guarded to prevent accidental contact, except where bulbs are deeply recessed in the reflector. Temporary lights shall not be suspended by their electric cords unless designed for this use. Explosion-proof bulb covers shall be used when contact with flammable vapors or gases are possible and shall meet Class 1, Division 1 requirements.
- Receptacles for attachment plugs shall be of the approved, concealed, contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.
- All field/construction shall require ground fault interruptors and watertight connectors.

Emergency Equipment

- The Company's fire equipment is not to be moved, relocated, or otherwise rendered inaccessible unless specific permission is granted in each case by the Company Representative.
- Self-contained breathing apparatus, first aid equipment, fire blankets, stretchers, eyewash fountains, and deluge showers are not to be moved, relocated, blocked, or used without the express permission of the Company Representative.

Excavations and Trenches

- Before any excavation work begins, all required permits shall be obtained.
- All work shall be in accordance with 29 CFR 1926 Subpart P and Company Procedure HS307.

- The Contractor's Competent Person shall be identified to the Company Representative, including documentation of qualifications.
- When subcontractor is responsible for design of excavation, shoring, trenches or barrier walls, full design/approval (i.e., P.E.) documentation shall be presented to the Company Representative.

Fall Protection

- Contractor shall ensure employees on a walking/working surface six feet or higher above a lower level are protected by guardrail systems, personal fall arrest systems, or safety net systems.
- Safety harnesses and lifelines (including extracting devices for top entry spaces) are required on all work performed in permit-required confined spaces.
- All lifelines shall be safely secured to stable and adequate supports.
- Contractor activities shall comply with 29 CFR 1926 Subpart M - Fall Protection.

Fire Prevention

Company Representative, or his designee, is authorized to correct any condition which he may consider a fire hazard. In any emergency, the site personnel are authorized to act directly with Contractor's Supervisor in regard to fire hazards without waiting for the Company Representative.

Floor Openings

- Floor openings shall be guarded by substantial barriers, railings, and/or covering materials strong enough to sustain twice the load of employee's equipment and materials that may be imposed on the cover at any one time. Barriers will be supplied by the Contractor.
- Where a danger of falling exists for personnel, elevated floor areas must be provided with guardrails. In addition, toeboards shall be provided when the possibility of falling objects striking personnel below exists.

High-Hazard Areas

Although this list is not all inclusive, there are certain areas and operations at Company facilities and job sites where extra precautions must be taken because of the nature of the hazards. When starting up any operation, Contractor is required to check with the Company Representative for a review of the safety and health rules which apply before entering any of the following areas:

- Confined spaces (tanks, manholes, vaults, pits, etc.)
- Building roof areas
- Laboratories
- Excavations
- Chemical storage and disposal areas

Contractor is also required to check with the Company Representative before any work is done on a flammable gas or solvent line; a tank or vessel that presently contains, or has contained, a flammable material; and before making an excavation anywhere on the site.

Housekeeping

- Material shall be carefully stacked and located so that it does not block aisles, doors, self-contained breathing apparatus, fire extinguishers, fire blankets, stretchers, emergency eyewash fountains, emergency safety showers, fixed ladders, stairways, or electrical breaker panels.
- Nails protruding from boards must be removed or bent over.



Safe Work Practices

- All work areas shall be kept clear of scrap lumber and all other debris.
- Combustible scrap, waste materials, and debris shall be removed at regular and frequent intervals.
- Containers shall be provided for the collection and separation, by type, of refuse. Covers shall be provided on containers used for flammable, combustible, or harmful substances.
- Overhead storage of debris, tools, equipment, pipes, etc., is prohibited.
- At the end of each workday, Contractor shall provide for pick-up of all debris such as paper, rags, empty cans and bottles, etc.

Ladders

- The use of ladders with broken or missing rungs or steps, broken or split handrails, or with other faulty or defective construction is prohibited.
- Ladders must not be placed adjacent to a door unless the door is locked or guarded.
- Metal ladders shall not be used for electrical work.
- Tie off top of ladder to structure.

Medical Service and First Aid

- Preplanned emergency medical service shall be provided as designated by Contractor and approved by the Company Representative.
- Contractor shall provide a first aid kit for Contractor employees, which meets or exceeds minimum OSHA requirements.
- Compliance with Bloodborne Pathogens Standard (29 CFR 1910.1030) and Company Procedure HS512 is required.

Overhead Work

No overhead work shall be performed when, as a result of that work, the possibility of a falling object striking any person exists. Do not work above any person at any time.

Personal Protective Clothing and Equipment

In certain construction and maintenance operations, personal protective equipment such as safety glasses, chemical goggles, respirators, hard hats, and protective clothing is required. The type of protective equipment to be worn will be determined by the degree of exposure to the potential hazard. There will be very few occasions when hard hats and eye protection will not be required at Company job sites. When in doubt of the safety measures to be observed, Contractor shall contact the Company Representative. This shall not, however, relieve Contractor of the responsibilities to determine appropriate protection. Eye protection is required when engaging in such operations as the following:

- Drilling, chipping, grinding, wire brushing
- Handling caustics and acids
- Breaking bricks or concrete
- Hammering chisels, drift pins, etc.
- Burning or welding
- Other situations which create a possible eye hazard (e.g., chemical environments)

Photographs

Only Company photographers are permitted to carry cameras or take pictures. If progress or finished construction photographs are desired, request for same should be made through the Company Representative.

Power/Air-Actuated Tools

- Power/air-actuated tools are not to be used on Company property or job sites without prior approval of the Company Representative.
- Explosive-actuated fastening tools shall meet ANSI design requirements. A tool which does not meet these design standards cannot be used.
- A tool shall never be left unattended in a place where it would be available to unauthorized persons.
- The tools shall not be used in explosive or flammable atmospheres.

Safety

Company Representative and designees are authorized to stop any work which they may consider hazardous to Company personnel or equipment or Contractor personnel.

Scaffolds

- All scaffolds, whether fabricated on site, purchased, or rented, shall conform to the specifications found in Safety Requirements for Scaffolding (ANSI A10.8) and 29 CFR 1910.28 or 1926.451, as appropriate. Rolling scaffolds shall maintain a four-to-one height-to-base ratio.
- The footing or anchorage for a scaffold shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.
- Unstable objects, such as barrels, boxes, loose bricks, or concrete blocks, shall not be used to support scaffolds or planks.
- No scaffold shall be erected, moved, dismantled, or altered except under the supervision of competent persons.
- Scaffolds and their components shall be capable of supporting, without failure, at least four times the maximum intended load.
- Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor.
- Scaffolds measuring four to ten feet in height, and having a horizontal dimension of less than 45 inches, shall have standard guardrails installed on all open sides and ends of the platform.
- Wire, synthetic, or fiber rope used for suspended scaffolds shall be capable of supporting at least six times the rated load.
- No riveting, welding, burning, or open flame work shall be performed on any staging suspended by means of fiber or synthetic rope.
- Tested fiber or approved synthetic ropes shall be used for or near any work involving the use of corrosive substances.

Smoking and Open Flames

Smoking and the use of open flames are strictly prohibited in areas where flammable liquids, gases, or highly combustible materials are stored, handled, or processed. Obey "No Smoking" signs. Smoke only in designated areas.

Solvents and Paints

- Adequate ventilation must be maintained at all times when paints or solvents are used.
- Personnel should use proper respiratory protection and protective clothing when toxicity of the material requires such protection.



Safe Work Practices

- Flammable solvents and materials shall not be used when possible sources of ignition exist.
- Flammable paints and solvents must be stored in an approved (Factory Mutual or Underwriters Laboratories) flammable liquids storage cabinet when storage is required inside buildings. If an approved cabinet is not available, paints and solvents must be removed from the building when not in use.
- Flammable liquids must be dispensed in safety cans with flash arresters bearing a Factory Mutual or Underwriters Laboratories approval. These containers must be clearly identified as to their contents.
- Material Safety Data Sheets, for materials used by the contractor, shall be maintained by the Contractor, and a copy provided to the Company Representative.

Tarpaulins

When tarpaulins are required for the deflection of hot slag, dust, paint drippings, etc., or as security barriers, they shall be flame-resistant and in good condition.

Tools

- Hand and power tools shall be kept in safe operating condition. Mushroomed heads on cold chisels, star drills, etc., are unsafe and shall not be used. Hammers shall have handles which are not cracked, split, or broken.
- Nonsparking tools may be necessary in certain areas where flammable materials are handled or where sparks could create an explosion.

Transporting Material and Equipment

- Extreme care must be taken while carrying sections of pipe, conduit, and other materials to assure safety to the Company and client personnel and property. This includes, but is not limited to, flagging and use of two people to carry pipe of lengths greater than ten feet.
- Tools, material, and equipment must not be left unattended in accessways.
- Tools, material, and equipment shall not be removed from the job site without permission of the Company Representative.

Walking and Working Surfaces

- Workroom floors shall be clean and, to the extent possible, dry.
- Drainage mats, platforms, or false floors should be used where wet processes are performed.
- Floors shall be free from protruding nails, splinters, holes, and loose boards or tiles.
- Permanent aisles or passageways shall be marked.
- Floor holes shall be protected by covers that leave no openings more than one inch wide.
- Floor openings into which persons can accidentally walk shall be guarded by a standard railing and toeboards.
- Open-sided floors, platforms, and runways higher than four feet shall be guarded by standard railings.
- Toeboards shall be used wherever people can pass below, or where hazardous equipment or materials are located below.

Warning Signs

All posted warning, safety, and security signs and barriers shall be observed. Additionally, Contractor shall provide warning signs, barriers, barricades, etc., wherever such protection is needed. Where signs and barricades do not provide adequate protection, particularly along a road, flagmen shall be used.



PROCEDURE

Subject: ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the requirements for incident reporting, investigation, and review. This procedure is an integral part of the company's overall accident prevention program and aids in the identification of potential causal factors and corrective actions. Key elements of this procedure include:

- **All occupational injuries/illnesses, vehicle accidents, and near miss incidents must be promptly reported and investigated.**
- All Occupational Safety and Health Administration (OSHA) recordable injuries/illnesses and chargeable vehicle accidents must be reviewed by an Accident Review Board. The Accident Review Board report is submitted to the Baton Rouge Corporate Safety Department, for production to and retention on behalf of the Legal Department.
- All incidents involving a fatality, major injury/illness, or resulting in significant property damage will be immediately reported to: the business line Health & Safety Manager; the Corporate Health and Safety Department; Business Line Vice President and the Legal Department.
- All investigations and associated materials obtained and/or produced, in association with OSHA recordable injuries/illnesses, chargeable vehicle accidents, fatalities, major injury/illness, or incidents resulting in significant property damage, are to be performed for & on behalf of the legal department and will be subject to being classified as Confidential Attorney-Client / Attorney Work Product.
- All business line Health & Safety Managers are required to prepare a Monthly Loss Report summarizing all current month, and year-to date, chargeable vehicle accidents, injury/illness cases (requiring outside medical care), lost work day totals and restricted work day totals. This report shall then be forwarded, by the 10th day of the following month, to the Baton Rouge Corporate Safety Office.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Corporate Health & Safety Department is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Chargeable Vehicle Accident - Any **at-fault** vehicle accident meeting any **one** of the following criteria:

- An individual other than an employee of the company is a party in the accident
- Property owned by a person or entity other than the company is damaged
- When company owned, leased or rented vehicles are involved and damage exceeds \$2,500.00.
- When an employee is driving a personal vehicle while on company business and damage exceeds \$2,500.00.

Company - All affiliates, indirect and wholly owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Days Away From Work - Days away from work are the number of **calendar** days following the injury or illness, excluding the date of the injury.

Job Safety Analysis (JSA) – The JSA is an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. (See HS045: Job Safety Analysis)



Restricted Work – Occurs when, as the result of a work-related injury or illness:

- A physician or other licensed health care professional recommends that the employee not perform one or more of the routine functions of his or her job, or not work the full workday that he or she would otherwise have been scheduled to work

Near Miss Incident - Any incident where no injury occurred, but where the potential for injury existed.

OSHA Recordable Case – See Attachment 8

Vehicle - Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. For the purpose of this procedure, off-road vehicles such as earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles. (See HS800 Motor Vehicle Operation: General Requirements)

5.0 TEXT

5.1 Incident Reporting Process

Employees are required to immediately report to their direct supervisor all occupational injuries, illnesses, accidents and near miss incidents having the potential for injury. Site Business Line Managers or Supervisors (supervisor directly responsible for the employee involved in the incident) with first-hand knowledge of an incident is required to:

- Immediately arrange for appropriate medical attention and notify the responsible health and safety representative.
- **As soon as practical, but not longer than one hour after gaining knowledge of the occurrence**, notify the Shaw Notification Hotline/Helpdesk by calling 1-866-299-3445 (Attachment 10) of any injury requiring off-site medical treatment, any chargeable vehicle accident or equipment incident involving property damage exceeding \$2,500 in value (Shaw or third party).
- Inform Health Resources of all incidents requiring off-site medical attention by calling 1-800-350-4511. This call should be made **prior** to transporting the employee such that they can coordinate physicians services prior to arrival of the employee to the clinic, and provide the following information:
 - Company Name (Shaw E&I) & Business Line (e.g. DOD, Commercial)
 - Employee Name
 - Name of anticipated, treating medical facility and phone number
 - Brief description of incident.

Health Resource's role is to interface with the treating physician, to ensure that appropriate care is provided to the injured employee.



- Complete the *Authorization for Treatment, Release of Medical Information, and Return to Work* (Attachment 9A, 9B, 9C) and the *Supervisor's Employee Injury Report* (Attachment 2) for all cases requiring off-site medical attention. The Site Safety and Health Representative or responsible supervisor shall ensure that the forms are completed and faxed to Health Resources at (800) 853-2641 prior to leaving the medical facility or as soon as reasonably possible.

- Post accident drug and alcohol testing shall occur in accordance with HS101 Drug and Alcohol Testing, immediately following an incident.

NOTE: Prior to performing non-DOT post accident testing, it is the responsibility of the employee's supervisor to ensure that Health Resources has verified that this testing is not prohibited or restricted by state or local regulations.

- Prior to an injured employee returning to his/her job duties, a follow-up call by Health Resources will be made to the project site. The purpose of this call is to ensure work restrictions are clarified and planned work activities are consistent with medical recommendations.

- The Supervisor shall initiate/complete the appropriate company documentation in accordance with the following incident classifications: (note: if a Site Safety and Health Representative is on site, he should work in concert with the supervisor)

- OSHA Recordable Cases

- a. Supervisor's Employee Injury/Illness Report (Attachment 2)
- b. Incident Investigation Report (Attachment 5)
- c. Witness Statement Form (Attachment 6)
- d. Accident Review Board (Attachment 7)

- First Aid Cases

- a. Supervisor's Employee Injury/Illness Report (Attachment 2)
- b. Incident Investigation Report (Attachment 5)
- c. Witness Statement Form (Attachment 6)

- Chargeable Vehicle Accidents

- a. Vehicle Accident Report (Attachment 3)
- b. Incident Investigation Report (Attachment 5)
- c. Witness Statement (Attachment 6)
- d. Accident Review Board (Attachment 7)
- e. Driving Record Certification (Procedure HS800)

- Non-Chargeable Vehicle Accidents

- a. Vehicle Accident Report (Attachment 3)
- b. Incident Investigation Report (Attachment 5)
- c. Witness Statement (Attachment 6)



- Equipment, Property Damage and General Liability Incidents
 - a. Incident Investigation Report (Attachment 5)
 - b. Witness Statement Form (Attachment 6)
 - c. Equipment, Property Damage and General Liability Loss Report (Attachment 4).
- Near Miss
 - a. Incident Investigation Report (Attachment 5)

5.2 Supervisor's Employee Injury/Illness Report (Attachment 2)

The Supervisor's Employee Injury Report is to be completed for all incidents that result in an employee occupational injury or illness requiring off-site medical attention. It is to be initiated by the supervisor of the injured employee and forwarded to the respective Business Line Safety Manager for review / comments. Upon completion of review and comments the report should be forwarded, **within 24 Hours**, to the Shaw Corporate Claims department in Baton Rouge, via the corporate claims fax number (225.932.2636).

5.3 Vehicle Accident Report (Attachment 3)

The Vehicle Accident Report must be completed for any vehicle accident in which a company vehicle is involved. This includes company-owned or leased vehicles, rental vehicles, and personal vehicles being used for company business. This report is to be initiated by both the employee involved in the accident and his/her direct supervisor and forwarded to the respective Business Line Safety Manager for review / comments. Upon completion of review and comments the report should be forwarded to the Shaw Corporate Claims department in Baton Rouge (fax number 225.932.2636).

5.4 Equipment, General Liability, Property Damage, and Loss Report (Attachment 4)

The General Liability, Property Damage, and Loss Report is to be used for all losses or damage to company property in excess of \$2,500.00. This form must be completed for all third party property, regardless of value, damaged as a result of company activities. The employee most familiar with the events that contributed to the loss or damage will complete the form, and then forward it to the project/location manager. The Corporate Claims Department and the respective Business Line Safety Manager must receive a copy of the report within one business day of the incident.

5.5 Incident Investigation Report (Attachment 5)

All injuries, illnesses, accidents, and near miss incidents will be investigated. Once arrangements for immediate medical care have been made, the employee's direct supervisor, with assistance from the health and safety representative and Business Line Health and Safety Manager, will:

- Collect the facts;
- Describe and document (include sketch, photos, etc.) how the incident occurred;



- Collect support documentation (JSA's, AHA's, Tailgate Safety Meetings, Work Orders, etc.);
- List witnesses and collect written statements;
- If applicable, contact the employee's Functional Manager in an effort to gain relevant information
- Identify the causative factors;
- Identify potentially unsafe acts or unsafe conditions that may have contributed to the incident;
- Identify potential curative action; and
- List the corrective actions which are to be executed, appropriate curative action, the person(s) responsible for the corrective action, and the date by which action is to be completed.

The investigation will be started as soon as possible following the incident and the relevant reports and support documentation (JSA's, AHA's, Tailgate Safety Meetings, Work Orders, etc.) shall be submitted to the appropriate Business Line Health and Safety Manager within 72 hours. In addition to the previous information, reports from external sources (police, insurance carriers, testing laboratories, etc.) are to be obtained as soon as they become available and forwarded by the Business Line Safety Manager to the Corporate Claims department in Baton Rouge.

5.6 Injured Employee Statement & Witness Statement Forms (Attachment 6a & 6b)

The Injured Employee and Witness Statement Forms allow for consistency in the development of the investigation process. The Injured Employee Statement must be completed in all cases where an employee injury results in off site medical treatment. If there are witnesses to the accident/incident, the Witness Statement form should be completed and signed by the subject witness. Both of these forms should be attached to the incident investigation report. It is essential that these statements are executed immediately following the incident to ensure an accurate account of the events.

5.7 Accident Review Board (ARB) (Attachment 7)

The purpose of the Accident Review Board is to collect and review the information gathered for each incident, report that information to the Legal Department and take appropriate curative action. In all cases, the purpose of the entire investigative process, inclusive of conducting an ARB, is to identify curative actions as it relates to the incident / injury. Accordingly, a diligent and concerted effort to accomplish these tasks must be established at the onset of all of the subject incidents.

In order to assist the Legal Department in evaluating the risk to, or liability of, the company, associated with OSHA recordable injuries, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, the responsible Project / Location Manager is required to coordinate with all parties and set up the ARB such that



it occurs **within 10 days of the accident**. The respective Business Line Health and Safety Manager, whose project/location experiences accident is then required to conduct the subject ARB.

The Accident Review Board shall be composed of the project/location manager, the employee's direct supervisor (at time of incident), a health and safety representative, and the employee(s) involved in the incident.

Additionally, there may be cases that involve an employee that has been assigned to a project and the Functional Manager of that employee may not have direct knowledge of an incident. In cases such as these, the Functional Manager shall be notified of the incident and requested to participate in the ARB. Also, as determined by the Business Line Health and Safety Manager, a representative of other internal sources of expertise should be involved where applicable.

All investigations and associated materials obtained and/or produced, in association with injuries/illnesses resulting in OSHA recordable classification, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, are to be performed for and on behalf of the legal department and will be subject to being classified as Confidential Attorney-Client / Attorney Work Product. If the ARB is initiated under a Confidential Attorney-Client / Attorney Work Product status, all documents and other work product arising out of, or associated with, the investigation process, including the ARB, shall be prepared in anticipation of litigation. The Accident Review Board report, and associated documents, is submitted to the Corporate Safety Department, for production to and retention on behalf of the Legal Department.

The ARB report, and all associated documents, shall be completed as soon as practicable, but not more than 5 business days following the ARB meeting, and forwarded by the Business Line Safety Manager to the Corporate Safety Department, via the Corporate Claims fax number. The original documents shall then be mailed to the Corporate Safety Department. These documents shall then be filed in a lockable cabinet, separate from files not meeting the subject criteria, by the Corporate Safety Department, for production to and retention on behalf of the Legal Department. In the event that copies of these files are maintained by Business Line Safety Managers and / or the respective location in which the injury occurred, the same filing criteria shall be followed. The criteria shall be that these documents are filed in lockable cabinets, separate from files not meeting the subject Attorney-Client / Attorney Work Product criteria.

It is generally not acceptable to discipline an employee for having an accident. However, if in the opinion of the Accident Review Board, it is determined that the accident resulted from an intentional unsafe act or intentional violation of company procedure on the employee's part, the employee may be subject to disciplinary action in accordance with the company's progressive disciplinary action system (see Human Resources Procedure HR207).



5.8 Monthly Loss Report

Each business line Health and Safety Manager is responsible to submit a Monthly Loss Report summarizing incidents that took place within their business line during the previous month. The business line Health and Safety Manager is responsible for submitting a consolidated package for the entire business line to the corporate health and safety office for **receipt no later than the 10th working day of the following month.**

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HR207 Disciplinary Action
HS013 Health and Safety Procedure Variances
HS101 Drug and Alcohol Testing
HS800 Motor Vehicle Operations - General Requirements
HS810 Commercial Motor Vehicles

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Supervisor's Employee Injury/Illness Report
3. Vehicle Accident Report
4. Equipment, Property Damage and General Liability Loss Report
5. Incident Investigation Report
6.
 - a. Injured Employee Statement
 - b. Witness Statement
7. Accident Review Board Report
8. Injury/Illness Classification Guidelines
9. Medical Forms
 - a. Authorization for Treatment of Occupational Injury/Illness
 - b. Authorization for Release of Medical Information
 - c. Return to Work Examination Form.
10. Help Desk / Hotline Notification Guidelines



ATTACHMENT 1

ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW RESPONSIBILITY MATRIX

Action	Procedure Section	Responsible Party					
		Employee	Supervisor	Project/ Location Manager	Site Health and Safety Rep. / Officer	Business Line Health and Safety Manager	Corporate Health & Safety Manager
Issue, Revise, and Maintain Procedure	3.1						X
Report All Incidents to Supervisor	5.1	X					
Notify Health and Safety Representative	5.1		X				
Arrange Medical Care	5.1		X		X		
Notify Health Resources or Gates McDonald of Incident	5.1		X		X		
Initiate/Complete Company Forms	5.1		X		X		
Complete Investigation of incident	5.5		X	X	X	X	
Complete Equipment, Property Damage and General Liability Loss Report Incident	5.4	X					
Coordinate and Set up Accident Review Board	5.7			X			
Conduct Accident Review Board	5.7					X	
Participate in Accident Review Board	5.7	X	X	X	X	X	
Complete Monthly Loss Report	5.8					X	



Attachment 2

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT
FAX REPORT WITHIN 24 HOURS OF INCIDENT TO 225-932-2636.
Phone all injuries/ illnesses to Shaw Notification Hotline/Helpdesk
1-866-299-3445

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION

Employee's Social Security Number: Claim Number:
Employee's Name: Home Phone Number:
Home Address: Business Line Code:
Male Female Date of Birth: Hire Date:
Dependents: Dependents Under 18: Marital Status:
Occupation: Department Name:
State Hired: Currently Weekly Wage: Hourly Wage:
Hours/Days Worked Per Week: Days Per Week Hours Worked Per Day:
Employment Status: Employee Report No.: N/A Employee ID No.: N/A
Salaried Continued: Paid For Date of Injury: Education No. of Years:
Ever Injured on the Job: Supervisor Name & Phone:

EMPLOYER INFORMATION

Employer Name: The Shaw Group, Inc.
Work Location:
Contact Name: Troy Allen Telephone Number: (800)747-3322
Employer SIC: Employer Location Code:
Employer FED ID: Employer Code: N/A
Nature of Business:
Policy Number:

ACCIDENT INFORMATION

Date and Time of Injury:
Did the Accident Occur at the Work Location: If no, where did the accident occur? N/A
Accident Address:
Nature of Accident:
Give a Full Description of the Accident: (Be as Factually Complete As Possible)
Are Other WC Claims Involved? No Date and Time Reported to Employer:
Person Reported To:



WITNESS INFORMATION

Were There Any Witnesses?
If Yes, List Names and How to Contact Them:

INJURY INFORMATION

Which Part of the Body Was Injured? (e.g. Head, Neck, Arm Leg)
What Was the Nature of Injury? (e.g. Fracture, Sprain, Laceration)
Part of Body Location: (e.g. Left, Right, Upper, Lower)
Injury Description:
Source of Injury: | Is Employee Hospitalized?
Lost Time: | If Yes, What was First Full Day Out:
Date Last Day Worked: | Date Disability Began: N/A
Date Returned to Work: | Estimated Return Date: N/A

MEDICAL INFORMATION

ER Treated & Released: | Hospitalized: | Phy./Clinic:
Hospital - Name, Address, Phone Number: | Was Employee Transported via Ambulance: Yes No
N/A

Clinic - Name, Address, Phone Number:

ADDITIONAL COMMENTS & INFORMATION

REPORT PREPARED BY

Name: | Title:
Signature: | Phone:



ATTACHMENT 3
VEHICLE ACCIDENT REPORT
 Page 1 of 2

ACCIDENT DESCRIPTION

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ A.M. or P.M.
 LOCATION OF ACCIDENT (CITY, STATE) _____
 DESCRIPTION OF ACCIDENT _____

 WITNESS _____ PHONE NO. _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 POLICE OFFICER'S NAME AND BADGE # _____ DEPARTMENT _____

COMPANY VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 WORK PHONE NO. _(____) _____ S.S. NO. _____ PROJECT NAME/NO. _____
 VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____
 STATE _____ VEHICLE OWNER: COMPANY LEASED/RENTED PRIVATE VEHICLE
 VEHICLE TYPE: COMMERCIAL MOTOR VEHICLE NON-COMMERCIAL
 IF NOT COMPANY-OWNED: OWNER _____ PHONE NO. _(____) _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 VEHICLE DAMAGE _____
 NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____
 WERE HAZARDOUS MATERIALS RELEASED? NO YES IF YES, DESCRIBE MATERIALS _____

OTHER VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 PHONE NO. _(____) _____ S.S. NO. _____
 OWNER'S NAME (CHECK IF SAME AS DRIVER) _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 INSURANCE COMPANY _____ POLICY NO. _____
 AGENT'S NAME _____ PHONE NO. _(____) _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 VEHICLE YEAR _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____
 VEHICLE I.D. NO. _____
 VEHICLE DAMAGE _____
 PASSENGERS: NO YES INJURIES: NO YES (If Yes, list names and telephone numbers below)



VEHICLE ACCIDENT REPORT

WEATHER: Clear Cloudy Fog Rain Sleet Snow Other _____
 PAVEMENT: Asphalt Steel Concrete Wood Gravel/Dirt
 Brick/Stone Other _____
 CONDITION: Dry Wet Icy Pot Holes Other _____
 TRAFFIC CONTROL: Traffic Light Stop Sign Railroad No Intersection No Control
 ROADWAY: Number of Lanes Each Direction: _____ Residential Divided Highway Undivided Highway

Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.

SYMBOLS:

- Your Vehicle ①
- Other Vehicle(s) ② ③
- Pedestrian 
- Stop Sign 
- Yield 
- Railroad 

ADDITIONAL INFORMATION: _____

EMPLOYEE _____ (Print) _____ (Signature) _____ (Date)

SUPERVISOR _____ (Print) _____ (Signature) _____ (Date)

HEALTH & SAFETY REP. _____ (Print) _____ (Signature) _____ (Date)

ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPORT

REPORT MUST BE FAXED TO:
 CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
 WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY.

**REPORT ALL CHARGEABLE VEHICLE ACCIDENTS TO SHAW NOTIFICATION HOTLINE/HELPDESK
 (PHONE: 1-866-299-3445)**



ATTACHMENT 4

EQUIPMENT, PROPERTY DAMAGE AND GENERAL LIABILITY LOSS REPORT

This report is to be completed for all losses or damage to company property in excess of \$2,500.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION _____ PROJECT NO. _____ DATE _____

ADDRESS _____

HOW DID DAMAGE OR LOSS OCCUR: _____

DESCRIPTION AND VALUE (\$) OF DAMAGED/LOST/STOLEN PROPERTY: _____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Home Phone (____) _____

Home Address _____ City _____

Employer and Address _____

2. Name _____ Home Phone (____) _____

Home Address _____ City _____

Employer and Address _____

WERE PICTURES TAKEN? YES NO

WERE POLICE NOTIFIED? YES NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____ (Print) _____ (Signature) _____ (Date)

PROJECT/LOCATION MANAGER: : _____ (Print) _____ (Signature) _____ (Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY



ATTACHMENT 6a
Injured Employee Statement
MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Time your shift ends? Time _____ am pm

Name of Known Witnesses:

Name _____

Name _____

Name _____

Name _____

Your Immediate Supervisors Name _____

If not employed by Shaw E&I, enter name of company and phone number _____

Have you had a prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

Signature/Date

Print Name



ATTACHMENT 6b
Employee Witness Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Ends _____ am pm

Witness Information:

Name _____

Home Phone No. _____

Home Address _____

County _____ Zip _____

Witness' Supervisor Name _____

If not employed by Shaw E&I, enter name of company _____

Company Phone Number _____

Did You See the Incident/Accident? _____

How Far From You (approx., in feet) Did the Incident/Accident Occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

Witness Signature/Date

Print Name



ATTACHMENT 8

INJURY/ILLNESS CLASSIFICATION GUIDELINES

First Aid Treatment – If the incident requires only the following types of treatment, consider it first aid. **Do Not** record the case if it involves only:

- Using non-prescription medications at non-prescription strength
- Administering tetanus immunizations
- Cleaning, flushing, or soaking wounds on the skin surface
- Using wound coverings such as bandages, Band-Aids™, gauze pads, etc., or using SteriStrips™ or butterfly bandages
- Using hot or cold therapy
- Using any totally non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc.
- Using temporary immobilization devices while transporting an accident victim (slings, neck collars, or back boards)
- Drilling a fingernail or toenail to relieve pressure, or draining fluids from blisters
- Using eye patches
- Using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye
- Using irrigation, tweezers, cotton swab or other simple means to remove splinters or foreign material from areas other than the eye
- Using finger guards
- Using massages
- Drinking fluids to relieve heat stress

Medical Treatment – Includes managing and caring for a patient for the purpose of combating disease or disorder. The following are **not** considered medical treatments and are not recordable:

- Visits to a doctor or Licensed Health Care Professional (LHCP) solely for the purpose of observation or counseling
- Diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes
- Any procedure that can be labeled first aid (see above descriptions)

OSHA Recordable Injuries and Illnesses

Work related injuries and illnesses that result in the following should be recorded on the OSHA 300 Log:

- Death
- Loss of consciousness
- Days away from work
- Restricted work activity or job transfer
- Medical treatment beyond first aid.



You must also record any **work related** injury or illness that involves cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum.

Additional Recordable Criteria

You must also record the following conditions when they are work related:

- Any needle stick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material
- Any case requiring an employee to be medically removed from a site under the requirements of an OSHA health standard
- Any Standard Threshold Shift (STS) in hearing (i.e., cases involving an average hearing loss of 10dB or more in either ear)
- Tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed health care professional after exposure to a known case of active tuberculosis.



**ATTACHMENT 9B
 MEDICAL FORMS**

AUTHORIZATION FOR TREATMENT OF OCCUPATIONAL INJURY/ILLNESS

Employee Name: _____
 Social Security #: _____ Injury: Illness:
 Job Title: _____ Incident Date: _____
 Project/Location _____ Location of Accident/Exposure: _____
 Telephone #: _____
 H&S Representative: _____
 Body Part(s) Injured: _____
 Describe in detail how incident occurred: _____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work:

It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **Health Resources** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work:

It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **Health Resources** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

Health Resources: Telephone: 1-800-350-4511 Fax: (800) 853-2641

Please Send Reports To **Health Resources** AND **The Shaw Group, Inc. Corporate Claims Department**
Both of the Following: 600 West Cummings Park, Suite 3400 4171 Essen Lane
 Woburn, Massachusetts 01801 Baton Rouge, LA 70809

Please Send Bills To: **The Shaw Group, Inc. Corporate Claims Department**
 4171 Essen Lane
 Baton Rouge, LA 70809

DOCTOR, Please provide:

Medical Diagnosis: _____
 Treatment Provided: _____

Recommended Work Limitation/Restriction: _____
 Return Visit Needed: No Yes Date if Yes _____ First Aid Only
 Physician Name: _____ Physician Telephone: _____
 Physician Signature: _____ Date: _____

**YOU MUST CALL HEALTH RESOURCES FOR ALL OCCUPATIONAL INJURIES/ILLNESSES
 REQUIRING OUTSIDE MEDICAL TREATMENT: 1-800-350-4511.**

FAX COMPLETED FORM TO HEALTH RESOURCES (800) 853-2641.



ATTACHMENT 9B
MEDICAL FORMS
AUTHORIZATION FOR RELEASE OF PROTECTED MEDICAL INFORMATION

Printed Name: _____ Date of Birth: _____

Address: _____

Social Security #: _____ Home Telephone: _____

Authority to Release Protected Health Information

I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

HEALTH RESOURCES 600 West Cummings Park, Suite 3400 Woburn, Massachusetts 01801 Phone: (800) 350-4511 Fax: (800) 853-2641	AND	The Shaw Group Inc. 4171 Essen Lane Baton Rouge, Louisiana 70809 Phone: 225-932-2500 Fax: 225-932-2636
--	------------	---

The Information To Be Released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other, (specify) _____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my Protected Health Information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release. *Check One:* **Yes** **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release. *Check One:* **Yes** **No**

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to **The Corporate Claims Dept. at The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana 70809.** Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (e.g. fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge The Shaw Group Inc of any liability and the undersigned will hold The Shaw Group Inc harmless for complying with this Authorization.**

Signature: _____ **Date:** _____

Description of relationship if not patient: _____



**ATTACHMENT 9C
 MEDICAL FORMS**

RETURN-TO-WORK EXAMINATION FORM

Exam Date: ____ / ____ / ____ **Employee Name:** _____
Birth Date: ____ / ____ / ____ **Social Security #:** ____ - ____ - ____
Job Title: _____ **Sex:** Male Female

Examining Provider: Please complete this form and fax to Health Resources at (800) 853-2641. Please contact Health Resources at (800) 350-4511 to report status of employee post-treatment.

DIAGNOSIS: _____
TREATMENT PLAN: _____
MEDICATIONS: _____
PHYSICAL THERAPY: _____
OTHER: _____

- May return to full duty work effective ____/____/____
- May return to limited duty from ____/____/____ to ____/____/____
- Unable to return to work from ____/____/____ to ____/____/____

WORK LIMITATIONS:

- Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (company limits all lifting to ≤ 60 lbs).
- Work only with right/left hand. Restricted repetitive motion right/left hand.
- Sitting job only. Restricted operation of moving equipment.
- Other: _____

FOLLOW-UP PLAN:

- Release from care.
- Schedule for follow-up appointment on ____/____/____.
Time _____ AM/PM
- Referral to _____
Appointment date ____/____/____ Time _____ AM/PM

Comments: _____

 Examiner's Name (*print*)

 Examiner's Signature

 Date



ATTACHMENT 10

HELP DESK / HOTLINE NOTIFICATION GUIDELINES

Any incident, as defined in the bulleted items below, requires corporate notification **as soon as practical but not longer than one hour after occurrence**, via the Health and Safety Help Desk / Hotline. This requirement is a corporate wide directive and applies to all Shaw Group companies, not just Shaw E&I. As such, the responsibility for whom makes this notification has purposefully not been defined. This is due to the various types of projects in which The Shaw Group performs activities. Some projects may only consist of three technicians at a site; others may involve multiple levels of site management and consist of 200+ employees. Therefore, the intent is for the supervisory/management person to communicate the notification requirements to his/her employees and make the appropriate determination as to how the notification takes place.

Immediate Corporate Notification via Help Desk: [1-866-299-3445](tel:1-866-299-3445)

- Illness and/or injury (doctors cases and above);
- Property damage (dollar amount greater than \$2,500);
- Automobile accidents (All);
- Criminal activity (i.e. bomb threat, theft);
- Natural disaster (i.e. earthquakes, flood, storm damage, hurricanes);
- Explosion and/or fires (that results in property damage greater then \$2,500 or result in injury);
- Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact);
- Regulatory visit (i.e. OSHA, EPA, DEQ, MSHA, etc.);
- Fatalities

Note:

- Help Desk / Hotline notification is in addition to the requirement to inform Health Resources of all incidents requiring off-site medical attention by calling [1-800-350-4511](tel:1-800-350-4511). This call should be made **prior** to transporting the employee such that they can coordinate physicians' services prior to arrival of the employee to the medical facility.
- As stated above, the notification requirements are a corporate directive and apply to the entire Shaw Group. Accordingly, Shaw E&I managers/supervisors should use sound judgment as it pertains to the two bulleted items that have been highlighted above. Although they may not be desired events, some Environmental spills/releases that occur may not be an uncommon situation at a particular site. In addition, there may be projects in which the EPA or some other regulatory agency visits on some normal frequency. Events such as these, which would typically be unusual at a construction or fabrication site, are not so unusual to some of our environmental projects. As such, a notification to the helpdesk would not be required.



PROCEDURE

UNCONTROLLED WHEN PRINTED

**Subject: ACCIDENT PREVENTION PROGRAM:
MANAGEMENT SAFETY INSPECTIONS**

1.0 PURPOSE AND SUMMARY

This procedure establishes the requirement for management safety inspections of project and office locations. These inspections are an integral part of the overall accident prevention program and help to demonstrate management's commitment to safety. Key requirements of this procedure include:

- Project managers are required to conduct one inspection per month and ensure that at least one other inspection is conducted during the month;
- Office managers are required to conduct an office safety inspection once every six months.
- Laboratory managers are required to conduct a laboratory safety inspection every six months or more frequent as new processes or chemicals are introduced to the laboratory.
- Completed inspection reports are given to the project/office health and safety representative for review. A copy of the completed report will then be forwarded to the respective business line health and safety manager.

2.0 TABLE OF CONTENTS

1.0	Purpose and Summary
2.0	Table of Contents
3.0	Responsibility Matrix
3.1	Procedure Responsibility
3.2	Action/Approval Responsibilities
4.0	Text
4.1	Safety Inspections and Documentation
4.2	Best Practices
4.3	Joint Inspections
4.4	Safety Improvement Log
4.5	Management Site Visit
4.5.1	Project Managers
4.5.2	Office Managers
4.5.3	Laboratory Managers
4.5.4	Project Supervisors
4.5.5	Health and Safety Representative
4.6	Workshops
5.0	Exception Provisions
6.0	Cross References
7.0	Attachments



3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Sr. Director of EH&S is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 TEXT

Inspections of project, laboratory, and office locations by managers, supervisors, and the health and safety staff are critical factors in a comprehensive accident prevention program. Management safety inspections help demonstrate management's commitment to safety and verify that proper work practices are in use. These inspections are also used to verify the existence of safe work conditions and regulatory compliance. All employees are afforded the opportunity to participate in the inspection via the safety interview process.

4.1 Safety Inspections and Documentation

Safety inspections are required by various tiers and functions of, and within, the management structure. The objective is for operation managers to visibly demonstrate their concern for safety by direct contact with employees while in the workplace. Each inspection is to be documented on the appropriate Safety Inspection Report (Attachments 3,4 or 5).

The primary responsibilities of the inspector include but are not limited to:

- Interviewing employees with regard to health and safety issues and how they might be corrected;
- Observing and correcting unsafe conditions and acts; and
- Verifying that corrective actions have been assigned to a responsible employee and implemented.

Positive safety observations and safety issues not specifically addressed in the Safety Inspection Report can be documented on the last page of the report. A list of all corrective action items will be maintained showing the corrective action, responsible person, and the date action is to be completed. Completed reports are to be given to the project/office health and safety representative, then forwarded to the respective business line health and safety manager. See Attachment 2 for more detail on the proper routing of each inspection report.

4.2 Best Practices

Observations of superior safety practices that may be benchmarked at other projects, offices or laboratories should be documented on the last page of the appropriate safety inspection report.

4.3 Joint Inspections



Managers are encouraged to conduct safety inspections jointly with EH&S personnel.

4.4 Safety Improvement Log

Each project, office and laboratory will maintain a Safety Improvement Log (Attachment 6). The Safety Improvement Log is the central repository for all observations for safety improvements identified through any type of safety inspection. Project, Office and Laboratory Managers will **verify** that corrective actions listed in the Safety Improvement Log are completed in a timely manner and **validate** that the corrective action(s) taken is effective in preventing accidents.

4.5 Management Site Visits

Each senior manager is encouraged to make an informal safety inspection and review previously conducted inspection reports, during each site visit, to demonstrate their commitment to safety and reinforce the responsibilities of project management. Findings during this informal inspection are to be brought to the attention of the project manager so that corrective action can be initiated.

4.5.1 Project Managers

All project managers are required to complete at least one safety inspection per month and ensure that at least one other safety inspection per month is conducted. In the event that the project manager is not present at the project site during the month, this responsibility may be delegated to the project supervisor.

4.5.2 Office Managers

Office managers are required to conduct an office safety inspection once every six months. Managers are encouraged to conduct more frequent inspections if the office location is being remodeled or if new space is being occupied that was not previously inspected.

4.5.3 Laboratory Managers

Laboratory managers are required to conduct a laboratory safety inspection once every six months or more frequent if new test chemicals, sample types, equipment or instrumentation have been introduced that pose a greater risk.

4.5.4 Project Supervisors

Project supervisors are expected to inspect their projects monthly and ensure that corrective actions are implemented. Dependent upon project manager participation, project supervisors may also be required to conduct an additional monthly inspection. The requirement to conduct these inspections cannot be delegated.

4.5.5 Health and Safety Representative

Health and safety representatives must continually observe activities and correct unsafe acts/conditions as soon as reasonably possible. They are also required to review each Safety Inspection Report completed at their location to ensure that corrective actions are implemented. Once this review is complete, they will forward the reports to the appropriate business line health and safety manager.

4.6 Workshops



Health and safety representatives will present workshops and/or conduct joint inspections to help managers and supervisors develop their inspection skills.

5.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

6.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances

7.0 ATTACHMENTS

- 1 Management Safety Inspection Responsibility Matrix
- 2 Management Safety Inspection Requirement Matrix
- 3 Project Safety Inspection Report
- 4 Office Safety Inspection Report
- 5 Laboratory Inspection Report
- 6 Safety Improvement Log



ATTACHMENT 1

**ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS
RESPONSIBILITY MATRIX**

Action	Procedure Section	Responsible Party				
		Senior Managers	Project/ Office Manager	Project Supervisors	Health and Safety Representative	Sr. Director of EH&S
Issue, Revise, and Maintain Procedure	3.1					X
Conduct Informal Safety Inspections and Review Previously Completed Reports	4.1.1	X				
Conduct Safety Inspections	4.1.2 4.1.3 4.1.4		X	X		
Give Completed Reports to Health and Safety Representative	4.1.2 4.1.3 4.1.4		X	X		
Review Reports and Forward to Health and Safety Manager	4.1.5				X	
Conduct Inspection Workshops	4.2				X	



ATTACHMENT 2

**ACCIDENT PREVENTION PROGRAM: MANAGEMENT SAFETY INSPECTIONS
REQUIREMENT MATRIX**

Tier Level	Management Level	Form used	Frequency	Routing (1)
1	Tier 1 Senior Management	Leadership Safety Assessment Report HS-021A	One / quarter	BL EH&S Director
2	Tier 2 Senior Management	Leadership Safety Assessment Report HS-021B	Two/quarter	BL EH&S Director
3	Project Managers/ Site Managers	Project Manager/Site Manager Safety Inspection HS-021C	Two / Month	Direct Supervisor, Site Safety Officer (if applicable) and Regional H&S Manager
3	Office Managers	Office Safety Inspection Report HS-021C	Semi-annually	Direct Supervisor, Regional H&S Manager
3	Laboratory Managers	Laboratory Safety Inspection Report HS-021C	Semi-annually	Direct Supervisor, Regional H&S Manager
3	Project Supervisors	Project Safety Inspection Report HS-021C	Two / Month	Project Manager, Site Safety Officer (if applicable) and Regional H&S Manager
3	Health & Safety Managers/Rep-resentatives	Joint Inspections (with Senior Managers, Project/Site Managers, Office Managers, Lab Managers or Project Supervisors) HS-021C	Three/quarter	As appropriate

(1) The BL H&S Director and Regional H&S Managers will forward a copy to the BL H&S Administrator for filing and metric tracking



ATTACHMENT 3

PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

BUSINESS LINE: _____ PROJECT NAME/NUMBER:
PROGRAM MANAGER: _____ PROJECT MANAGER:
GENERAL PROJECT DESCRIPTION:
SITE ACTIVITIES AT TIME OF INSPECTION:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INSPECTION COMPLETED BY: _____ DATE:

HEALTH AND SAFETY REVIEW BY: _____ DATE:



PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

FIRST AID YES NO N/A

- 1. Are first aid kit locations identified and accessible? _____
- 2. Are emergency eye wash/safety showers available and inspected monthly? _____
- 3. Are first aid kits inspected weekly? _____
- 4. Is a qualified first aid/CPR provider on site? _____

PERSONAL PROTECTIVE EQUIPMENT

- 1. Have levels of personnel protection been established? _____
- 2. Are respirators decontaminated, inspected, and stored according to standard procedures? _____
- 3. Have employees been fit-tested? _____
- 4. Is defective personal protective equipment tagged and taken out of service? _____
- 5. Does compressed breathing air meet CGA Grade "D" minimum? _____
- 6. Are there sufficient sizes and quantities of protective equipment? _____
- 7. At a minimum, are employees utilizing safety glasses, hard hats, and steel toe boots? _____

FIRE PREVENTION

- 1. Are employees smoking only in designated outdoor areas? _____
- 2. Are fire lanes established and maintained? _____
- 3. Are flammable liquid dispensing systems bonded? _____
- 4. Are approved safety cans available for storage of flammable liquids? _____
- 5. Has the local fire department been contacted? _____
- 6. Are fire extinguishers available and inspected monthly? _____
- 7. Are flammables and combustibles properly stored? _____
- 8. Are flammable storage cabinets available and used when needed? _____

AIR MONITORING

- 1. Is required air monitoring being conducted? _____
- 2. Are air monitoring instruments calibrated daily? _____
- 3. Are air monitoring logs up to date? _____
- 4. Are instrument user manuals available? _____
- 5. Are instruments being maintained? _____
- 6. Are employees notified of personal sampling results within 5 days of receipt? _____

WELDING AND CUTTING

- 1. Are fire extinguishers present at welding and cutting operations? _____
- 2. Are confined spaces evaluated prior to and during cutting and welding operations? _____
- 3. Have Hot Work Permits been completed? _____
- 4. Are proper helmets, goggles, aprons, and gloves available for welding and cutting operations? _____
- 5. Are welding machines properly grounded? _____
- 6. Are oxygen and fuel gas cylinders stored a minimum of 20 feet apart? _____
- 7. Are only trained personnel permitted to operate welding and cutting equipment? _____
- 8. Are gas cylinders transported in a secured vertical position with caps in place? _____

HAND AND POWER TOOLS

- 1. Are defective hand and power tools tagged and taken out of service? _____
- 2. Is eye protection available and used when operating power tools? _____



PROJECT SAFETY INSPECTION REPORT

PROJECT _____

DATE _____

	YES	NO	N/A
3. Are guards and safety devices in place on power tools?	_____	_____	_____
4. Are power tools inspected before each use?	_____	_____	_____
5. Are nonsparking tools available when necessary?	_____	_____	_____
6. Is the correct tool being used for the job?	_____	_____	_____

MOTOR VEHICLES

1. Are vehicles regularly inspected?	_____	_____	_____
2. Are personnel licensed for the vehicles they operate?	_____	_____	_____
3. Are unsafe vehicles tagged and reported to supervision?	_____	_____	_____
4. Is vehicles safety equipment operating properly?	_____	_____	_____
5. Are loads secure?	_____	_____	_____
6. Are vehicle occupants using safety belts?	_____	_____	_____
7. Are current insurance cards and blank accident report forms located in vehicles?	_____	_____	_____

EMERGENCY PLANS

1. Are emergency telephone numbers posted?	_____	_____	_____
2. Have emergency escape routes been designated?	_____	_____	_____
3. Are employees familiar with the emergency signal?	_____	_____	_____
4. Has the emergency route to the hospital been established and posted?	_____	_____	_____
5. Is a vehicle on site that can transport injured employees to the hospital?	_____	_____	_____

MATERIALS HANDLING

1. Are materials stacked and stored to prevent sliding or collapsing?	_____	_____	_____
2. Are tripping hazards identified?	_____	_____	_____
3. Are semi-trailers chocked?	_____	_____	_____
4. Are fixed jacks used under semi-trailers?	_____	_____	_____
5. Are riders prohibited on materials handling equipment?	_____	_____	_____
6. Are approved manlifts provided for the lifting of personnel?	_____	_____	_____
7. Are personnel in manlifts wearing approved fall protection devices?	_____	_____	_____
8. Are only qualified operators utilized i.e., forklift trained?	_____	_____	_____

FIRE PROTECTION

1. Has a fire alarm system been established?	_____	_____	_____
2. Do employees know the location and use of all fire extinguishers?	_____	_____	_____
3. Are fire extinguisher locations posted?	_____	_____	_____
4. Are combustible materials segregated from open flames?	_____	_____	_____
5. Have fire extinguishers been professionally inspected during the last year?	_____	_____	_____
6. Are fire extinguishers visually inspected monthly?	_____	_____	_____
7. Has a fire drill occurred within the last 12 months?	_____	_____	_____

ELECTRICAL

1. Is electrical equipment and wiring properly guarded and maintained in good condition?	_____	_____	_____
2. Are extension cords kept out of wet areas?	_____	_____	_____
3. Is damaged electrical equipment tagged and taken out of service?	_____	_____	_____
4. Have underground electrical lines been identified by proper authorities?	_____	_____	_____
5. Has a lockout/tagout system been established?	_____	_____	_____
6. Are GFCIs being used on all temporary electrical systems and as needed?	_____	_____	_____
7. Are extension cords being inspected daily (i.e., group pin in place, no	_____	_____	_____



PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

Table with 3 columns: Question, YES, NO, N/A. Contains questions 8-13 regarding electrical safety.

CRANES AND RIGGING

Table with 3 columns: Question, YES, NO, N/A. Contains questions 1-12 regarding crane and rigging safety.

COMPRESSED GAS CYLINDERS

Table with 3 columns: Question, YES, NO, N/A. Contains questions 1-8 regarding compressed gas cylinder safety.

SCAFFOLDING

Table with 3 columns: Question, YES, NO, N/A. Contains questions 1-12 regarding scaffolding safety.



PROJECT SAFETY INSPECTION REPORT

PROJECT _____ DATE _____

13. Are all scaffold components manufactured by the same company? YES NO N/A

WALKING AND WORKING SURFACES

- 1. Are ladders regularly inspected?
2. Are access ways, stairways, ramps, and ladders clean of ice, mud, snow, or debris?
3. Are ladders being used in a safe manner?
4. Are ladders kept out of passageways, doors, or driveways?
5. Are broken or damaged ladders tagged and taken out of service?
6. Are metal ladders prohibited in electrical service?
7. Are stairways and floor openings guarded?
8. Are safety feet installed on straight and extension ladders?
9. Is general housekeeping being maintained?
10. Are ladders tied off?
11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?

SITE SAFETY PLAN

- 1. Is a site safety plan available on site or accessible to all employees?
2. Does the safety plan accurately reflect site conditions and tasks?
3. Have potential hazards been described to employees on site?
4. Is there a designated safety official on site?
5. Have all employees signed the safety plan acknowledgment form?

SITE POSTERS

- 1. Are the following posters displayed in a prominent and accessible area?
A. Minimum Wage
B. OSHA Job Protection
C. Equal Employment Opportunity
D. Family and Medical Leave
E. Employee Polygraph Protection
F. Uninformed Services Employment and Reemployment Rights Act
G. Shaw Speak Up
H. Shaw HR203 Harassment Policy
I. Shaw Equal Employment Opportunity and Affirmative Action
2. Are all required state-specific posters displayed?

SITE CONTROL

- 1. Are work zones clearly marked?
2. Are support trailers located to minimize exposure from a potential release?
3. Are support trailers accessible for approach by emergency vehicles?
4. Is the site properly secured during and after work hours?
5. Is an exclusion zone sign-in/sign-out log maintained?
6. Are only personnel with current training and physicals permitted in exclusion or contamination reduction zone?

HEAVY EQUIPMENT

- 1. Is heavy equipment inspected as prescribed by the manufacturer?
2. Is defective heavy equipment tagged and taken out of service?



PROJECT SAFETY INSPECTION REPORT

PROJECT _____ **DATE** _____

	YES	NO	N/A
3. Are project roads and structures inspected for load capacities and proper clearances?	_____	_____	_____
4. Is heavy equipment shut down for fueling and maintenance?	_____	_____	_____
5. Are backup alarms installed and working on mobile equipment?	_____	_____	_____
6. Have qualified equipment operators been designated?	_____	_____	_____
7. Are riders prohibited on heavy equipment?	_____	_____	_____
8. Are guards and safety appliances in place and used?	_____	_____	_____
9. Are operators using the "three point" system when mounting/dismounting equipment?	_____	_____	_____

EXCAVATION

1. Has a "competent person" been designated to oversee excavation activities?	_____	_____	_____
2. Prior to opening excavations, are utilities located and marked?	_____	_____	_____
3. Has a professional engineer evaluated all excavations greater than 20 feet deep?	_____	_____	_____
4. Is there rescue equipment on site and accessible to the excavation area?	_____	_____	_____
5. Is excavated material placed a minimum of 24 inches from the excavation?	_____	_____	_____
6. Are the sides of excavations sloped or shored to prevent cave ins?	_____	_____	_____
7. Have excavations greater than 4 feet deep been monitored for hazardous atmospheres (i.e., LEL/O ₂ deficiency)?	_____	_____	_____
8. Are ladders or ramps used in excavations over 4 feet deep?	_____	_____	_____
9. Are means of egress available so as to require no more than 25 feet of lateral travel?	_____	_____	_____
10. Are barriers, i.e., guardrails or fences, placed around excavations near pedestrian or vehicle thoroughfares?	_____	_____	_____
11. Is excavation inspected <u>daily</u> by competent persons and documented?	_____	_____	_____

CONFINED SPACES

1. Have employees been trained in the hazards of confined spaces?	_____	_____	_____
2. Are confined space permits posted at entrance to confined space?	_____	_____	_____
3. Is a copy of the confined space entry procedure available?	_____	_____	_____
4. Has a rescue plan been established?	_____	_____	_____
5. Is an entry supervisor present at each permit-required entry?	_____	_____	_____
6. Are required extraction/fall protection devices being used?	_____	_____	_____

DECONTAMINATION

1. Are decontamination stations set up on site?	_____	_____	_____
2. Is decontamination water properly contained and disposed of?	_____	_____	_____
3. Are all pieces of equipment inspected for proper decontamination before leaving the site?	_____	_____	_____
4. Are shin/metatarsal guards being used during power washing activities?	_____	_____	_____

HAZARD COMMUNICATION

1. Is there a copy of the HAZCOM procedure on site?	_____	_____	_____
2. Are there MSDSs for required materials/chemicals present on site?	_____	_____	_____
3. Are all containers properly labeled, as to content, hazard?	_____	_____	_____
4. Have employees been trained in accordance with the HAZCOM procedure?	_____	_____	_____
5. Do employees (including subcontractors) know and understand the effects of exposure from the chemicals on site?	_____	_____	_____
6. Have all personnel signed the HAZCOM acknowledgment form?	_____	_____	_____
7. Is there an updated list of chemicals maintained on site?	_____	_____	_____

TRAINING



PROJECT SAFETY INSPECTION REPORT

PROJECT _____

DATE _____

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
1. Are tailgate safety meetings being conducted daily or before each shift?	_____	_____	_____
2. Are current training/medical records maintained on site?	_____	_____	_____

DOCUMENTATION

1. Is an OSHA 300 Log maintained and the 300A posted during February 1, to April 30,?	_____	_____	_____
2. Are accident report forms available?	_____	_____	_____
3. Is a copy of health and safety policy and procedures available on site?	_____	_____	_____



PROJECT SAFETY INSPECTION REPORT

PROJECT _____

DATE _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETED	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS



ATTACHMENT 4

OFFICE SAFETY INSPECTION REPORT

OFFICE _____ DATE _____

DATE: _____ OFFICE NAME:
OFFICE MANAGER:
AREA(S) OF OFFICE INSPECTED:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INTERVIEWED EMPLOYEE:
SAFETY ISSUE:
CORRECTIVE ACTION:

ASSIGNED TO: _____ FOLLOW-UP DATE:
CORRECTION VERIFIED BY: _____ DATE:

INSPECTION COMPLETED BY: _____ DATE:

HEALTH AND SAFETY REVIEW BY: _____ DATE:



OFFICE SAFETY INSPECTION REPORT

OFFICE _____ DATE _____

FIRST AID YES NO N/A

- 1. Are first aid kits accessible and identified? _____
- 2. Are emergency eye wash/safety showers available where needed and inspected? _____
- 3. Are first aid kits inspected weekly? _____

FIRE PREVENTION

- 1. Are employees smoking only in designated outdoor areas? _____
- 2. Are fire lanes/evacuation routes established and maintained? _____
- 3. Are approved safety cans/cabinets available for storage of flammable liquids? _____
- 4. Are fire exits clearly identified and unobstructed? _____
- 5. Are sprinkler heads unobstructed? _____

FURNITURE AND EQUIPMENT

- 1. Are desks, file cabinets, etc. arranged so that drawers do not open into aisles or walkways? _____
- 2. Are desk and file drawers closed after use? _____
- 3. Is weight distributed in file cabinets so that upper drawer contents does not create a top-heavy condition? _____
- 4. Are cabinets, bookcases, and shelves secured to prevent their falling over? _____
- 5. Are faulty desks, chairs, or other office equipment repaired or taken out of service? _____
- 6. Is adequate and sufficient lighting provided in all work areas? _____
- 7. Are paper cutter blades in fully down and locked position when not in use? _____
- 8. Are work stations arranged to be comfortable without unnecessary strains on backs, arms, necks, etc.? _____
- 9. Do machines with exposed moving parts have appropriate guards? _____

AISLES AND FLOORS

- 1. Is aisle clearance adequate for two-way traffic and for unobstructed access to all parts of the office and building? _____
- 2. Does office arrangement allow easy egress under emergency conditions? _____
- 3. Are wastebaskets, briefcases, or other objects placed where they are not a tripping hazard? _____
- 4. Are floors clear of pencils, bottles, and other loose objects? _____
- 5. Are tripping hazards from electrical cords, phone outlets, or other protrusions on the floor prevented by arrangement of furniture or other means? _____
- 6. Are floors free of loose tiles and projections that can create a tripping hazard? _____
- 7. Is carpeting in good condition and not badly worn or torn? _____

HAND AND POWER TOOLS

- 1. Are defective hand and power tools tagged and taken out of service? _____
- 2. Is eye protection available and used when operating power tools? _____
- 3. Are guards and safety devices in place on power tools? _____
- 4. Are power tools inspected before each use? _____
- 5. Is the correct tool being used for the job? _____
- 6. Do knife blades have guards when not in use? _____

MOTOR VEHICLES

- 1. Are vehicles regularly inspected? _____
- 2. Are personnel licensed for the vehicles they operate? _____
- 3. Are unsafe vehicles reported to supervision? _____



OFFICE SAFETY INSPECTION REPORT

OFFICE _____

DATE _____

	YES	NO	N/A
4. Is safety equipment on vehicles?	_____	_____	_____
5. Are loads secure on vehicles?	_____	_____	_____
6. Are vehicle occupants using safety belts?	_____	_____	_____
7. Are current insurance cards and blank accident report forms located in vehicles?	_____	_____	_____

EMERGENCY PLANS

1. Are emergency telephone numbers posted?	_____	_____	_____
2. Have emergency escape routes been designated?	_____	_____	_____
3. Are employees familiar with the emergency signal?	_____	_____	_____
4. Has an emergency route to the hospital been established and posted?	_____	_____	_____
5. Has a fire drill occurred within the last 12 months?	_____	_____	_____

MATERIALS HANDLING

1. Are materials stacked and stored to prevent sliding or collapsing?	_____	_____	_____
2. Are flammables and combustibles stored in approved containers?	_____	_____	_____
3. Are tripping hazards identified?	_____	_____	_____
4. Are riders prohibited on material handling equipment?	_____	_____	_____
5. Are only qualified operators utilized i.e., forklift trained?	_____	_____	_____

FIRE PROTECTION

1. Has a fire alarm system been established?	_____	_____	_____
2. Do employees know the location and use of all fire extinguishers?	_____	_____	_____
3. Are fire extinguisher locations marked?	_____	_____	_____
4. Have fire extinguishers been professionally inspected during the last year?	_____	_____	_____
5. Are fire extinguishers visually inspected monthly?	_____	_____	_____
6. Is there an operating fire detection system?	_____	_____	_____

ELECTRICAL

1. Are extension cords kept out of wet areas?	_____	_____	_____
2. Are certified electricians used for electrical work?	_____	_____	_____
3. Are GFCIs being used as needed?	_____	_____	_____
4. Are extension cords not being used in lieu of permanent wiring?	_____	_____	_____
5. Are warning signs exhibited on high voltage equipment (250V or greater)?	_____	_____	_____
6. Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?	_____	_____	_____
7. Are electric fans protected with guards of not over one-half inch mesh, which prevents fingers getting inside guard?	_____	_____	_____
8. Are cords, panels, receptacles, and plugs in good condition?	_____	_____	_____
9. Are multi-outlet strips not plugged into other multi-outlet strips?	_____	_____	_____
10. Are extension cords not plugged into other extension cords?	_____	_____	_____
11. Are circuit breakers or fuse panels properly labeled, kept closed, and accessible?	_____	_____	_____
12. Are extension cords arranged so that they are not placed over radiators, steam pipes, through doorways, or under carpets?	_____	_____	_____
13. Do space heaters have automatic shut-offs that will actuate if the heater tips over?	_____	_____	_____
14. Are space heaters UL listed and plugged directly into a wall receptacle?	_____	_____	_____
15. Are space heaters located at least 3 feet from combustible material?	_____	_____	_____
16. Are restricted and limited approach boundaries identified on electrical panels?	_____	_____	_____
17. Are authorized electricians trained in NFPA 70?	_____	_____	_____
18. Are only electrically rated tools being used for electrical work?	_____	_____	_____



OFFICE SAFETY INSPECTION REPORT

OFFICE _____

DATE _____

	YES	NO	N/A
<u>WALKING AND WORKING SURFACES</u>			

- 1. Are cords, cables, and other items not placed in walkways? _____
- 2. Are ladders regularly inspected? _____
- 3. Are access ways, stairways, ramps, and ladders clean of ice, mud, snow, or debris? _____
- 4. Are ladders being used in a safe manner? _____
- 5. Are ladders kept out of passageways, doors, or driveways? _____
- 6. Are broken or damaged ladders tagged and taken out of service? _____
- 7. Are metal ladders prohibited in electrical service? _____
- 8. Are stairways and floor openings guarded? _____
- 9. Are safety feet installed on straight and extension ladders? _____
- 10. Are employees walking instead of running? _____
- 11. Are handrails and side rails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches? _____
- 12. Are there torn, loose, or curled carpets? _____

HOUSEKEEPING

- 1. Is good housekeeping maintained? _____
- 2. Are paper and materials stored properly? _____
- 3. Are cleaning fluids used only in small quantities and stored in closed containers that are kept in well-ventilated areas? _____
- 4. If cleaning fluids are flammable, are they not used near a flame or an open heating element? _____
- 5. Are wastebaskets emptied on a daily basis? _____

SITE POSTERS

- 1. Are the following posters displayed in a prominent and accessible area?
 - A. Minimum Wage _____
 - B. OSHA Job Protection _____
 - C. Equal Employment Opportunity _____
 - D. Family and Medical Leave _____
 - E. Employee Polygraph Protection _____
 - F. Uninformed Services Employment and Reemployment Rights Act _____
 - G. Shaw Speak Up _____
 - H. Shaw HR203 Harassment Policy _____
 - I. Shaw Equal Employment Opportunity and Affirmative Action _____
- 2. Are all required state-specific posters displayed? _____

HAZARD COMMUNICATION

- 1. Is the written HAZCOM program available? _____
- 2. Is there a MSDS FOR EACH HAZARDOUS CHEMICAL present in the office? _____
- 3. Are all containers properly labeled, as to content, hazard? _____
- 4. Have employees been trained on chemical hazards? _____
- 5. Have all employees signed the HAZCOM acknowledgment form? _____
- 6. Is there a list of chemicals maintained on site? _____

DOCUMENTATION

- 1. Is an OSHA 300 Log maintained and a 300A posted during February1, to April 30? _____
- 2. Are accident report forms available? _____
- 3. Is a copy of health and safety policy and procedures available? _____



OFFICE SAFETY INSPECTION REPORT

OFFICE _____

DATE _____

ALL NEGATIVE RESPONSES	CORRECTIVE ACTION	ASSIGNED TO	DATE ASSIGNED	DATE COMPLETE D	VERIFIED BY

DESCRIBE POSITIVE SAFETY OBSERVATIONS



ATTACHMENT 5 LABORATORY SAFETY INSPECTION REPORT

LOCATION _____ **DATE** _____

	YES	NO	N/A
I. <u>FIRST AID</u>			
1. Are first aid kit locations identified and accessible?	_____	_____	_____
2. Are emergency eye wash/safety showers available and inspected monthly?	_____	_____	_____
3. Is access to eye wash units and safety showers unimpeded?	_____	_____	_____
II. <u>PERSONAL PROTECTIVE EQUIPMENT</u>			
1. Are employees wearing safety glasses in the laboratory?	_____	_____	_____
2. Are laboratory coats worn by all employees and visitors when working with chemicals and/or samples?	_____	_____	_____
3. Are gloves worn when chemicals and samples are handled?	_____	_____	_____
III. <u>FIRE PREVENTION/FIRE PROTECTION</u>			
1. Are employees smoking only in designated outdoor areas?	_____	_____	_____
2. Are flammable storage cabinets available and used when needed?	_____	_____	_____
3. Has a fire alarm system been established?	_____	_____	_____
4. Are fire extinguishers available and inspected monthly?	_____	_____	_____
5. Do employees know the location and use of fire extinguishers?	_____	_____	_____
6. Are fire extinguisher locations posted?	_____	_____	_____
7. Have fire extinguishers been professionally inspected during the last year?	_____	_____	_____
IV. <u>EMERGENCY PLANS</u>			
1. Are emergency telephone numbers posted?	_____	_____	_____
2. Have emergency escape routes been designated?	_____	_____	_____
3. Are employees familiar with the emergency signal?	_____	_____	_____
4. Are appropriate spill kit supplies available?	_____	_____	_____
5. Are emergency exits marked?	_____	_____	_____
6. Are sprinkler heads unobstructed?	_____	_____	_____
7. Has a fire drill occurred within the last 12 months?	_____	_____	_____
V. <u>ELECTRICAL</u>			
1. Are extension cords kept out of wet areas?	_____	_____	_____
2. Are extension cords arranged so that they are not placed over radiators, steam pipes, through doorways, or under carpets?	_____	_____	_____
3. Are cords, panels, receptacles, and plugs in good condition?	_____	_____	_____
4. Are extension cords not being used in lieu of permanent wiring?	_____	_____	_____
5. Are extension cords not plugged into other extension cords?	_____	_____	_____
6. Are multi-outlet strips not plugged into other multi-outlet strips?	_____	_____	_____
7. Has a lockout/tagout system been established?	_____	_____	_____
8. Are GFCIs being used on all temporary electrical systems and as needed?	_____	_____	_____
9. Are warning signs exhibited on high voltage equipment (250V or greater)?	_____	_____	_____
10. Are circuit breakers or fuse panels properly labeled, kept closed, and accessible?	_____	_____	_____



ATTACHMENT 5
LABORATORY SAFETY INSPECTION REPORT

LOCATION _____

DATE _____

	YES	NO	N/A
11. Are restricted and limited approach boundaries identified on electrical panels?			
12. Are authorized electricians trained to NFPA 70?			
13. Are only electrically rated tools being used for electrical work?			
VI. COMPRESSED GAS CYLINDERS			
1. Are like cylinders segregated and stored in well ventilated areas?	_____	_____	_____
2. Is smoking prohibited in cylinder storage areas?	_____	_____	_____
3. Are cylinders stored secure and upright?	_____	_____	_____
4. Are cylinders protected from snow, rain, etc.?	_____	_____	_____
5. Are cylinder caps in place for storage and movement?	_____	_____	_____
VIII. WALKING AND WORKING SURFACES			
1. Are accessways, stairways, and ramps clean of ice, mud, snow, or debris?	_____	_____	_____
2. Are stairways and floor openings guarded?	_____	_____	_____
3. Are handrails and siderails installed along the unprotected sides of stairways having 4 or more risers or rising more than 30 inches?	_____	_____	_____
4. Are tripping hazards from electrical cords, phone outlets, or other protrusions on the floor prevented by arrangement of furniture or equipment?	_____	_____	_____
5. Are floors free of loose tiles and projections that can create a tripping hazard?	_____	_____	_____
VIII. HAZARD COMMUNICATION			
1. Is there a copy of the Chemical Hygiene Plan (CHP) on site?	_____	_____	_____
2. Have employees been trained in accordance with the CHP?	_____	_____	_____
3. Are all containers properly labeled as to content, hazard, etc.?	_____	_____	_____
4. Is there an updated list of chemicals maintained at the laboratory?	_____	_____	_____
5. Are there MSDSs for the chemicals present in the laboratory?	_____	_____	_____
6. Do employees know and understand the effects of exposure from the chemicals they work with?	_____	_____	_____
IX. DOCUMENTATION			
1. Is an OSHA 300A Log maintained on site and posted between February 1and May 1?	_____	_____	_____
2. Are accident report forms available?	_____	_____	_____
X. FURNITURE AND EQUIPMENT			
1. Are desks, file cabinets, etc. arranged so that drawers do not open into aisles or walkways?	_____	_____	_____
2. Are desk and file drawers closed after use?	_____	_____	_____
3. Are cabinets, bookcases, and shelves secured to prevent their falling over?	_____	_____	_____
4. Is adequate and sufficient lighting provided in all work areas?	_____	_____	_____
5. Are work stations arranged to be comfortable without unnecessary strains on backs, arms, necks, etc.?	_____	_____	_____
6. Do machines with exposed moving parts have guards?	_____	_____	_____
XI. LABORATORY FUME HOODS			
1. Are face velocities posted on each hood?	_____	_____	_____
2. Is the average face velocity at least 100 ft/min.?	_____	_____	_____
3. Is the sash position marked or otherwise indicated to show the acceptable	_____	_____	_____



ATTACHMENT 5
LABORATORY SAFETY INSPECTION REPORT

LOCATION _____

DATE _____

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
position for achieving the desired airflow rate?	_____	_____	_____
4. Has the hood face velocity been measured with a calibrated instrument in the last 6 months?	_____	_____	_____
5. Are signs posted on hoods that are not working correctly?	_____	_____	_____
6. Does the hood contain visual indicators that it is working properly (e.g., manometer, magneheilic guage, etc.)?	_____	_____	_____
XII. <u>GENERAL LABORATORY RULES</u>			
1. Are open-toed shoes and sandals prohibited in the laboratory?	_____	_____	_____
2. Are eating, drinking, chewing gum or tobacco products prohibited in the laboratory?	_____	_____	_____
3. Are food refrigerators labeled such as to prevent chemical storage or vice versa?	_____	_____	_____
XIII. <u>HOUSEKEEPING</u>			
1. Are lab benches orderly?	_____	_____	_____
2. Are laboratories free of liquid spills?	_____	_____	_____
3. Are sinks free of accumulated glassware?	_____	_____	_____
4. Are waste disposal containers available and labeled?	_____	_____	_____



PROCEDURE

Subject: JOB SAFETY ANALYSIS (JSA)

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

This procedure provides the guidelines to perform a Job Safety Analysis. The (JSA) is an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. This process can identify less obvious potential hazards that may go undetected during routine management observations or audits. **A new JSA must be completed every day, before commencement of any work activity and updated in the event of changing conditions. It should be understood that changing conditions that a work crew encounters during a work period (inclement weather, another contractor began work in area, etc.) requires that the JSA be modified to address the new hazards. The JSA should be changed to reflect new conditions in the task being performed or new hazards not identified previously.**

2.0 TABLE OF CONTENTS

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5.3	Analyzing The Job
5.4	Common Errors
5.5	Identifying the Hazards and Potential Accidents
5.6	Accident Types
5.7	Writing Instructions
5.8	Develop Solutions
6.0	Specific Requirements
6.1	Sequence of Basic Job Steps
6.2	Potential Hazards
6.3	Recommended Action Procedure
7.0	References
8.0	Attachments



3.0 Responsibility Matrix

3.1 Procedure Responsibility

- The Manager/Supervisor is responsible for implementing and enforcing this procedure.
- The Safety Representative is responsible for monitoring compliance with this procedure.
- Each Employee is responsible for complying with the project safety program, along with the rules and regulations as stipulated in this procedure and instructions issued by the employee's supervisor.
- It is the responsibility of management and supervision to ensure that this policy is followed. Accordingly, should the project / site requirements stipulate the use of another method of job safety analysis, it is the responsibility of management and supervision to ensure that the proposed method either meets or exceeds this JSA policy and the accompanying JSA form. Any policy or JSA form that does not cover the items contained herein shall not be used.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1

4.0 DEFINITIONS

HAZARD - A potential danger. Oil on the floor is a hazard.

ACCIDENT - An unintended happening that may result in injury, loss or damage.

EXAMPLE - Slipping on the oil is an accident.

INJURY - The result of an accident. A sprained wrist from the fall would be an injury.

5.0 TEXT

5.1 General Requirements

The first page of the JSA form is a checklist that should be used for reference purposes and serves to assist the work crew and supervisor in completing the second page of the JSA. The first page of the JSA form is used to write out the various tasks involved, potential hazards, recommended actions, etc.



Job Safety Analysis is a procedure used to review job methods and uncover hazards:

- That may have been overlooked in a Hazard Analysis, project layout or design of the equipment, tools processes or work area.
- That may have developed after production started.
- That may have resulted from changes in work procedures or personnel

The three basic steps in performing a job safety analysis are:

- Job Task - Break the job down into successive steps or activities and observe how these actions are performed.
- Potential Hazards - Identify the hazards and potential accidents. This is the critical step because only an identified problem can be corrected or eliminated.
- Recommended Actions - Develop safe job procedures to eliminate the hazards and prevent potential accidents.

5.2 Methods of Conducting JSA's

There are two basic methods for conducting the Job Safety Analysis:

- Direct observation
- Group discussion

A fast and efficient method of conducting a JSA is through direct observations of job performance. In many instances, however, this method may not be practical. However, through direct observation, one can gain knowledge concerning an activity and use it on a future JSA.

For instance, new jobs and those that are done infrequently do not lend themselves to direct observation. When this is the case, the JSA can be made through discussions with persons familiar with the job. Individuals often involved in the process include, but are not limited to, first line supervisors, safety specialists, engineers, experienced employees and outside contractors.

5.3 Analyzing The Job

When analyzing the job, most people start with the worst first. You should be guided by the following factors:

- **Frequency of Accidents** (Including "near misses"):



An element of a job that repeatedly produces accidents is a candidate for starting a JSA. The greater the number of incidents associated with a job element, the greater its priority claim for a JSA.

- **New or Revised Jobs:**
Jobs created by changes in equipment or in processes obviously have no history of accidents, but their accident potential may not be fully appreciated. Analysis should not be delayed until accidents or near misses occur. Any changes from the original task/job shall be noted on the form as a revision. Once this has occurred the new found hazards must be reviewed with the crew.
- **Multiple Employee Exposure**
Jobs that expose more than one individual to potential hazards should also be analyzed.

5.4 Common Errors

Five common errors that are often made when performing a job analysis are:

- Making the breakdown so detailed that an unnecessarily large number of steps are listed.
- Making the job so general that basic steps are not recorded.
- Failure to identify the education and experience level of the target audience.
- Failure to identify end use(s). (i.e., training, actual procedure, basis for procedure, etc.)
- Always relying on the Supervisor for completing the JSA. Supervisor should describe work scope to the crew. The crew should then assist in identifying hazards and controls at the job site with active involvement from the Supervisor. Ultimately, the supervisor is responsible, however, crew members and the Supervisor should be actively involved in each JSA.

5.5 Identifying the Hazards and Potential Accidents

The purpose is to identify all hazards, both **physical** and **environmental**. To do this, ask yourself these questions about each step:

- Is there a danger of striking against, being struck by, or otherwise making harmful contact with an object?
- Can the employee be caught in, on, by or between objects?
- Is there a potential for a slip, trip or fall? If so, will it be on the same elevation or to a different elevation?
- Can he strain himself by pushing, pulling, lifting, bending or twisting?



- Is the Environment hazardous to one's safety or health? Has the weather been considered as a factor? Has the work product of others, as it pertains to the environment, been considered?

5.6 Accident Types

- Struck by
moving or flying object
falling material
- Contact with
acid
electricity
heat
caustic
cold
radiation
toxic and noxious substances
- Caught
in
on
between
- Bodily reaction from
voluntary motion
involuntary motion
- Struck against
stationary or moving object
protruding object
sharp or jagged edge
- Overexertion / repetitive
Lifting
pulling
pushing
reaching
twisting
- Fall to
same level
lower level
- Rubbed or abraded by
friction
pressure
vibration

5.7 Writing Instructions

- Put any qualifying statements first, not last.
- Start each instruction with an action word.
- Each instruction should be observable.
- Each instruction should be measurable.

When evaluating a given procedure, ask the following question.

"What should the employee do -- or not do -- to eliminate this particular hazard or prevent this potential accident?"

Answer must be specific and concrete to be beneficial. General precautions such as



"be careful"; "use caution" or "be alert" are useless. Answers should state what to do and how to do it.

This recommendation, "Make certain the wrench does not slip or cause loss of balance" is incomplete. It does not tell how to prevent the wrench from slipping. Here is a more complete recommendation. "Set the wrench properly and securely. Test its grip by exerting a slight pressure on it. Brace yourself against something immovable, or take a stance with feet wide apart before exerting full pressure. This prevents loss of balance if the wrench slips."

Job Safety Analyses can be very beneficial if they are performed correctly. They not only result in a safer job, but also increase productivity and eliminate waste. Take the time to do them correctly; **and more importantly, use them.**

5.8 Develop Solutions

The final step in conducting a JSA is to develop a recommended safe job procedure to prevent the occurrence of potential accidents. The principle solutions are:

- Find a new way to do the job.
- Change the physical conditions that create the hazard.
- Try to eliminate remaining hazards by changing work methods or procedures.
- Try to reduce the necessity of doing a job, or at least the frequency that it must be performed.

6.0 Specific Requirements

Instructions for Completing Job Safety Analysis Form

Job Safety Analysis (JSA) is an important accident prevention tool that works by finding hazards and eliminating or minimizing them before the job is performed, and before they have a chance to become accidents.

- Use your JSA for job clarification and hazard awareness
- as a guide in new employee training
- for periodic contacts and for retraining of senior employees
- as a reference tool to be used prior to commencing a job which is performed infrequently
- as an accident investigation tool
- Informing employees of specific job hazards and protective measures.



6.1 Sequence of Basic Job Steps

Break the job down into steps. Each of the steps of a job should accomplish some major task. The task will consist of a set of movements used to perform a task, and then determine the next logical set of movements.

For example, the job might be to move a box from a conveyor in the receiving area to a shelf in the storage area. How does that break down into job steps? Picking up the box from the conveyor and putting it onto a hand truck is one logical set of movements, so it is one job step.

Everything related to that one logical set of movements is part of that job step. The next logical set of movements might be pushing the loaded hand truck to the storeroom. Removing the boxes from the truck and placing them on the shelf is another logical set of movements. Finally, returning the hand truck to the receiving area might be the final step in this type of job.

Be sure to list all the steps in a job. Some steps might not be done each time -- checking the casters on a hand truck, for example. However, that task is part of the job as a whole, and should be listed and analyzed.

6.2 Potential Hazards

Identify the hazards associated with each step. Examine each step to find and identify hazards -- actions, conditions and possibilities that could lead to an accident. It is not enough to look at the obvious hazards. It is also important to look at the entire work environment and discover every conceivable hazard that might exist.

- Be sure to list health hazards as well, even though the harmful effect may not be immediate. A good example is the harmful effect of inhaling a solvent or chemical dust over a long period of time.
- Hazards contribute to accidents, injuries and occupational illnesses. In order to do part three of a JSA effectively, you must identify potential and existing hazards. That's why it's important to distinguish between a hazard, an accident and an injury. Each of these terms has a specific meaning:

Some people find it easier to identify possible accidents, illnesses, and work back from them to the hazards. If you do that, you can list the accident and illness types in parentheses following the hazard. However, be sure you focus on the hazard for developing recommended actions and safe work procedures.



6.3 Recommended Action Procedure

Decide what actions are necessary to eliminate or minimize the hazards that could lead to an accident, injury or occupational illness. Among the actions that can be taken are:

- 1) Engineering the hazard out
- 2) Administrative controls
 - Job instruction training
 - Good housekeeping
 - Good ergonomics
(Positioning the person in relation to the machine or other elements in the Environment in such a way as to eliminate stresses and strains)

- 3) Providing personal protective equipment

- List recommended safe operating procedures on the form, and list required or recommended personal protective equipment for each step of the job.
- Be specific. Say exactly what needs to be done to correct the hazard, such as “lift, using your leg muscles.” Avoid general statements like “be careful.”
- Give a recommended action or procedure for every hazard.
- If the hazard is a serious one, it shall be corrected immediately.

The JSA should be changed to reflect new conditions in the task being performed or new hazards not identified previously.

7.0 REFERENCES

"Job Hazard Analysis", U.S. Dept. of Labor -- OSHA Publication No. 3071

"Job Safety Analysis" - Safety Manual No. 5, U.S. Dept. of Interior, Mining Enforcement and Safety Administration



Procedure No.	HS045
Revision No.	0
Date of Revision	01/07/03
Last Review Date	03/24/04
Page	9 of 11

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Job Safety Analysis Form



**ATTACHMENT 1
EMPLOYEE AND SUBCONTRACTOR TRAINING REQUIREMENTS**

Responsibility Matrix

Action	Procedure Section	Responsible Party		
		Manager/ Supervisor	H&S Representative	Employee
Responsible for implementing and enforcing procedure	3.1	X		
Monitoring for compliance with the procedure.	3.1		X	
Complying with the project JSA program, along with the rules and regulations as stipulated in this procedure	3.1			X
Review completed JSA forms for any errors and communicate to the originator of the changes.	5.5		X	



JOB SAFETY ANALYSIS

DATE:
JOB#:
PERMIT#:
ISSUED BY:

SUPERVISION/FOREMAN

Consider the following and check the items which apply to the job, then review with the work crew.

<p>PERMITS</p> <p>_____ Required</p> <p>_____ Cold Work</p> <p>_____ Hot Work</p> <p>_____ Entry Permit</p> <p>_____ All Conditions Met</p> <p>_____ Signed Off When Complete</p> <p>_____ Other _____</p> <hr/> <p>PERSONAL PROTECTIVE EQUIP. (PPE)</p> <p>_____ Type of Gloves</p> <p>_____ Composition of Gloves</p> <p>_____ Special Purpose Gloves</p> <p>_____ Tyvek Suit</p> <p>_____ Acid Suit /Slicker Suit</p> <p>_____ Rubber Boots</p> <p>_____ Mono Goggles (vented/non-vented)</p> <p>_____ Face Shield</p> <p>_____ Respirator</p> <p>_____ Fresh Air</p> <p>_____ Ear Protection</p> <p>_____ Safety Harness</p> <p>_____ Burning Goggles</p> <p>_____ Other _____</p> <hr/> <p>TOOLS</p> <p>_____ Current Inspection</p> <p>_____ Proper Tools for the Job</p> <p>_____ Good Tool Condition</p> <p>_____ Qualifications</p> <p>_____ Other _____</p> <hr/> <p>EMERGENCY EQUIPMENT</p> <p>_____ Fire Extinguishers</p> <p>_____ Safety Shower</p> <p>_____ Evacuation Route</p> <p>_____ Other _____</p> <hr/> <p>ACCESS</p> <p>_____ Scaffold (properly inspected)</p> <p>_____ Ladder (Tied off)</p> <p>_____ Manlift</p> <p>_____ Personnel Basket (inspected & approved)</p> <p>_____ Operator Training</p> <p>_____ Special Provisions</p> <p>_____ Other _____</p>	<p>WELDING</p> <p>_____ Flashburns</p> <p>_____ Combustibles</p> <p>_____ Spark Containment</p> <p>_____ Shields</p> <p>_____ Grounding</p> <p>_____ Water Hose</p> <p>_____ Fire Extinguisher</p> <p>_____ Fire Blanket</p> <p>_____ Fire Watch</p> <p>_____ Sewer Covers</p> <p>_____ Other _____</p> <hr/> <p>OVERHEAD WORK</p> <p>_____ Barricades</p> <p>_____ Signs</p> <p>_____ Hole Cover</p> <p>_____ Handrail</p> <p>_____ Other _____</p> <hr/> <p>ELECTRICAL</p> <p>_____ Locked & Tagged out</p> <p>_____ Try Start/Stop Switch</p> <p>_____ GFCI Test</p> <p>_____ Assured Grounding</p> <p>_____ Extension Cord Inspection</p> <p>_____ Other _____</p> <hr/> <p>LIFTING</p> <p>_____ Forklift</p> <p>_____ Cherry Picker</p> <p>_____ Load Chart</p> <p>_____ Angle</p> <p>_____ Crane</p> <p>_____ Chainfall</p> <p>_____ Proper Rigging Practices</p> <p>_____ Manual Lifting</p> <p>_____ Condition of Equipment</p> <p>_____ Operator Certificate</p>	<p>HAZARDS (ENVIRONMENTAL)</p> <p>_____ Electrical Shock</p> <p>_____ Heat Stress</p> <p>_____ Heavy Objects</p> <p>_____ Hot/Cold Surf. Or Mat.</p> <p>_____ Inadequate Lighting</p> <p>_____ Line Breaking</p> <p>_____ Noise</p> <p>_____ Poor Access/Egress</p> <p>_____ Sharp Objects</p> <p>_____ Other _____</p> <hr/> <p>HAZARDS/CHEMICALS</p> <p>_____ Chemical Burn Shin/Eyes</p> <p>_____ Flammable</p> <p>_____ Ingestion</p> <p>_____ Inhalation</p> <p>_____ Skin Contamination</p> <hr/> <p>HAZARDS/BODY</p> <p>_____ Fall Potential</p> <p>_____ Pinch Points</p> <p>_____ Slip-Trip Potential</p> <p>_____ Other _____</p> <hr/> <p>OTHER WORK IN AREA</p> <p>_____ Others Working Overhead</p> <p>_____ Type Work Others Doing</p> <p>_____ PPE Due to Other Work</p> <p>_____ Other _____</p> <hr/> <p>Confined Space</p> <p>Know the Following:</p> <ul style="list-style-type: none"> • Possible hazards within the confined space • First signs of exposure • How to summons help • How to track personnel • Entering and exiting the confined space • Maintain contact with all entrants by voice or visual • Do not attempt to rescue unless you are a part of a coordinated effort • Remain at entry point assume no duties with take you from there.
---	---	---

SUPERVISOR/FOREMAN RECOMMENDATION: _____



JOB SAFETY ANALYSIS

DATE:
JOB#:
PERMIT#:
ISSUED BY:

Location of Job (Unit/Location on Project):								
Required PPE:	Safety Access/ Location	Supervisor of Work:						
	Safe Haven:	JSA Prepared By:						
	Wind Direction:	Are other crews in area?						
<u>Pre-Job Preparation</u>	Evacuation Route:							
<ol style="list-style-type: none"> 1. Fill out JSA 2. Review JSA (EVERYONE) 3. Sign JSA (EVERYONE) 	Assembly Point:	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; padding: 2px;">New:</td> <td style="width: 15%;"></td> <td style="width: 70%;"></td> </tr> <tr> <td style="padding: 2px;">Revised:</td> <td></td> <td></td> </tr> </table>	New:			Revised:		
New:								
Revised:								
Job Task (What are You Doing)		Audit the Job Audit Time:						
Potential Hazards		<u>Supervisors Comments</u>						
Recommended Action or Procedure		Supervisor's Initials:						
Crew Name Signatures:								



PROCEDURE

Subject: TAILGATE SAFETY MEETINGS

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

This procedure establishes the requirement for the conductance of tailgate safety meetings. These meetings are to be conducted at each company project site, on a daily basis, prior to the start of any work activities.

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
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- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Tailgate Safety Meeting - A short training or informative session that provides safety guidelines for the planned work activities for the day or shift.



5.0 TEXT

The project supervisor or his/her designee conducts a tailgate safety meeting at the beginning of each shift or whenever new employees arrive at the work site. The topics discussed at the tailgate safety meeting should cover the work assignments for the day, the expected hazard(s) presented by the work, and an explanation on how employees will protect themselves from those hazards.

The meetings are to be documented by the completion of a Tailgate Safety Meeting Form. The project supervisor will assure that the form is properly completed and signed by all attendees. Completed forms will be maintained in the project files.

The following sections provide guidance for the completion of the form:

- **Project Name/Number** - Specific project name and number assigned to the project.
- **Date** - Date of meeting.
- **Time** - Time at which meeting is held.
- **Client** - Identification, name, etc. of entity for whom work is to be performed.
- **Work Activities** - Detailed description of the work activities to be performed that day.
- **Hospital Name/Address** - Hospital name and address designated to be used for the project.
- **Phone Number** - Designated hospital non-emergency phone number.
- **Ambulance** - Phone number for medical emergency transportation.
- **Safety Topics Presented:**
 1. **Chemical Hazards** - Specific chemical name and adverse properties of all chemicals to be encountered on the job that day. A Material Safety Data Sheet (MSDS) for each should be available and discussed in accordance with Procedure HS060.
 2. **Physical Hazards** - Address physical hazards associated with the work site, such as slipping/tripping/falling hazards, pinch points, overhead hazards, and nearby operations that could pose a hazard.
 3. **Personal Protective Equipment** - Specify levels of protective clothing and protective devices to be used by employees for each of the days activities.



4. **New Equipment** - Indicate proper work techniques and any hazards associated with new or unfamiliar equipment.
5. **Other Safety Topic(s)** - List any remaining safety topics pertinent to the potential hazards of the job for that day. This is an area where different, unique subjects can be introduced to make the tailgate safety meeting more interesting.

- **Attendees** - Printed name and signature of all persons in attendance. (Also, list affiliation if not employed by the company.)
- **Meeting Conducted By** - Printed name and signature of individual conducting the tailgate safety meeting.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS060 Hazard Communication Program

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Tailgate Safety Meeting Form



**ATTACHMENT 1
TAILGATE SAFETY MEETINGS**

Responsibility Matrix

Action	Procedure Section	<i>Responsible Party</i>	
		Director of Health and Safety	Project Supervisor
Issuance, Revision, and Maintenance of Procedure	3.1	X	
Conduct Meeting	5.0		X



ATTACHMENT 2

TAILGATE SAFETY MEETING FORM

Project Name/Number: _____ Date: _____ Time: _____

Client: _____

Work Activities: _____

Hospital Name/Address: _____

Hospital Phone No.: _____ Ambulance Phone No.: _____

Safety Topics Presented

Chemical Hazards: _____

Physical Hazards: _____

Personal Protective Equipment:

Activity: _____ PPE Level: _____

New Equipment: _____

Other Safety Topic(s): _____

Attendees

NAME PRINTED

SIGNATURE

Meeting conducted by:



PROCEDURE

Subject: HAZARD COMMUNICATION PROGRAM

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

This procedure has been developed to ensure that all affected company employees are provided with current information on the hazardous chemicals that they may encounter during their work. The basic principle of Hazard Communication (HAZCOM) is that anyone that works with hazardous chemicals has both a need and a right to know the identities and the hazards of any chemical to which they may be occupationally exposed. This principle has been propagated by the Occupational Safety and Health Administration (OSHA) in 29 Code of Federal Regulations (CFR) 1910.1200 *Hazard Communication*.

Some company activities are likely to occur in states or localities that either have or will have requirements that differ from those contained within the federal standard. In such circumstances, the local health and safety representative will be responsible for ensuring that these requirements are included in either a site health and safety plan or a similar document and conveyed to all affected employees. If federal, state, or local regulations vary or conflict, the more protective requirements and practices will be followed.

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5.2	Procurement of Hazardous Chemicals
5.3	Container Labeling
5.4	Material Safety Data Sheets (MSDS)
5.5	Training
5.6	Trade Secrets
5.7	Contractors
6.0	Exception Provisions
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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The EH&S Operations Manager is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Article - A manufactured item other than a fluid or particle which is formed to a specific shape or design during manufacture, has end use function dependent in whole or in part upon its shape or design during end use, which under normal conditions of use does not release more than trace amounts of a hazardous substance and does not pose a physical hazard or health risk to employees.

Affected Employee - Any company employee who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I)

Hazardous Chemical - Any chemical which poses a physical or health hazard.

Health Hazard - A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Health hazards include chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

Immediate Use - When hazardous chemicals will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Label - Any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

Local Health and Safety Representative - The person who is responsible for the management and/or oversight of health and safety activities at a particular workplace. He/she may be assigned as a site health and safety officer or act as a home office health and safety manager who is responsible for multiple workplaces. This person does not necessarily need to be physically



located at a workplace in which they are responsible for ensuring that the requirements of this procedure are fulfilled. The local health and safety representative may designate another qualified individual to assume some or all of the responsibilities delineated in this procedure.

Physical Hazard - A chemical for which there is scientifically valid evidence that it is a combustible liquid, compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable, or reactive.

Responsible Party - The entity responsible for preparation or distribution of Material Safety Data Sheets (MSDS) that can provide additional information on the hazardous chemical and appropriate emergency procedures.

Trade Secret - Any confidential formula, pattern, process, device, information, or compilation of information that is used in an employers business, and that gives the employer an opportunity to obtain an advantage over competitors who do not currently know or use it.

Workplace - An establishment, job site, laboratory, office, or project at one geographic location containing one or more work areas.

5.0 TEXT

In accordance with the requirements established in 29 CFR 1910.1200, employers are required to develop, implement, and maintain at each workplace a HAZCOM program. The program contained herein is intended to ensure that the hazards of all chemicals used by employees are evaluated and that information concerning the hazards of each chemical are conveyed to affected employees. The company program generally consists of five provisions, including hazardous chemical inventories, procurement of hazardous chemicals, container labeling, MSDSs, and the development and implementation of employee training programs. Since the company does not typically produce, distribute, or import hazardous chemicals, the focus of this procedure is on establishing an effective consumer/handler type HAZCOM program and the communication of information to our affected employees.

There are some types of chemicals that are specifically exempt from this procedure. These materials include:

- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1967, as amended (42 U.S.C. 6901 *et seq.*), when subject to regulations issued under that Act by the U.S. Environmental Protection Agency.
- Any hazardous chemical as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) when the hazardous chemical is the focus of remedial or removal actions being conducted under CERCLA in accordance with U.S. Environmental Protection Agency regulations.



- Tobacco or tobacco products.
- Wood or wood products, including lumber which will not be processed, where the manufacturer or importer can establish that the only hazard they pose to employees is the potential for flammability or combustibility. Wood or wood products which have been treated with a hazardous chemical are covered by this procedure, and wood which may be subsequently sawed or cut, generating dust.
- Articles.
- Food or alcoholic beverages which are sold, used, or prepared in a retail establishment, or foods intended for personal consumption by employees while in the workplace.
- Any drug, as defined by the Federal Food, Drug, and Cosmetic Act, when it is in solid, final form for direct administration to patient; drugs which are packaged by the manufacturer for sale to consumers in a retail establishment; and drugs intended for personal consumption by employees while in the workplace.
- Cosmetics which are packaged for sale to consumers in a retail establishment, and cosmetics intended for personal consumption by employees while in the workplace.
- Any consumer product or hazardous chemical, as defined by Consumer Product Safety Act and Federal Hazardous Chemicals Act, where the employer can show that it is used in the workplace for the purpose intended by the manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended.
- Nuisance particulates where the manufacturer, distributor, or importer can establish that they do not pose any physical or health hazard covered under this procedure.
- Ionizing and nonionizing radiation.
- Biological hazards.

5.1 Hazardous Chemical Inventories

A complete list of all hazardous chemicals known to be present in the workplace that may expose an employee to a physical or health hazard will be maintained at each office location and project site. This list will be placed in the front section of the MSDS binder discussed in Section 5.4. The local health and safety representative/site safety officer will be responsible for maintaining the list and revising it as new chemicals are procured or when chemicals are no longer used and have been removed from the workplace. The identity of the hazardous chemical maintained on the list will be consistent with that



which appears on the MSDS. All affected employees will be made aware of the location of the MSDS binder.

5.2 Procurement of Hazardous Chemicals

Since the company does not typically manufacture, distribute, or import hazardous chemicals, procurement is the primary method of obtaining hazardous chemicals. The person initiating the procurement of a hazardous chemical will be responsible for requesting a MSDS from the manufacturer or distributor. This MSDS is to be provided either prior to or at the time of receipt of the chemical. Hazardous chemicals are strictly forbidden to be accepted without an accompanying MSDS. Upon receipt of a hazardous chemical, the person receiving the shipment will notify the local health and safety representative so that a review of the MSDS can be conducted. Also, note that the supplier is only required to submit a MSDS with the initial shipment of a hazardous chemical to a specific location.

In the unlikely event that a hazardous chemical is either manufactured, imported, or distributed by the company, the Vice President, Health and Safety will be notified so that required actions, as dictated by OSHA, can be implemented.

5.3 Container Labeling

Labeling on hazardous chemical containers is meant to provide immediate information to affected employees about the hazards of chemicals they will be expected to handle during the course of their job duties. It is the responsibility of the manufacturer, importer, or distributor of the chemical to ensure that each hazardous chemical leaving their place of business is labeled, tagged, or marked with the following information:

- Identity of the hazardous chemical (must be common to the label, the MSDS, and the chemical inventory list);
- Appropriate warnings of the hazardous effects of a chemical (words, pictures, symbols, or any combination that appears on the label and convey the specific physical or health hazards including target organ effects); and
- Name and address of the chemical manufacturer, importer, or other responsible party.

The person receiving the shipment is responsible to ensure that each container of hazardous chemical(s) has been provided with this labeling information. Hazardous chemicals that do not contain adequate labeling will not be accepted by the receiving person. In the event that hazardous chemicals that do not contain adequate labeling are inadvertently received, they are not to be handled until the identity of the material and appropriate hazard warnings are provided. If the hazardous chemical is regulated by a chemical-specific health standard, then it must be labeled in accordance with the requirements of that standard.



As long as the hazardous chemicals are maintained in their original, properly labeled container and their composition is not altered, there is no need for additional labeling. In the event that the chemical is transferred from a labeled container to an unlabeled portable container, the user must label this secondary container unless the container is intended for immediate use of the employee who performs the transfer. In this case, the container must be labeled with the identity of the chemical and the appropriate hazard warnings, as described above.

In locations where employees are present who only communicate in languages other than English, all labeling information must be presented in their language as well as in English.

5.4 Material Safety Data Sheets (MSDS)

MSDSs are written documents that convey specific, detailed information about the hazards associated with a specific chemical. It is the responsibility of the manufacturer, importer, or distributor to either provide MSDSs prior to shipment or with the shipped materials. The employee receiving the shipment of materials is responsible to ensure that a MSDS has been supplied. As described in Section 5.2, the employee initiating the procurement is responsible for requesting a MSDS from the manufacturer or distributor. In the event that a MSDS has not been provided, it is the responsibility of the receiving person to obtain one from the manufacturer or distributor as soon as possible. The material will not be handled prior to the receipt of a MSDS.

Each MSDS will be forwarded to the local health and safety representative/site safety officer or a designee who will then place a copy into a MSDS binder. This binder will be maintained in the workplace and updated as new materials arrive. The local health and safety representative/site safety officer will ensure that this binder is reviewed with all affected employees and is readily accessible during each work shift. A designated area for the storage of the binder will be established and all employees are to be informed of its location. Employees can request a personal copy of a MSDS by completing the Employee Request for MSDS form provided in Attachment 2. Where employees travel between workplaces during a work shift, the MSDSs may be kept at the primary workplace. Affected employees must be able to immediately obtain information from the MSDSs in the event of an emergency.

MSDSs will be in English and other languages, as necessary, for the particular employees in which the MSDSs will be used. MSDSs are to include the following information:

- Name, address, and telephone number of the responsible party;
- Identity of the chemical as it appears on the label;
- Hazardous ingredients;
- Physical and chemical characteristics;
- Physical and health hazards;
- Primary route(s) of entry;



- OSHA permissible exposure limit (PEL) or other applicable exposure limits;
- Carcinogen information;
- Safe handling and use information;
- Control measures;
- Emergency and first aid procedures; and
- Date of preparation and latest revision date.

5.5 Training

All affected employees will be provided with information and training on the hazardous chemicals in their work area at the time of their initial assignment, when new information about the hazards of a chemical is discovered, and whenever a new physical or health hazard that the employees have not previously been informed of is introduced into the workplace. The HAZCOM training record has been provided as Attachment 3.

Information provided in this training will include:

1. Requirements of the HAZCOM program.
2. Any operations in the work area where hazardous chemicals are present.
3. Location of written hazard communication program, listing of hazardous chemicals present and MSDS.
4. Methods and observations that may be used to detect the presence or release of hazardous chemicals by use of monitoring devices, visual appearance or odor.
5. The physical and health hazards of chemicals in the work area.
6. Protection measures to be utilized to prevent exposure, appropriate work practices, emergency procedures and proper PPE to be used.
7. Explanation of the labeling system and the MSDS and how employees can obtain and use the appropriate hazard information.

Training on this HAZCOM program may be satisfied by the use of two different types of training sessions. These sessions include:

- **Tailgate Safety Meetings** - These meetings will be used to convey the methods and observations that may be used to detect the presence or release of a hazardous chemical in the workplace, the physical and health hazards of the chemicals in the workplace, and the measures that can be taken to protect affected employees from these hazards. The guidelines for this meeting are described in Procedure HS051, Tailgate Safety Meetings.
- **Workplace-Specific or Annual Refresher Training** - Either of these training sessions can be used to convey the details of this HAZCOM program. These details include an explanation of labeling systems, the use of MSDSs, and how employees can obtain and use the appropriate hazard information. These training sessions are discussed further in Procedure HS050, Training Requirements.



Workplace-specific and tailgate safety meetings will be facilitated by the local health and safety representative or another individual who is knowledgeable on the requirements of the HAZCOM program and the specific chemicals that are being discussed. Training for non-English speaking employees shall be conducted in a manner such that the employee is able to comprehend. Annual refresher training can only be conducted by personnel previously approved by the company Training Department.

5.6 Trade Secrets

Some hazardous chemical manufacturers, importers, and distributors may withhold proprietary information required to be present on a MSDS. In such instances, the name and telephone number of the manufacturer, importer, or distributor will be forwarded to the Vice President of Health and Safety for further action. It will be the responsibility of the Vice President of Health and Safety to either obtain the necessary information or to decide to reject the chemical for use in company workplaces.

5.7 Contractors

During the execution of our work, there will be situations when the company will be at locations where employees of other entities may be exposed to chemicals being used by the company. It will be the responsibility of the local health and safety representative or designee to provide the other entities= site representative(s) with copies of all MSDSs in which their employees may be exposed, as well as the labeling system in place, the protective measures to be taken, safe handling procedures to be used, and the location and availability of the MSDS binder.

Periodically, company work areas will be located on or adjacent to a facility operated by another entity. In these situations, the local health and safety representative or designee will contact the other entity to obtain applicable MSDS(s) for hazardous chemicals that company employees may be exposed to.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS050 Training Requirements
HS051 Tailgate Safety Meetings
HS500 OSHA Regulated Toxic and Hazardous Chemicals
OSHA 29 CFR 1910.1200

8.0 ATTACHMENTS

1. Responsibility Matrix



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2. Employee Request for MSDS
3. HAZCOM and Right-to-Know Standards Employee Training Record



**ATTACHMENT 1
HAZARD COMMUNICATION PROGRAM**

Responsibility Matrix

Action	Procedure Section	Responsible Party				
		Purchaser	Receiver	Affected Employee	Local Health and Safety Representative	EH&S Operations Manager
Understand and Comply With State and/or Local Regulations	1.0				X	
Issuance, Revision, and Maintenance of Procedure	3.1					X
Review and Understand This Procedure	5.0	X	X	X	X	
Establish, Update, and Revise MSDS Binder	5.1				X	
Request MSDSs for Procured Chemicals	5.2	X				
Initial Review of MSDSs	5.2				X	
Implement Requirements For Company Manufactured, Imported, or Distributed Chemicals	5.2					X
Review Incoming Shipments for Hazard Labeling/MSDS	5.3		X			
Request Missing MSDSs From Manufacturer or Distributor	5.4		X			
Provide HAZCOM Training	5.5				X	
Receive HAZCOM Training	5.5			X		
Obtain Information on Proprietary Chemicals	5.6					X
Transmit MSDSs to Contractors	5.7				X	
Obtain MSDSs From Other Entities	5.7				X	



ATTACHMENT 2

EMPLOYEE REQUEST FOR MATERIAL SAFETY DATA SHEET (MSDS)

Employee Name: (Please print) _____

Employee Number: _____

Job Title/Location: _____

Department/Work Area: _____

I am requesting a copy of the MSDS(s) for the following chemical(s):

(Chemical name, Common name, Trade name)

1. _____

2. _____

3. _____

Signature

Date

I have received a copy of the above MSDS(s) I requested.

Signature

Date

cc: Local Health and Safety Representative



ATTACHMENT 3

**HAZARD COMMUNICATION AND RIGHT-TO-KNOW STANDARDS
EMPLOYEE TRAINING RECORD**

INITIAL:

1. I have been informed about the Hazard Communication Program, Material Safety Data Sheets (MSDS), their use and location, and the procedures to obtain copies.

2. I have been informed that some of my work may involve exposure to toxic substances, the hazards of which will be reviewed with me in tailgate safety meetings or site-specific training.

3. I have been informed about the right of employees to have access to relevant exposure and medical records, and the procedures for requesting access.

4. I understand that the company must act upon a request in a reasonable amount of time so as to avoid interruption of normal work operations.

5. I have been provided access to the applicable regulations governing hazard communication, and access to employee exposure and medical records.

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____



ATTACHMENT 4

CHEMICAL LISTING

Chemical	MSDS Number
A12 - Car Cleaner Wax	1
A-33 Dry	2
ABC Dry Chemical	3
Acetone	4
Acid, Acetic	5
Acid Hydrochloric	6
Acid, Nitric	7
Acid, Nitric (Lightning)	8
Acid, Oxalic Dihydrate	9
Alcohol, Ethyl	10
Alcohol, Isopropyl	11
Alcohol, Methanol	12
Alconox	13
All Weather DTR Primer White Comp A	14
Aluminum Nitrate, 9-Hydrate	15
Amine Mixture	16
Ammonium Hydroxide	17
Anti-Seize Lubricant (133K)	18
Anti-Static Spray #19050	19
Antimicrobial Wipes	20
Armor All Protectant	21
Barium Nitrate	22
Bentonite Extender D20	23
Bradley Opti-Aid and Opti-Aid Plan 1181	24
Brake Cleaner (Aerosol), GUNK	25
Buffer Solution pH4	26
Buffer Solution pH7	27
Buffer Solution pH10	28
Butyl Rubber Sealant	29
Butyl Tape Glazing Compound 250 H	30
Calcium Chloride, (Flake)	31
Calcium Oxide, (Lime)	32
Canvak Coating	33
Carbon Dioxide	34
Casrn 38640-62-9	35
Casrn 92-71-7	36
Castrol Super Clean	37
Cement sp-4633	38
Certicool Instant Cold Pack	39
Chemlok AP-134	40
Closed Cell Neoprene Sponge	41



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Dap Kwik Foam	46
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Diesel Aid	51
Diesel Fuel	52
Dow All Purpose Cleaner	53
Dow Disinfectant Bathroom Cleaner	54
Dow Glass Plus	55
Dragon Home Pest Killer	56
Dursban Many Purpose Concentrate	57
Dye, (D11006 Chromatint Uranine HS Liquid)	58
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Enforcer Wasp and Hornet Killer XT	60
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Envirosorb	64
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Ethyl Chloride	66
Ethylene Glycol	67
Eyesaline Concentrate	68
Eyesaline Solution	69
Fantastic All Purpose Cleaner	70
Fast Track Trim Adhesive - 3M Brand	71
Ferric Chloride, 6-Hydrate	72
Fly Ash. NO DESIGN. NO DESIGN	73
Formamide	74
Formula 409 Cleaner/Degreaser	75
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Freeze Ban	77
Freshly-Mixed, Unhardened Concrete	78
Gasoline	79
Glass, Fibrous	80
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Hazorb	83
Home Safeguard, Smoke Detector Tester	84
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STANDARD OPERATING PROCEDURE

Subject: Drug and Alcohol Testing

UNCONTROLLED WHEN PRINTED

1. PURPOSE

Shaw Environmental & Infrastructure (hereinafter referred to as collectively as "Shaw E & I") has established this Drug and Alcohol procedure to maintain a work environment free from substance abuse; provide a safe and healthy environment for our Employees and the general public; maintain the quality and integrity of Shaw E & I's products and services; preserve Shaw E & I's reputation in the communities where Shaw E & I operates; and protect and secure our property and information.

The purpose of this procedure is to provide guidelines for all "Employees" (hereinafter referred to collectively as, and inclusive of: applicants, prospective employees, existing employees and employees working for Shaw E & I through temporary staffing agencies) regarding substance use and abuse and to provide supervisors with practical procedures for its administration. Subcontractors and lower tier subcontractors (a lower tier subcontractor is any subcontractor at any level working on any Company project whether directly with Shaw E & I or through a third party) are required to document that they maintain a substance abuse prevention program comparable to this program. Shaw E & I reserves the right to modify this procedure at any time consistent with changes in medical procedures, technologies, the law, or Shaw E & I's operational needs. This procedure shall not, in any event, alter the basic "at will" status of any Employee, nor shall it create any expressed or implied contractual rights relative to employment with Shaw E & I.

2. SCOPE

This procedure applies to all applicants applying for positions in the United States, all Employees working in the United States, and all international Employees testing in the United States prior to deployment including but not limited to officers, directors, and supervisors. Subcontractors and lower tier subcontractors are required to document that they maintain a substance abuse prevention program comparable to this program.

An applicant or prospective Employee of Shaw E & I who refuses a post-offer, pre-employment drug or alcohol test will not be considered for a position with Shaw E & I.

This procedure applies to all Company work locations except when state restrictions apply. For the purpose of this procedure, and as a result of the nature of work in which Shaw E & I performs for our customers, we often employ individuals that actually work at a location that is neither owned or otherwise leased / rented by Shaw E & I. Accordingly, we define these customer job site work locations as being "Host Employer" premises.

An existing Employee who refuses to submit to a drug/alcohol test is subject to disciplinary action, up to and including termination, pursuant to Shaw E & I's guidelines and applicable Federal and state laws. "Company or Host Employer's Premises" are defined as: all areas or locations in which work is performed, including but not limited to Employee's lockers, lunch boxes, personal bags and effects, clothing, furniture, desks, drawers, containers, tool boxes, storage facilities, work areas and personal vehicles parked on Company property or job site locations and equipment, either owned, borrowed, leased or operated by Shaw E & I or Host Employer.

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3. REFERENCES

3.1 Internal References

- HS800 Motor Vehicle Operation and Maintenance
- HS020 Accident Prevention Program: Reporting, Investigation, and Review

3.2 External References

- Title 10 Code of Federal Regulations (10 CFR) Part 707
- 49 CFR Part 40
- 49 CFR Part 40, Part 199

4. DEFINITIONS

None.

5. RESPONSIBILITIES

5.1 Vice President of Health and Safety

The Vice President of Health & Safety is responsible for issuing, revising, and maintaining this procedure.

5.2 Director of Health and Safety

The Director of Health and Safety is responsible for the following:

- Contacting collection facilities, approved laboratories, and the medical review officer (MRO)
- Verifying that subcontractor programs meet the intent of this procedure

5.3 Project/Office Manager

The project/office manager is responsible for the following:

- Providing a copy of this procedure to covered non-DOT employees
- Contacting collection facilities, approved laboratories, and the MRO
- Handling positive (failed) test results
- Verifying that subcontractor programs meet the intent of this procedure
- Coordinating local testing program

5.4 Health and Safety Representative

The health and safety representative is responsible for the following:

- Providing a copy of this procedure to covered non-DOT employees
- Contacting collection facilities, approved laboratories, and the MRO
- Verifying that subcontractor programs meet the intent of this procedure
- Coordinating local testing program

5.5 Substance Abuse Program Administrator

The substance abuse program administrator is responsible for the following:

- Issuing, revising, and maintaining this procedure

- Contacting collection facilities, approved laboratories, and the MRO
- Handling positive (failed) test results
- Verifying that subcontractor programs meet the intent of this procedure
- Coordinating local testing program

5.6 Medical Review Officer

The MRO is responsible for the following:

- Handling positive (failed) test results
- Evaluating test results

5.7 Employee

Employees are responsible for the following:

- Complying with Shaw E & I's Drug and Alcohol testing policy and this procedure
- Providing test specimens when requested.

6. PROCEDURE

All employees should read and sign Form HS101.01r4, The Shaw Drug and Alcohol Policy, prior to submitting to drug and alcohol testing. Additional provisions that consider non-DOT regulations and drug and alcohol laws of Puerto Rico are contained in Attachment 1. The following sections describe Shaw's drug and alcohol testing program.

6.1 Illegal Drugs

The use, possession, concealment, manufacturing, promotion, transportation, distribution or sale of illegal drugs by any Employee or any employee of any subcontractor or lower tier subcontractor of Shaw E & I is strictly prohibited on all Company and Host Employer Premises and during Company working hours at any location and is grounds for disciplinary action up to and including termination.

Illegal drugs are defined as any drug (or the synthetic or generic equivalents of such drugs) that is illegal under Federal, state, or local laws. This includes but is not limited to marijuana, heroin, hashish, opiates, cocaine, hallucinogens, methamphetamine, depressants, and stimulants not prescribed for current medical treatment by a licensed physician.

6.2 Alcohol

Possession or consumption of alcohol on Company or Host Employer's Premises or unauthorized consumption while on the job is a violation of this procedure and is grounds for disciplinary action up to and including termination. Alcohol or alcoholic beverages means any beverage that has an alcoholic content and that is subject to state regulatory control for distribution as an alcoholic beverage.

6.3 Prescribed Medications

Any Employee undergoing medical treatment by a physician, dentist or other medical professional that includes the use of any drug or medication capable of affecting the Employee's mental or physical abilities is required to communicate to his/her supervisor that he/she is taking the medication.

In any situation whereby an Employee's medications are capable of affecting the Employee physically or mentally and thus affecting his/her ability to work safely, the Employee is required to consult with their physician and explain their job requirements. The Employee must provide a release to work to their supervisor from the treating physician prior to returning to work.

It is the responsibility of an Employee to communicate to his/her supervisor if he/she is taking medication that is capable of affecting the Employee mentally or physically. If the Employee fails to do so it is a violation of this procedure and is grounds for disciplinary action up to and including termination.

Any questions concerning this section of the procedure should be directed to Shaw E & I's Human Resources Department or Shaw E & I's Substance Abuse Program Administrator.

6.4 Drug and Alcohol Testing

Shaw E & I may utilize any type of drug or alcohol test allowed by both Federal laws and the laws of the state in which an Employee is employed to help in the control of or in the detection of drug or alcohol usage that violates this procedure. Drug and alcohol tests will be conducted for job related purposes and be consistent with business necessity.

Drug and alcohol tests may be utilized in, but are not limited to, the following circumstances, as may be allowed under the laws of the jurisdiction in which the Employee is employed:

- Post-offer, pre-employment examinations
- Random/Unannounced sampling
- Post-accident
- Reasonable cause or suspicion
- Post rehabilitation
- When otherwise requested or required by the client or by contract and pursuant to applicable law.

Employees agree to comply with drug testing facilities and sign all consent forms needed by the drug testing facilities.

Employees assigned to U.S. Department of Energy (DOE) sites may be required to participate in facility-specific drug and alcohol screening pools meeting the requirements of Title 10 Code of Federal Regulations (10 CFR) Part 707.

6.4.1 Post offer Pre-Employment Drug Testing

This section applies to all states except Montana which has restrictions in place where certain additional requirements should be followed pursuant to state legislation. Call the Medical Services Department for additional guidance on drug testing in the state of Montana.

Following an employment offer and prior to becoming an active Employee, the applicant/prospective Employee will be tested to determine use of illegal drugs. No Employee will begin work on any project or at any subcontractor location without submitting to and successfully passing an approved, pre-employment drug testing method pursuant to the requirements set forth in this procedure.

In circumstances where an Employee has been laid-off or terminated from Shaw E & I and subsequently re-hired by Shaw E & I within a 30 day period, the Employee will not be required to submit to a post-offer, pre-employment drug test before beginning work on a project as long as the Employee has submitted to a drug test with Shaw E & I within one calendar year. In cases where the Employee is re-hired within 30 days and has not been drug tested with Shaw E & I within one calendar year, the Employee will be required to submit to a post-offer, pre-employment drug test before beginning work on any project or at any location.

In circumstances where an Employee has been laid-off or terminated from Shaw E & I and subsequently re-hired with Shaw E & I after a 30 day time period, the Employee will be required to submit to a post-offer, pre-employment drug test before beginning work on any project or at any location.

In circumstances where an Employee was terminated for a positive drug test, including refusing to take a drug test (which is assumed positive by Shaw E & I) and that Employee is re-applying for employment, the prospective Employee will have to take a pre-employment, post-offer drug test, as well as fulfill all of the requirements of Section 6.6.3 of this procedure.

6.4.2 Random/Unannounced Drug Testing

This section applies in all states and/or cities, except; Rhode Island; Vermont; San Francisco, California; and Boulder, Colorado. There are restrictions in Massachusetts, New Jersey, New York, West Virginia, Connecticut, Maine, Minnesota, Montana, and California where certain additional requirements should be followed pursuant to state legislation. Call the Medical Services Department for guidance.

A mandatory random/unannounced drug testing program is in effect and all Employees are subject to a random/unannounced drug testing program unless prohibited by state or local law. Accordingly, due to certain state and local law exclusions, certain offices, sites, or project locations may not be included in the random/unannounced drug testing program. Employees at locations whereby random/unannounced drug testing is allowed will be included in the selection process for random/unannounced drug testing by using a computer based random number generator that is matched to an Employee's I.D. or reference number. These tests shall be random, unannounced, and conducted in the concurrent quarter with the quarterly random selection process. The goal of the program shall be to randomly test a minimum of ten percent of the affected work force not covered by DOT or different contract requirements, on a quarterly basis.

6.4.3 Post-Accident Drug/Alcohol Testing

This section applies in all states, except in San Francisco, California. There are restrictions in Boulder, Colorado; Connecticut; Iowa; Maine; Vermont; Rhode Island; Mississippi; and Oklahoma where certain additional requirements should be followed pursuant to state legislation. Call the Medical Services Department for additional guidance.

Subject to Federal and state laws, Shaw E & I will conduct post accident/injury drug and/or alcohol tests on any Employee receiving medical care for a work-related injury. This post-accident testing shall be performed as soon as practicable following work-related accidents or incidents. Additionally, Shaw E & I shall require a drug/alcohol test for any Employee Shaw E & I reasonably believes contributed or caused the accident or incident. A drug/alcohol test may be performed in the following situations:

1. Any incident or accident that causes the Employee or third party affected by an Employee's actions to seek medical care for work-related injuries.
2. Any incident or accident resulting in serious personal injury or death.
3. Any property/equipment damage equal to or exceeding \$2,500.00 or any property/equipment damage considered to be significant by Shaw E & I representative.

4. Any Chargeable Vehicle Accident (see HS800).

6.4.4 Reasonable Cause Drug/Alcohol Testing

This section applies in all states, except in Vermont and Rhode Island.

Reasonable cause drug/alcohol testing will be performed when an Employee is observed by at least two trained Company representatives displaying symptoms or behavior that he/she is using drugs or alcohol or is under the influence of a substance prohibited by this procedure. The two Company representatives shall complete Form HS101.02r4 of this procedure describing their observations. For training opportunities in reasonable suspicion drug testing, the Medical Services Department should be contacted. Such symptoms or behaviors include, but are not limited to, the following:

- Extreme drowsiness, respiratory depression, large pupils, constricted pupils, and slurred speech
- Disorientation
- Drunken behavior with or without the use of alcohol
- Admission by Employee of hallucinations or drug/alcohol use on the job
- Unexplained tremors, convulsions, or violent behavior
- Excessive absenteeism/tardiness, including established absentee patterns
- Significant decline in job performance
- Significant change in personality (misconduct, insubordination)
- Unexplained absences from workstation
- Information from credible source(s) indicating possible substance abuse
- Changes in personal hygiene
- Difficulty in motor coordination

A reasonable cause drug/alcohol test will also be performed on an Employee that is arrested during non-work hours for a drug/alcohol offense as soon as practical when he/she returns to the jobsite to the extent permitted by Federal, state, and local law.

The Employee suspected will not be allowed to operate any equipment. If an on-site collection is not available the Employee suspected will be driven by a Company representative for testing. The Employee suspected will not be allowed to return to work until receipt of a negative test.

6.4.5 Post-Rehabilitation Drug/Alcohol Testing

This section applies in all states. There are restrictions in Maine and Vermont where certain additional requirements should be followed pursuant to state legislation. Call the Medical Services Department for additional guidance.

Subject to applicable Federal and state laws, any Employee who is eligible to return to work after receiving counseling/rehabilitation, as recommended by a state-certified substance abuse professional, will be required to sign a return to work agreement (Form HS101.03r4), pass a drug/alcohol test before returning to duty, and is subject to periodic unannounced drug/alcohol tests for a period of 24 months after returning to duty.

6.5 DRUG/ALCOHOL TESTING PROCEDURES

Shaw E & I has in place specific written procedures for specimen collection, testing, storage and laboratory urinalysis. These procedures are available for review and can be requested from your supervisor, Shaw E & I's Human Resources Department or Shaw E & I's Substance Abuse Program Administrator.

6.5.1 Collection Sites/Laboratories

Shaw E & I will select collection sites and/or laboratories, certified by the U.S. Department of Health and Human Services and/or appropriate state agencies, to conduct drug/alcohol tests. The collection sites and/or laboratories will agree to conduct tests in accordance with applicable state and Federal laws and regulations.

6.5.2 Medical Review Officer

The MRO is a licensed physician with knowledge of substance abuse disorders. The MRO will receive all dilute specimen reports, all positive drug test results, and certain pre-employment tests from the laboratory and will verify the test result. Pre-employment test results that are reported as positive will not be reviewed by the MRO except in situations where it is required by local or state law.

6.5.3 Cost of Testing

All costs of drug/alcohol tests required by Shaw E & I are paid for by Shaw E & I.

6.5.4 Time of Testing

Employees are required to report to the drug/alcohol testing location designated by Shaw E & I immediately after notification from Shaw E & I. Generally, drug/alcohol tests are scheduled immediately before, during or immediately after an Employee's work hours, and Employees will be given a maximum of two hours after notification to report to the testing facility. If the Employee requires additional time, he/she is required to provide the reason for the request for the time extension immediately, which will be considered by Shaw E & I's Substance Abuse Program Administrator (by calling the EH&S department in Baton Rouge, LA at 225-932-2500). Requests should be presumed denied unless specifically granted by the Substance Abuse Prevention Administrator within the two hour time frame.

6.5.5 Inability to Provide Drug Screen Sample

Any Employee who is unable to provide a specimen sample within three hours of the first attempt to provide such specimen for a drug/alcohol test will be treated as refusing to cooperate with this procedure and will not be considered for employment or be subject to disciplinary action, up to and including termination. However, an applicant/prospective Employee or Employee who is unable or cannot provide a sample specimen within three hours due to a medical condition or illness must notify Shaw E & I's Substance Abuse Program Administrators immediately (by calling the EH&S department in Baton Rouge, LA at 225-932-2500.)

6.5.6 Pending Test

Any Employee whose test result is pending final analysis confirmation by the MRO may immediately be removed from the work site until final results are available.

6.5.7 Rapid Drug Testing Cups

This section applies in all states except for on-site purposes in Minnesota and Vermont. There are restrictions in Puerto Rico and New York where certain additional requirements should be followed pursuant to state legislation. Call the Medical Services Department for guidance.

Rapid drug testing cups/dipsticks should only be used when authorized by state law and/or local legislation and when proper written approval is received from the Substance Abuse Program Administrator.

If a rapid drug testing cup is used, the following will apply:

- A result from a rapid drug testing cup is never considered positive; if there is a presence of drugs detected the result is considered non-negative.
- Non-negative specimens must be sent to the lab for GC/MS confirmation and MRO evaluation (if confirmed positive).
- A third party specimen collector must be utilized unless written approval is obtained from the Substance Abuse Program Administrator.
- If a rapid drug testing cup is non-negative then an Employee may be suspended pending confirmation result from the lab. An Employee will not proceed in the hiring process with a non-negative rapid drug testing cup result until a confirmed negative result is received. An Employee can proceed in the hiring process if a negative rapid drug testing cup result is received.
- All specimens from a rapid drug testing cup, whether negative or non-negative, must be sent to the lab for analysis.

6.5.8 Procedure for Rebutting and/or Appealing a Positive Drug or Alcohol Test Result

If an Employee rebuts and/or appeals a positive drug or alcohol test result; Section 6.6.5 of this procedure will be followed.

6.5.9 Procedure for Post-Accident Drug Testing

To determine if a post accident drug test is required, see Section 6.4.3 of this procedure. If a post-accident drug test is required, the following will apply:

- The drug test must have a completed chain-of-custody.
- In the event of a non-negative drug test result, the Employee will be suspended pending the GC/MS confirmation and MRO evaluation (if needed).
- The specimen collection will be administered by a third party.
- In the event a medical provider does not provide drug testing services, the Substance Abuse Program Administrator should be called immediately.
- A refusal to submit to a post-accident drug test will be considered a positive drug test/refusal to comply with this procedure (refer to Section 6.5.5) and is grounds for disciplinary action up to and including termination.

6.5.10 Procedure for Observed Specimen Collection

This section applies in all states except: Boulder, Colorado; Connecticut; Oklahoma; California; Maine; and Rhode Island.

An observed specimen collection will be allowed under the following circumstances:

- A person provides a specimen and the temperature is out-of-range.
- An Employee that leaves the testing area without the approval from Shaw E & I representative.
- There is clear and convincing evidence that a person is trying to substitute a specimen sample with another sample.

- A person gives a sample that is too dilute to test.
- A client requests that all drug test collections be witnessed.
- An adulterant is detected in a person's specimen.
- A third party observer of the same sex as the Employee must be utilized unless written approval is obtained from the Substance Abuse Program Administrator.

Specimens will be collected per the guidance in Attachment 2.

6.6 Results of Drug/Alcohol Screen

Compliance with the Drug and Alcohol Program is a condition of employment. Employees who violate any provision in this procedure will not be considered for employment or are subject to disciplinary action, up to and including termination, pursuant to Shaw E & I's guidelines and applicable Federal and state laws.

6.6.1 Positive Drug and Alcohol Tests

Any Employee who has a positive drug/alcohol test result (pursuant to the minimum cutoffs designated by Shaw E & I, client or otherwise provided by applicable state law) will be notified of a positive test result. The consequences of a positive test result and procedures for appealing the positive test result will be explained prior to any disciplinary or adverse action being taken. Every Employee has the right to inspect and/or obtain a copy of the positive drug/alcohol test. If, after a conditional offer of employment, an Employee tests positive, the offer of employment will be withdrawn.

6.6.2 Positive Drug Tests

Any existing Employee who tests positive is subject to disciplinary action, up to and including termination, pursuant to Shaw E & I's guidelines and applicable Federal and state laws. An Employee denied employment or an existing Employee whose employment has been terminated as a result of a positive drug test may re-apply for employment within Shaw E & I after:

- Waiting at least 30 days after the date that the positive drug test was reported.
- Successfully completing an evaluation by a state-certified substance abuse professional and successfully completing or in the process of completing all recommended courses of treatment established by the substance abuse professional and providing documentation from the substance abuse professional to Shaw E & I.
- Completing Form HS101.03r4.

Shaw E & I will require any such individual to comply with the provisions of this procedure and to be subject to periodic unannounced drug testing for 24 months as is allowed under Federal and/or state laws.

6.6.3 Positive Alcohol Tests

Any existing Employee who has a breath alcohol level of 0.02 through 0.039 will be immediately suspended from any work duties with Shaw E & I unless he/she works in Montana where the breath alcohol level has to be greater than 0.04 to be recognized as positive. An Employee may return to work at his or her next scheduled shift as long as his or her breath alcohol level is below 0.02. All breath alcohol tests must be administered by a certified technician. Any existing Employee who has a breath alcohol level of 0.04 or higher will be subject to disciplinary action, up to and including termination, pursuant to Shaw E & I's guidelines and applicable Federal and state laws.

An Employee denied employment or an existing Employee of Shaw E & I whose employment has been terminated as a result of a positive breath alcohol test of 0.04 or higher may re-apply for employment within Shaw E & I after:

- Waiting at least 30 days after the date of the positive breath alcohol test.
- Successfully completing an evaluation by a state-certified substance abuse professional and successfully completing or in the process of completing all recommended courses of treatment established by the substance abuse professional and providing documentation from the substance abuse professional to Shaw E & I.
- Completing Form HS101.03r4.

Shaw E & I will require any such individual to comply with the provisions of this procedure and to be subjected to periodic unannounced alcohol testing for 24 months as is allowed under Federal and/or state laws.

6.6.4 Rebutting and/or Appealing a Drug or Alcohol Test Result

Any Employee may rebut the drug or alcohol test results to the extent an opportunity to rebut is provided under applicable state or local law. The Employee should contact the MRO to discuss, explain or contest the test results within the appropriate time period under state or local law.

Any Employee that desires to appeal a drug or alcohol test result can have the original specimen re-tested. Employee must request re-test within 72 hours (or the specific time period pursuant to local or state law if different) of receiving initial notice of test result from the MRO. All requests for a re-test must be submitted to the MRO within the 72 hours after initial notification of result. The Employee will pay for the re-test of the original specimen unless prohibited by law. Payment for the re-test will be made to the appropriate clinic/MRO. The procedure of appealing a drug test result includes:

- The re-test will only be completed on the original specimen that yielded the positive result. A second specimen will not be collected.
- The cost of the re-test has to be paid by the Employee to the clinic/MRO before the specimen can be re-tested.
- The re-test will be completed at a SAMSHA certified lab of the Employee's choice. The Employee will send the name and address of the SAMSHA certified lab along with the payment to the clinic before the specimen can be re-tested.
- The result of the re-test will serve as the final determining result regarding the appeal process. No further retesting is allowed.

6.6.5 Adulterated, Unsuitable or Diluted Samples

Existing Employees:

Adulterated, unsuitable, or diluted urine samples, as determined by the MRO and in accordance with state and Federal guidelines, will be treated as positive samples. Employees who furnish adulterated, unsuitable, or diluted urine samples may be required to submit to a second drug screen and/or are subject to disciplinary action, up to and including termination pursuant to Shaw E & I's guidelines and applicable Federal and state laws. Any re-testing of an Employee, because of an adulterated, unsuitable, or diluted urine sample submission shall be done in accordance with the time of submission requirements outlined in Section 6.5 and may require direct observation of collection. In the event that a specimen's temperature is out-of-range, an observed recollection will administered when allowed by Federal, state and local law. If the specimen's temperature is out-of-range after the observed recollection, it will be considered as a refusal to provide a valid specimen.

Applicants / Prospective Employees:

If, after a conditional offer of employment, it is determined that an applicant/prospective Employee provided an adulterated or unsuitable urine sample, as determined by the MRO and in accordance with state and Federal guidelines, that individual will not be considered for a position with Shaw E & I.

The applicant may re-apply for employment with Shaw E & I after waiting at least 30 days after the date of the adulterated or unsuitable urine sample.

If an applicant provides a diluted urine sample, as determined by the testing laboratory, the sample will be analyzed and measured to level of detection as to determine if the sample contains any trace amounts of illegal drugs (as described in Section 6.1). If it is then determined that the dilute sample contains any trace amounts of illegal drugs, the employment process will be terminated and the applicant will not be allowed to re-apply for employment until after 30 days following the date of the test and completing the provision in Section 6.6.5. However, if it is determined that the original dilute sample does not contain any trace amounts of illegal drugs, the specimen will be reported out as a negative drug test and the applicant will be eligible for employment.

6.7 Privacy and Confidentiality

Individual privacy and confidentiality will be carefully respected in maintaining a record retention program. Any information obtained through drug/alcohol testing unrelated to the use of drugs and/or alcohol will be held in strict confidence by the MRO and not released to Shaw E & I. With the exception of the testing laboratory, the MRO, and the Substance Abuse Program Administrator (or other individuals designated by Shaw E & I to receive and evaluate test results and resulting employment decisions), the results of individual drug tests will not be released to anyone without the express written authorization of the tested individual, except as ordered by a Court or governmental agency. Results that are reported to Shaw E & I by the MRO as positive will also be held in strict confidence with individual privacy and confidentiality being carefully respected.

Written records will be stored in locked containers or in a secured location. Such records will not be made a part of individual personnel files. Unless an Employee gives his or her written consent, the Employee's drug/alcohol test records will not be released to a subsequent employer absent a court order or unless required by Federal or state law.

6.8 Searches and Inspections

Shaw E & I may at any time conduct searches and inspections where there is reason to believe that an Employee may be in possession of substances which are prohibited under this Policy. Shaw E & I has the right to inspect an Employee's personal property on Company or Host Employer Premises. This search will be for the purpose of determining if such Employees are in possession, use, transportation or concealment of any prohibited items or substances. Searches and inspections may be conducted without prior announcement. Submission to a search or inspection is a condition of employment. Failure to cooperate and not signing the consent form (HS101.01r4) shall result in immediate suspension and is grounds for disciplinary action up to and including termination. Employees acknowledge and agree that they have no expectation of privacy in any space, item, locker, property, or equipment located on Company or Host Employer Premises or equipment owned, operated, leased, provided, or controlled by Shaw E & I or a Host Employer.

If an illegal substance is found Company or Host Employer Premises, a phone call to the authorities, the Substance abuse program administrator or the Human Resource Business Unit Director should be made immediately. The person that discovered the illegal substance should document his/her findings thoroughly.

6.9 Criminal Drug Conviction

Any Employee who has had a criminal drug conviction for a drug offense must notify Shaw E & I within five (5) days of that conviction. When an Employee has been convicted (meaning a finding of

guilt or imposition of sentence, including a plea of *nolo contendere*) of a drug offense fails to notify Shaw E & I of such conviction, Shaw E & I will either pose a sanction on the Employee, up to and including termination, or require the Employee to satisfactorily complete a drug-abuse rehabilitation program before returning to work.

6.10 Drug and Alcohol Education/Employee Assistance Program (EAP)

Drug and alcohol use awareness education will assist Company representatives and Employees to recognize individuals who may be abusing drugs or alcohol. The purpose of drug and alcohol awareness education is to:

- Provide Employees with an awareness of alcohol and drug use problems concerning the health and safety aspects of such use.
- To help Employees recognize symptoms of abuse.
- To help Employees recognize drugs and drug paraphernalia.
- To help Employees understand this procedure and penalties for violating this procedure and to outline procedures for handling situations related to this procedure.
- To reinforce Employee awareness of Shaw E & I's work rules on this subject.
- To reinforce the dangers of drug and alcohol abuse in the workplace.
- Provide information on the availability of drug and alcohol counseling, rehabilitation and Employee assistance.

Any Employee desiring information on substance use and abuse or a list of Employee Assistance Programs available in your area should contact Shaw E & I's Human Resources Department or Shaw E & I's Substance Abuse Program Administrator.

7. ATTACHMENTS

- Attachment 1, The Shaw Group Inc. Drug and Alcohol Non-DOT Policy Puerto Rico Addendum
- Attachment 2, Specimen Collection Procedure

8. FORMS

- HS101.01r4, The Shaw Drug and Alcohol Policy
- HS101.02r4, Reasonable Suspicion Documentation Form
- HS101.03r4, Re-Hire Certification and Agreement Employees Returning from a Substance Abuse Counseling/Rehabilitation Program

Attachment 1
The Shaw Group Inc. Drug and Alcohol Non-DOT Policy
Puerto Rico Addendum

I. Puerto Rico Law

A. Possession

Under Puerto Rico law, **24 L.P.R.A. § 2404**, it is unlawful for any person knowingly or intentionally, to possess any controlled substance, unless such substance was obtained directly or pursuant to a valid prescription or order from a practitioner, while acting in the course of his professional practice.

Any person who violates Puerto Rico law shall be guilty of a felony and upon conviction thereof, shall be punished by imprisonment for a fixed term of three (3) years. Should there be aggravating circumstances, the fixed penalty established may be increased to a maximum of five (5) years; if there should be extenuating circumstances, it may be reduced to a minimum of two (2) years. The court, in its discretion, in addition to imprisonment, may impose a fine that shall not exceed five thousand (5,000) dollars and an administrative fee.

If such person commits the said offense after one or more previous convictions under this subsection are final, he shall be guilty of a felony and, upon conviction thereof, shall be sentenced to imprisonment for a fixed term of six (6) years. Should there be aggravating circumstances, the fixed penalty established may be increased to a maximum of ten (10) years; if there should be extenuating circumstances, it may be reduced to a minimum of four (4) years.

If any person who has not been previously convicted of violating Puerto Rico law or any other law of the United States, related to narcotic drugs, marijuana or stimulant or depressant substances, is found guilty of violating subsection (a) of this section, be it after a trial or entering a plea of guilty, the court, without entering a verdict of guilty and with the consent of said person, may defer further proceedings and place said person on probation under such reasonable terms and conditions as it may require and for a fixed term of three (3) years. Should there be aggravating circumstances, the fixed penalty established may be increased to a maximum of five (5) years; should extenuating circumstances exist, it may be reduced to a minimum of two (2) years. The court shall advise the defendant that should he/she abandon the treatment and rehabilitation program, he/she shall be sanctioned pursuant to the provisions of § 4428 of Title 33.

B. Manufacture and Distribution

Under Puerto Rico law it is unlawful for any person knowingly or intentionally:

- (1) To manufacture, distribute, dispense, transport or conceal or possess with the intent to manufacture, distribute, dispense, transport or conceal a controlled substance; or
- (2) To produce, distribute or dispense, transport or conceal or possess with the intent to distribute or dispense, transport or conceal an adulterated substance.

Any person who violates this Puerto Rico law will be convicted of a felony and punished in accordance with the type of drug involved. Such punishment ranges from a sentence of a minimum of a fixed term of ten years to a maximum of a fixed term fifty years in prison. In addition, the court, in its discretion, may impose a fine, not to exceed fifty thousand (50,000) dollars and an administrative fee.

II. United States Law

Under the laws of the United States of America, it is unlawful for any person knowingly or intentionally:

- (1) To manufacture, distribute or dispense or possess with intent to manufacture, distribute or dispense, a controlled substance; or
- (2) To import or export a controlled substance.

Any person who violates this law will be sentenced to a term of imprisonment ranging from 5 years to 40 years and a fine of up to \$20,000,000, depending on the type and quantity of the controlled substance or drug involved.

Attachment 2 Specimen Collection Procedures

Subject to laws and regulations of the jurisdiction in which the Employee may be employed, the specimen collection shall be conducted in the following manner. Specimens used in testing shall be collected by a certified laboratory or their agents in a manner in compliance with applicable state and Federal laws and regulations.

Drug Screen Specimen Collection

A. Scope

1. The drug testing custody and control form is to be used as a permanent record on which identifying data on the Employee and on the specimen collection and transfer process are retained. The drug-testing plan requires testing for at least marijuana, cocaine, opiates, amphetamines, and phencyclidine.
2. Urine Drug Screen specimens collected under this plan may be used only to test for controlled substances designated or approved for testing as described in this procedure and shall not be used to conduct any other analysis or test.
3. This plan does not prohibit procedures reasonably incident to the analysis of the specimen for controlled substances (e.g., determination of pH or tests for specific gravity, creatinine concentration, or presence of adulterants).

B. Procedures

1. The collection site person shall utilize the drug testing custody and control form provided by company; this form must address the requirements as contained in § 40.23. The custody and control form must comply with the provisions as contained in 49 CFR Part 40 with regard to the information that must be contained on the form. (Standard Form #DOT, 3900.0 or equivalent).
2. The drug testing custody and control form may include such additional information as may be required for billing or other legitimate purposes necessary to the collection.
3. A clean, single-use specimen bottle that is securely wrapped until filled with the specimen and use of a tamper proof sealing system, designed in a manner such to ensure against undetected opening shall be utilized.
4. Written procedures, instructions, and training shall be provided as follows:
 - a. Shaw E & I may contract for and utilize when possible, an independent collection Site. The independent collection site shall abide by all procedures, techniques and methods outlined in 49 CFR Part 40, Part 199 and any DOT agency regulation, as well as those outlined in this document.
 - b. Company collection procedures and training shall clearly emphasize that the collection site person is responsible for maintaining the integrity of the specimen collection and transfer process, carefully ensuring the modesty and privacy of the donor and is to avoid any conduct or remarks that might be construed as accusatorial or otherwise offensive or inappropriate.

- c. The collection site person shall have successfully completed training to carry out this function or shall be a licensed medical professional or a technician who has been provided instructions for collection and certifies completion as required.
 - d. Unless it is impracticable for any other individual to perform this function, a direct supervisor of an Employee shall not serve as the collection site person for a test of the Employee.
5. The collection individual shall use a shipping container in which the specimen and associated paper work may be transferred and which can be sealed and initialed to prevent undetected tampering.

C. Security

1. The purpose of this section is to prevent unauthorized access, which could compromise the integrity of the collection process of the specimen.
2. The designated collection site is to be secure. If a collection site facility is dedicated solely to urine collection, it shall be secure at all times. If a facility cannot be dedicated solely to drug testing, the portion of the facility used for testing shall be secure during drug testing.
3. A facility normally used for other purposes, such as a public rest room or hospital examining room, may be secured by visual inspection to ensure other persons are not present and undetected access (e.g., through a rear door not in the view of the collection site person) is not possible. Security during collection may be maintained by effective restriction of access to collection materials and specimens. In the case of a public rest room, the facility must post and secure against access during the entire screen collection procedure to avoid embarrassment to the Employee or distraction of the collection site person.
4. If it is impractical to maintain continuous physical security of a collection site from the time the specimen is presented until the sealed mailer is transferred for shipment, the following minimum procedures shall apply:
 - a. The specimen shall remain under the direct control of the collection site person from delivery to its being sealed in the mailer.
 - b. The mailer shall be immediately mailed, maintained in secure storage, or remain until mailed under the personal control of the collection site person.

D. Chain-of-Custody

1. The chain-of-custody block, of the drug testing custody and control form, shall be properly executed by authorized collection site personnel upon receipt of specimens.
2. Handling the transportation of urine specimens from one authorized individual or place to another shall always be accomplished through chain-of-custody procedures. Every effort shall be made to minimize the number of persons handling specimens.

E. Access to Authorized Personnel Only

1. No unauthorized personnel shall be permitted in any part of the designated collection site when urine specimens are collected or stored. Only the collection site person may handle specimens prior to their sealing in the mailing container or monitor or observe a specimen collection (under the conditions specified in this section).
2. To promote security of specimens, avoid distraction of the collection site person and ensure against any confusion in the identification of specimens, the collection site person shall have only one donor under supervision at anytime.

3. For this purpose, a collection procedure is complete when the urine bottle has been sealed and initialed, the drug testing custody and control form has been executed and the Employee has departed the site (or, in the case of an Employee who was unable to provide a complete specimen, has entered a waiting area).

F. Privacy

1. Procedures for collecting urine specimens shall allow individual privacy unless there is a reason to believe that a particular individual may alter or substitute the specimen to be provided, as further described in this section.
2. For purposes of this procedure, the following circumstances are the exclusive grounds constituting a reason to believe that the individual may alter or substitute the specimen:
 - a. The Employee has presented a urine specimen that falls outside the normal temperature range (32.0_C/90_F – 38_C/100_F), &
 - (1) The Employee declines to provide a measurement of oral body temperature, as provided in paragraph G.14. of this section; or
 - (2) Oral body temperature varies by more than 1_C/1.8_F from the temperature of the specimen.
 - b. The last urine specimen provided by the Employee (i.e., on a previous occasion) was determined by the laboratory to have a specific gravity of less than 1.003 and a creatinine concentration below 0.2g/L.
 - c. The collection site person observes conduct clearly and unequivocally indicating an attempt to substitute or adulterate the sample (e.g., substitute urine in plain view, blue dye in specimen presented); or
 - d. The Employee has previously been determined to use a controlled substance without medical authorization or the particular test was being conducted under a DOT regulation providing for follow-up testing upon or after return to service.
3. A higher-level supervisor of the collection site person or a designated employer representative shall review and concur in advance with any decision by a collection site person to obtain a specimen under the direct observation of a same gender collection site person based upon the circumstances described in paragraph 2 above.

G. Integrity and Identity of the Specimen

The collection site person shall take precautions to ensure that a urine specimen is not adulterated or diluted during the collection procedure and that information on the urine bottle and on the urine custody and control form can identify the individual from whom the specimen was collected. The following minimum precautions shall be taken to ensure that unadulterated specimens are obtained and correctly identified:

1. To deter the dilution of specimens at the collection site, toilet-bluing agents shall be placed in toilet tanks wherever possible, so that reservoir of water in the toilet bowl always remains blue. Where practicable, there shall be no other source of water (e.g., no shower or sink) in the enclosure where urination occurs. If there is another source of water in the enclosure, it shall be effectively secured or monitored to ensure it is not used as a source for diluting the specimen.
2. When an individual arrives at the collection site, the collection site person shall ensure that the individual is positively identified as the Employee selected for testing (e.g., through presentation of photo identification or identification by the employer's representative). If the

individual's identity cannot be established, the collection site person shall not proceed with the collection. If the Employee requests, the collection site person shall show proper identification to the Employee. The Employee shall complete any required registration/consent form at collection site.

3. If the individual fails to arrive at the assigned time, the collection site person shall contact the appropriate authority to obtain guidance on the action to be taken.
4. The collection site person shall ask the individual to remove any unnecessary outer garments such as a coat or jacket that might conceal items or substances that could be used to tamper with or adulterate the individual's urine specimen. The collection site person shall ensure that all personal belongings such as a purse or briefcase remain with the outer garments. The individual may retain his or her wallet. If the Employee requests it, the collection site person shall provide the Employee a receipt for any personal belongings.
5. The individual shall be instructed to wash and dry his or her hands prior to urination.
6. After washing hands, the individual shall remain in the presence of the collection site person and shall not have access to any water fountain, faucet, soap dispenser, cleaning agent, or any other materials which could be used to adulterate the specimen.
7. The individual may provide their specimen in the privacy of a stall or otherwise partitioned area that allows for individual privacy. The collection site person shall provide the individual with a specimen bottle or collection container, if applicable, for this purpose.
8. The collection site person shall note any unusual behavior or appearance on the urine custody and control form.
9. In the exceptional event that an employer-designated collection site is not accessible and there is an immediate requirement for specimen collection (e.g., circumstances require a post-accident test), a public restroom may be used according to the following procedures: A collection site person of the same gender as the individual; shall accompany the individual into the public restroom this shall be secured during the collection procedure. If possible, a toilet bluing agent shall be placed in the bowl and any accessible toilet tank. The collection site person shall remain in the restroom, but outside the stall, until the specimen is collected. If no bluing agent is available to deter specimen dilutions the collection site person shall instruct the individual not to flush the toilet until the specimen is delivered to the collection site person. After the collection site person has possession of the specimen, the individual will be instructed to slush the toilet and to participate with the collection site person in completing the chain-of-custody procedures.
10. If Shaw E & I is using the single collection method then the following procedures shall be used:
 - a. The collector may choose to direct the Employee to urinate either directly into a specimen bottle or into a separate collection container.
 - b. If a separate collection container is used, the collection site person or the Employee shall pour at least 30 ml of the urine from the collection container into the specimen bottle in the presence of the Employee.
11. Collection Methodology
 - a. In either collection methodology, upon receiving the specimen from the individual the collection site person shall determine if it has at least 30 ml of urine for a single specimen collection or 45 ml of urine for a split specimen collection.

- b. If the individual has not provided the required quantity of urine, the specimen shall be discarded. The collection site person shall direct the individual to drink up to 40 ounces of fluid, distributed reasonably through a period of up to three hours or until the individual has provided a new urine specimen, whichever occurs first. If the Employee refuses to drink fluids as directed or to provide a new urine specimen, the collection site person shall terminate the collection and notify the employer that the Employee has refused to submit to testing. If the Employee has not provided a sufficient specimen within three hours of the first unsuccessful attempt to provide the specimen, the collection site person shall discontinue the collection and notify the employer.
12. After the specimen has been provided and submitted to the collection site person, the individual shall be allowed to wash his or her hands.
13. Immediately after the specimen is collected, the collection site person shall measure the temperature of the specimen. The temperature-measuring device used must accurately reflect the temperature of the specimen and not contaminate the specimen. The time from urination to temperature measure is critical and in no case shall exceed 4 minutes.
14. A specimen temperature outside the range of 32.0_C/90_F - 38_C/100_F, constitutes a reason to believe that the individual has altered or substituted the specimen (See Section F.2.a.). In such cases, the individual supplying the specimen may volunteer to have their temperature taken to provide evidence to counter the reason to believe the individual may have altered or substituted the specimen.
15. Immediately after the specimen is collected, the collection site person shall also inspect the specimen to determine its color and look for any signs of contaminants. Any unusual findings shall be noted on the urine custody and control form.
16. All specimens suspected of being adulterated shall be forwarded to the laboratory for testing.
17. Whenever there is reason to believe that a particular individual has altered or substituted the specimen as described in Section F.2.a. and c., a second specimen shall be obtained as soon as possible under the direct observation of a same gender collection site person.
18. Both the individual being tested and the collection site person shall keep the specimen in view at all times prior to its being sealed and labeled. As provided below, the specimen shall be sealed by placement of a tamper-proof seal over the bottle cap and down the sides of the bottle and labeled in the presence of the Employee. If the specimen is transferred to a second bottle, the collection site person shall request the individual to observe the transfer of the specimen and the placement of the tamper-proof seal over the bottle cap and down the sides of the bottle.
19. The collection site person and the Employee shall be present at the same time during procedures outlined in items 20 through 24 of this section.
20. The collection site person or Employee shall place securely on the bottle an identification label, which contains the date, the individual's specimen number and any other identifying information provided or required by the employer. If separate from the label, the tamper-proof seal shall also be applied.
21. The specimen donor shall initial the identification label on the specimen bottle for the purpose of certifying that it is the specimen collection from the donor.
22. The collection site person shall enter on the drug testing custody and control form all information identifying the specimen. The collection site person shall sign the drug testing custody and control form, certifying that the collection was accomplished according to the applicable Federal requirements.

23. The individual shall be asked to read and sign a statement on the drug testing custody and control form that the specimen collected from him/her is in fact that specimen he/she provided.
24. The collection site person shall complete the chain-of-custody portion of the drug testing custody and control form to indicate receipt of the specimen from the Employee and shall certify proper completion of the collection.
25. The urine specimen and chain-of-custody form are now ready for shipment. If the specimen is not immediately prepared for shipment, the collection site person shall ensure that it is appropriately safeguarded during temporary storage.
26. Control of Specimen
 - a. While any part of the above chain-of-custody procedures is being performed, it is essential that the urine specimen and custody documents be under the control of the involved collection site person.
 - b. If the involved collection site person leaves their workstation momentarily, the collection site person shall take the specimen and drug testing custody and control form with them or shall secure them. After the collection site person returns to the workstation, the custody process will continue. If the collection site person is leaving for an extended period of time, they shall package the specimen for mailing before leaving the site.
 - c. The collection site person shall not leave the collection site in the interval between presentation of the specimen by the Employee and secure the sample with an identifying label bearing the Employee's specimen identification number and seal initialed by the Employee. If it becomes necessary for the collection site person to leave the site during this interval, the collection shall be nullified and at the election of Shaw E & I a new collection may be begun.
27. Collection Control
 - a. To the maximum extent possible, collection site personnel shall keep the individual's specimen bottle within sight both before and after the individual has urinated. After the specimen is collected, it shall be properly sealed and labeled.
28. Transportation to Laboratory
 - a. Collection site personnel shall arrange to ship the collected specimens to the drug testing laboratory. The specimens shall be placed in shipping containers designed to minimize the possibility of damage during shipment (e.g., specimen boxes and/or padded mailers); and those containers shall be securely sealed to eliminate the possibility of undetected tampering. On the tape sealing the container, the collection site person shall sign and enter the date specimens were sealed in the containers for shipment. The collection site person shall ensure that the chain-of custody documentation is attached to each container sealed for shipment to the drug-testing laboratory.
29. Failure to Cooperate
 - a. If the Employee refuses to cooperate with the collection process, the collection site person shall inform the designated company representative and shall document the non-cooperation on the drug testing custody and control form.

30. Employee Requiring Medical Attention
 - a. If the sample is being collected from an Employee in need of medical attention part of a post-accident test given in an emergency medical facility, necessary medical attention shall not be delayed in order to collect the specimen.
31. Use of Chain-of-Custody Forms
 - a. A chain-of-custody form shall be used for maintaining control and accountability of each specimen from the point of collection to final disposition of the specimen. The date and purpose shall be documented on the form each time a specimen is handled or transferred and every individual in the chain shall be identified. Every effort shall be made to minimize the number of persons handling specimens.

Evidential Breath Testing (EBT) for Alcohol

A. Scope

1. The evidential and non-evidential testing procedures set forth in this section was developed from utilizing, a guidance document, the requirements as set forth in 49 CFR Part 40 and specifies the required form and disposition of such testing forms.

B. Alcohol Testing Form

1. Shaw E & I may utilize a form similar to that of a DOT Breath Alcohol Testing form or a form that is directly generated by an EBT and may omit the space for affixing a separate printed result to the testing form. In all cases, the form shall provide triplicate or three consecutive identical copies with copy 1 being retained by Shaw E & I, copy 2 shall be provided to the Employee and copy 3 shall be retained by the BAT/STT.
2. The Breath Alcohol Testing form may include such additional information as may be required for billing or other legitimate purposes necessary to the testing, provided that personal identifying information on the individual (other than the social security number or Employee identification number) may not be provided.

C. Breath Testing Locations

1. Shaw E & I shall ensure that there are sufficient breath testing sites or the availability of BAT's/STT's located within a reasonable proximity to each of Shaw E & I's work locations.
2. Shaw E & I shall conduct the testing in a location that affords visual and aural privacy to the Employee being tested. All necessary equipment, personnel, and materials for conducting the alcohol testing shall be provided at the testing site.
3. A mobile collection facility, such as a van that is equipped for alcohol testing, that meets the requirements set forth in this procedure may be utilized.
4. No unauthorized persons shall be permitted access to the testing site when the EBT remains unsecured or to prevent such individuals from seeing or hearing a test result.
5. In some circumstances Shaw E & I may have to conduct such alcohol testing outdoors at the scene of an accident that does not meet the requirements as specified in post-accident provisions of the procedure. In these situations the BAT/STT shall provide the necessary visual and aural privacy to the Employee to the greatest extent practicable.
6. The BAT/STT shall supervise only one Employee's use of the EBT at a time. The BAT/STT shall not leave the alcohol testing site while the testing process is in progress.

D. Alcohol Testing Equipment

1. General
 - a. Shaw E & I shall use only approved evidential breath testing (EBT) devices and non-evidential devices for conducting the alcohol testing provisions required in the program. These devices are listed on NHTSA's conforming products list (CPL).
2. Screening Devices
 - a. Shaw E & I shall utilize either non-evidential devices or EBTs listed on the CPL for screening tests.
3. Confirmation Devices
 - a. Shaw E & I shall utilize an EBT listed on the CPL for confirmation testing.
4. NHTSA Conforming Products List (CPL)
 - a. All devices that will be used by Shaw E & I for alcohol testing are NHTSA approved evidential breath alcohol testing devices. NHTSA has model specifications for evidential breath testing devices. NHTSA periodically publishes an updated Conforming Products List, which states which devices have met NHTSA standards.
5. Quality Assurance Plans for Evidential Breath Testing Devices. Each EBT used shall have an approved quality assurance plan (QAP) to include the following:
 - a. Methods for conducting external calibration.
 - b. Minimum intervals for performing external calibrations.
 - c. Tolerance on an external calibration check.
 - d. Inspection, maintenance and calibration requirements. Each QAP is submitted to NHTSA for approval. Records demonstrating that the EBTs are subject to required external calibration checks will be maintained. An EBT will be taken out of service if any external calibration check results in a reading outside the tolerance for the EBT set forth in the QAP. The EBT will not be used again until it has been serviced and has had an external calibration check resulting in a reading within the tolerance for the EBT. This company will ensure that required inspections, maintenance and calibration checks are conducted. When the EBT is not being used it will be stored in a secure location.
6. Quality Assurance Plans for Non-Evidential Screening Devices. Each Non-Evidential Screening Device used shall have an approved quality assurance plan (QAP) to including the following:
 - a. The plan shall designate the method or methods to be used to perform quality control checks; the temperatures at which the non-evidential screening device shall be stored and used, as well as other environmental conditions (e.g., altitude, humidity) that may affect the performance of the device; and, where relevant, the shelf life of the device.
 - b. The QAP shall prohibit the use of any device that does not pass the specified quality control checks or that has passed its expiration date. The manufacturers' instructions on or included in the package for each saliva testing device shall include directions on the proper use of the device, the time frame within which the device must be read and the manner in which the reading is made. The employer and its agents shall comply with the QAP and manufacturer's instructions for each non-evidential screening device it uses for alcohol screening tests.

E. Breath Alcohol Testing Preparations

1. When an Employee arrives at the alcohol testing site, the BAT/STT shall ensure that the individual is positively identified as the Employee selected for alcohol testing (e.g., through presentation of photo identification or identification by Shaw E & I's representative). If the Employee's identity cannot be established, the BAT/STT shall not proceed with the alcohol test. If the Employee requests, the BAT/STT shall show proper identification to the Employee.
2. The BAT/STT shall explain the alcohol testing process to the Employee.
3. If the Employee fails to arrive at the assigned time, the BAT/STT should contact the appropriate company authority to obtain guidance on any action to be taken.

F. Screening Test Procedures for Evidential Breath Testing and Non-Evidential Breath Testing Devices.

1. The BAT shall begin the alcohol testing process by completing Step 1 on the Alcohol Breath Testing form. The Employee shall then complete Step 2 by signing the certification. Refusal by the Employee to sign the certification shall be regarded as a refusal to take the alcohol test.
2. The BAT shall select an individually sealed mouthpiece. It shall be opened in full view of the Employee and attached to the EBT in accordance with the manufacturer's instructions.
3. The BAT shall instruct the Employee to blow forcefully into the mouthpiece for at least 6 seconds or until the EBT instrument indicates that an adequate amount of breath has been obtained.
4. The BAT shall show the Employee the result displayed on the EBT. The BAT shall record the displayed result, testing device, serial number of the testing device, time and quantified result in Step 3 of the form.
5. If the EBT prints the test result directly onto the alcohol form, then the BAT shall show the Employee the result displayed on the EBT.
6. If the EBT does not provide a printed result, the BAT shall show the Employee the result displayed on the EBT. The BAT shall then record the test result onto the breath alcohol test form in the designated space and the Employee will sign the form as to acknowledge the results. The result shall be entered in such a manner that will provide clear evidence as to the results that were displayed by the EBT.
7. If the result of the screening alcohol test is a breath alcohol concentration of less than 0.04, the BAT shall date the form and sign the certification in Step 3 of the form. The Employee shall then sign the certification and fill in the date in Step 4 of the form. If the Employee does not sign the certification in Step 4, it shall not be considered a refusal to be tested. In this event, the BAT shall note the Employee's failure to sign in the "Remarks" section of the form.
8. If the EBT has printing capabilities and the test result printed by the EBT does not match the displayed result, the BAT shall note the disparity in the "Remarks" section. Both the BAT and the Employee shall initial or sign the notation. The alcohol test is invalid and Shaw E & I representative and the Employee shall be so advised.
9. At this point, no further testing is authorized. The BAT shall transmit the result of less than 0.04 to the appropriate company representative in a confidential manner. Shaw E & I shall receive and store the information so as to ensure that confidentiality is maintained as required in the procedure.

10. If the result of the screening test is an alcohol concentration of 0.04 or greater, then the BAT shall perform a confirmation test. If a different BAT will conduct the confirmation test, then the BAT who conducts the screening test shall complete and sign the form and log entry. The BAT will upon completion of the alcohol test provide the Employee with Copy 2 of the Breath Alcohol Testing form.

G. Confirmation Test Procedures.

1. When a BAT other than the one who conducted the screening test is required to conduct the confirmation test, the new BAT will require the Employee to provide positive identification such as photo ID card or identification by a company representative. The BAT will, upon request of the Employee being tested, provide such identification.
2. The BAT shall instruct the Employee not to eat, drink, put any object or substance in his/she mouth and, to the extent possible, not belch during the waiting period just prior to the confirmation test being conducted. This waiting period shall begin with the completion of the screening test and shall not be less than 15 minutes, but must be within 30 minutes of the completion of the screening test. The time the Employee spends in transit between the screening test and confirmation test, the Employee is under direct observation, counts toward the mandatory 15 minute deprivation period. If the BAT conducts the confirmation test more than 30 minutes after the result of the screening test has been obtained the BAT shall note in the "Remarks" section of the form the time that elapsed between the screening and the confirmation test and the reason why the confirmation test could not be conducted within 30 minutes of the screening test. The BAT shall explain to the Employee that the reason for this is to prevent any accumulation of mouth alcohol leading to an artificially high reading and that it is for the benefit of the Employee to comply with these instructions. The BAT shall also explain that the test will be conducted at the end of the required waiting period, even if the Employee has disregarded the instructions. If the BAT becomes aware that the Employee has not complied with the provided instructions; the BAT shall note the observations in the "Remarks" section of the form.
3. When a BAT other than the one who conducted the screening test is required to conduct the confirmation test, the new BAT shall initiate a new breath alcohol testing form. The BAT shall then complete step 1 on the form and the Employee shall then complete Step 2 by signing the certification. If the Employee should choose not to sign the certification, the BAT shall then make an appropriate notation in the "Remarks" section indicating the Employee's refusal to take the alcohol test. The BAT shall note in the "Remarks" section that a different BAT conducted the screening test.
4. The BAT shall open, in the presence of the Employee, a new individually-sealed mouthpiece and attach the mouthpiece to the EBT in accordance with the manufacturer's instructions. The BAT will then instruct the Employee to blow forcefully into the mouthpiece for at least 6 seconds or until the EBT indicates that an adequate amount of breath has been obtained.
5. In the event that the screening and confirmation test results are not identical, the confirmation test result shall be deemed to be the final result on which any action by Shaw E & I may be taken in order to comply with the requirements of the AMPP and any applicable Federal requirements.
6. If the EBT prints the test result directly onto the alcohol form, then the BAT shall show the Employee the result displayed on the EBT.
7. If the EBT does not provide a printed result, the BAT shall show the Employee the result displayed on the EBT. The BAT shall then record the test result onto the breath alcohol test form in the designated space and the Employee will sign the form as to acknowledge the results. The result shall be entered in such a manner that will provide clear evidence as to the results that were displayed by the EBT.

8. After the confirmation test is completed, the BAT shall date the form and sign the certification in Step 3 of the form. The Employee shall then be instructed to sign the certification and fill in the date in Step 4. If the Employee should elect to not sign the certification or to provide his/her initials in the log book entry for the test conducted, it shall not be considered as a refusal to be tested. The BAT shall then note the Employee's failure to sign or initial the log book entry in the "Remarks" section of the testing form.
9. The BAT shall transmit all alcohol testing results to the APM (Alcohol Program Manager) or other designated company representative in a confidential manner. All communications by BAT's shall be to the APM or designee only and may be provided in writing, in person or by telephone or electronic means. The BAT shall ensure that immediate transmission of test results to Shaw E & I is conducted in order for Shaw E & I to prevent the Employee from performing any covered functions.
10. Should the initial transmission not be accomplished in writing, but via telephone notification, Shaw E & I designee shall establish a mechanism to verify the identity of the BAT providing the information. The BAT shall follow the initial transmission by providing to Shaw E & I designee Shaw E & I's copy of the Breath Alcohol Testing form. The test results shall be stored in such a manner so as to protect the confidentiality of the results and to eliminate the disclosure of information to unauthorized persons.

H. Refusals to Test and Uncompleted Tests.

1. Refusal by an Employee to complete and sign Step 2 of the Breath Alcohol Testing form, to provide breath, to provide an adequate amount of breath or otherwise to cooperate with the testing process in a way that prevents the completion of the test shall be noted by the BAT in the "Remarks" section of the form. The testing process shall be terminated and the BAT shall immediately notify Shaw E & I representative/designee.
2. If a screening or confirmation test cannot be completed or if an event occurs to invalidate the test, the BAT/STT shall, if practicable, begin a new screening or confirmation test using a new Breath Alcohol Testing form with a new sequential test number.

I. Inadequate Amount of Breath for EBT Devices

1. If the Employee is unable or alleges that he/she is unable, to provide a sufficient amount of breath to permit a valid breath test because of a medical condition, the BAT or STT shall again instruct the Employee to attempt to provide an adequate amount. If the Employee refuses to make the attempt, the BAT or STT shall immediately inform Shaw E & I.
2. If the Employee attempts and fails to provide an adequate amount of breath, the BAT or STT shall so note in the "Remarks" section of the testing form and shall immediately inform Shaw E & I. Shaw E & I shall direct the Employee to obtain, as soon as practical after the attempt, an evaluation from a licensed physician, who is acceptable to Shaw E & I, concerning the Employee's medical ability to provide an adequate amount of breath for the screen.
3. If the physician determines, in his/her reasonable medical judgment, that a medical condition has or could have precluded the Employee from providing an adequate amount of breath, the Employee's failure to provide an adequate amount of breath shall not be deemed as a refusal to take an alcohol test. The physician shall provide to Shaw E & I representative a written statement of the basis of his/her conclusion.
4. If the physician, in his/her reasonable medical judgment, is unable to make the determination that a medical condition has precluded the Employee from providing an adequate amount of breath, the Employee's failure to provide an adequate amount of breath shall be regarded as a refusal to take a test. The physician shall provide a written statement of the basis for his/her conclusion to Shaw E & I.

J. Invalid Tests

1. An evidential breath alcohol test shall be invalid under the following circumstances:
 - a. The EBT does not pass its next external calibration check. This invalidates all test results of 0.04 or greater on tests conducted since the last valid external calibration test. This would not invalidate any negative tests conducted.
 - b. The BAT does not observe the minimum 15-minute waiting period prior to conducting the confirmation test.
 - c. The BAT does not sign the Breath Alcohol Testing form.
 - d. The BAT fails to note in the remarks section of the form that the Employee has failed or refused to sign the form following the recording or printing on or attachment to the form of the test results.

Reasonable Suspicion Documentation Form

Employee is reporting for duty

Employee is already on duty:

EMPLOYEE NAME:		DATE OF OBSERVATION:	
LOCATION:		TIME OF OBSERVATION:	
		FROM:	TO:
		AM/PM	AM/PM
OBSERVED PERSONAL BEHAVIOR (CHECK ALL APPROPRIATE ITEMS)			
BREATH: (Odor of alcoholic beverage)	<input type="checkbox"/> STRONG <input type="checkbox"/> NONE	<input type="checkbox"/> FAINT	<input type="checkbox"/> MODERATE
EYES:	<input type="checkbox"/> BLOODSHOT <input type="checkbox"/> CLEAR <input type="checkbox"/> DILATED PUPILS	<input type="checkbox"/> GLASSY <input type="checkbox"/> HEAVY EYELIDS <input type="checkbox"/> FIXED PUPILS	<input type="checkbox"/> NORMAL <input type="checkbox"/> CONSTRICTED PUPILS
SPEECH:	<input type="checkbox"/> CONFUSED <input type="checkbox"/> ACCENT <input type="checkbox"/> SLURRED <input type="checkbox"/> NOT ABLE TO UNDERSTAND	<input type="checkbox"/> STUTTERED <input type="checkbox"/> MUMBLED <input type="checkbox"/> GOOD <input type="checkbox"/> COTTON MOUTHED	<input type="checkbox"/> THICK TONGUED <input type="checkbox"/> FAIR <input type="checkbox"/> MUSH MOUTHED <input type="checkbox"/> OTHER: _____
ATTITUDE:	<input type="checkbox"/> EXCITED <input type="checkbox"/> INDIFFERENT <input type="checkbox"/> CARE FREE <input type="checkbox"/> COOPERATIVE <input type="checkbox"/> POLITE	<input type="checkbox"/> COMBATIVE <input type="checkbox"/> TALKATIVE <input type="checkbox"/> COCKY <input type="checkbox"/> PROFANE	<input type="checkbox"/> HILARIOUS <input type="checkbox"/> INSULTING <input type="checkbox"/> SLEEPY <input type="checkbox"/> OTHER: _____
UNUSUAL ACTION:	<input type="checkbox"/> HICCOUGHING <input type="checkbox"/> FIGHTING <input type="checkbox"/> LAUGHING	<input type="checkbox"/> BELCHING <input type="checkbox"/> CRYING	<input type="checkbox"/> VOMITING <input type="checkbox"/> OTHER: _____
BALANCE:	<input type="checkbox"/> FALLING <input type="checkbox"/> SWAYING	<input type="checkbox"/> NEEDS SUPPORT <input type="checkbox"/> WOBBLING	<input type="checkbox"/> OTHER: _____
WALKING:	<input type="checkbox"/> FALLING <input type="checkbox"/> SWAYING	<input type="checkbox"/> STAGGERING <input type="checkbox"/> STUMBLING	<input type="checkbox"/> OTHER: _____
TURNING:	<input type="checkbox"/> FALLING <input type="checkbox"/> SWAYING	<input type="checkbox"/> STAGGERING <input type="checkbox"/> HESITANT	<input type="checkbox"/> OTHER: _____ <input type="checkbox"/> STUMBLING
<i>Check All That Apply:</i> <input type="checkbox"/> Significant decline in job performance; <input type="checkbox"/> Unexplained absences from work station; <input type="checkbox"/> Significant change in personality; <input type="checkbox"/> Changes in personal hygiene; <input type="checkbox"/> Excessive absenteeism/tardiness; <input type="checkbox"/> Operates equipment			
ANY OTHER UNUSUAL OBSERVED ACTIONS OR STATEMENTS BY THE EMPLOYEE:			

Reasonable Suspicion Test Performed? Yes No Reason Not Performed: _____

Signature of Supervisor: _____ Date ____/____/____ Time _____

Signature of Witness: _____ Date ____/____/____ Time _____



PROCEDURE

UNCONTROLLED WHEN PRINTED

Subject: EXCAVATION AND TRENCHING

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to describe the company requirements for excavation and trenching safety. These requirements are based on the federal Occupational Safety and Health Administration (OSHA) excavation standard found in 29 Code of Federal Regulations (CFR) 1926, Subpart P.

Some company activities are likely to occur in states or localities that either currently have or will have requirements that differ from those contained within the federal standard. In such circumstances, the local health and safety representative will be responsible for ensuring that these requirements are included in either a site health and safety plan or a similar document and conveyed to all affected employees. If federal, state, or local regulations vary or conflict, the more protective requirements and practices will be followed.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Accepted Engineering Practices

Those requirements or practices which are compatible with standards required by a registered professional engineer.

Angle of Repose

The greatest angle above the horizontal plane at which a material will lie without sliding.

Benching

A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels of steps, usually with vertical or near-vertical surfaces between levels.

Competent Person

An employee who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has the authority to take prompt corrective measures to eliminate them.

Company

All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Excavation

Any man-made cut, cavity, trench or depression in an earth surface, including its sides, walls, or faces, formed by earth removal.



Registered Professional Engineer

An individual currently registered as a professional engineer (preferably civil) in the state where work is to be performed.

Sheeting

Members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield

A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Shields may be pre-manufactured or job-built in accordance with 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields".

Shoring

Structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sloping

A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Support System

A structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated Data

Tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench

A narrow (in relation to its length) excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

Type A Soil

Cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, soil is NOT Type A if:

- The soil is fissured;
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects;



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

Type B Soil

This classification refers to:

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

Type C Soil

This classification refers to:

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

5.0 TEXT

5.1 Pre-Excavation Requirements

5.1.1 Underground Utilities. Prior to opening an excavation, the estimated location of underground utilities such as sewer, telephone, fuel, electric, water, or any other underground installation that may be reasonably expected to be encountered during the excavation work shall be determined.



Utility companies or a utility location service shall be contacted within the established pre-notification time, advised of the proposed work, and asked to delineate the location of all underground utilities. Employees should be careful to protect and preserve the utility markings until they are no longer required for safe excavation. At least 3 feet of clearance between any underground utility and the cutting edge or point of powered excavation equipment will be maintained until the precise location of the utility is determined. Initial excavation within this 3 foot area will be conducted manually.

5.1.2 Surface Encumbrances. All surface encumbrances (trees, poles, boulders, etc.) that may create a hazard to employees shall be removed or supported.

5.1.3 Vehicular Traffic. Employees exposed to vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material. Traffic control devices (i.e., barricades, signs, cones, flag persons, etc.) shall be specified and used in accordance with regulations applicable to the roadway or area in which excavation activities are occurring.

5.1.4 Training. Those who supervise the entry of personnel into an excavation must have completed a training course that included instruction in:

- Types of hazards associated with excavation operations;
- Safe work practices and techniques;
- A review of applicable Federal, state and local regulations; and
- A review of this procedure.

Employees who enter excavations are required to complete a site-specific training session to enable them to recognize unsafe conditions in and around the excavation. This training can be conducted during a tailgate safety meeting that emphasizes the specific excavation hazards that may be encountered.

Training documentation shall be maintained in the project file with a copy forwarded to the Knoxville Training Department.

As part of standard employee supervision process, training shall be complemented with on-the-job instruction and reinforcement of accepted practices to the extent necessary to assure compliance with this procedure and all other applicable regulations.



5.2 Excavation Work Practices

5.2.1 General. Each employee working within an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 29 CFR 1926 Subpart P, except when the excavation is made entirely in stable rock or when the excavation is less than 5 feet deep and examination of the ground by a competent person provides no indication of a potential cave-in. A competent person shall ensure that protective systems, when required, are installed and maintained per the design specifications.

No employees shall be permitted to enter an excavation unless it is absolutely essential to do so and all requirements of this procedure are met.

5.2.2 Supervision. Work in an excavation shall at all times be supervised by a competent person. This individual will remain outside of the excavation at all times, and will be responsible for identifying any unusual developments above ground which may warn of impending earth movement.

5.2.3 Soil Classification. Based on the results of tests described in Attachment 3, the competent person will classify each soil/rock deposit as stable rock, Type A, Type B, or Type C. When layers of soil/rock exist, the weakest layer will be classified; however, each layer may be classified individually when a more stable layer lies under a less stable layer. If the properties or conditions of a soil/rock deposit change in any way, re-evaluation will be required.

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

A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 or more feet in depth so as to require no more than 25 feet of lateral travel for employees.

5.2.5 Protective Systems. Protective systems shall be designed in accordance with 29 CFR 1926.652(b) or (c) and shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

5.2.6 Exposure to Falling Loads. No employees shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by spillage or falling materials. Operators may remain in the cabs of vehicles being



loaded or unloaded provided the vehicles are equipped with a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.

5.2.7 Warning System for Mobil Equipment. When mobile equipment is operated adjacent to an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs.

5.2.8 Hazardous Atmospheres. Where an oxygen deficient (less than 19.5% O₂) or hazardous atmosphere exists, or could reasonably be expected to exist, the excavation shall be tested before employees enter. Testing shall be conducted as often as necessary to ensure that the atmosphere remains safe. Some excavations may be considered confined spaces which require compliance with Shaw E & I Procedure HS300.

Adequate precautions shall be taken to prevent employee exposure to oxygen deficient or hazardous atmospheres. As appropriate, ventilation and/or respiratory protective devices shall be used.

5.2.9 Water Accumulation Hazards. Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water is controlled or prevented from accumulating by the use of water removal equipment, the process shall be monitored by a competent person to ensure proper operation.

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

5.2.10 Stability of Adjacent Structures. Structures adjoining an excavation shall be evaluated to assess their stability. Excavation below the level of the base or footing of any foundation or retaining wall that could reasonably be expected to pose a hazard to employees shall only be permitted when:

- A support system (underpinning) is provided to ensure the safety of employees and the stability of the structure;
- The excavation is in stable rock;
- A registered professional engineer has determined that the structure will be unaffected by the excavation; or
- A registered professional engineer has determined that such excavation will not pose a hazard to employees.



Sidewalks, pavements and other surface structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

5.2.11 Protection from Loose Rock or Soil. Employees shall be protected from loose rock or soil which could fall or roll from the excavation face or edge. Such protection could consist of scaling to remove loose materials, or the installation of protective barriers. All spoil shall be placed at least 2 feet from the edge of the excavation. It is strongly recommended that spoil be placed 4 or more feet from the excavation edge so as not to cover surface indicators of subsidence (such as fissures or cracks).

5.2.12 Inspections. The competent person shall make daily inspections of excavations, adjacent areas, and protective systems for evidence of conditions that could result in a cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. The inspection shall be made prior to start of work, and as needed throughout the shift. Inspections shall be made after each rainstorm or other hazard-increasing event and will be documented using Attachment (2).

Where the inspection finds evidence of any hazardous condition, exposed employees shall be immediately removed from the hazardous area until necessary precautions have been taken.

5.2.13 Fall Protection. Where employees or equipment are permitted to cross over excavations, walkways or bridges shall be provided. Standard guardrails shall be provided where walkways are 6 feet or more above lower levels.

Adequate barriers or other types of physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered and shall be backfilled as soon as possible.

6.0 EXCEPTION PROVISIONS

Variations and exceptions may be requested pursuant to the provisions of procedure HS013, Health and Safety Procedure Variations.



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7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS050 Training Requirements
HS051 Tailgate Safety Meetings
HS300 Confined Spaces
29 CFR 1926 Subpart P - Excavations

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Excavation Inspection
3. Soil Classification Worksheet
4. Selection of Protective Systems for Excavations 20 Feet or Less in Depth
5. Sloping Options
6. Shoring or Shielding Options



ATTACHMENT 1
EXCAVATION AND TRENCHING

Responsibility Matrix

Action	Procedure Section	Responsible Party					
		Employee	Supervisor	Registered Professional Engineer	Director of Health and Safety	Local H&S Representative	Competent Person
Incorporate state, local, or client-specific excavation requirements into project plans.	1.0					X	
Issue, revise, and maintain procedure	3.1				X		
Coordinate identification of underground utilities.	5.1.1		X				
Determine need for traffic control devices.	5.1.3		X				
Participate in excavation training.	5.1.4	X	X			X	X
Ensure that protective systems are installed and maintained.	5.2.1						X
Classify Soil Type	5.2.3						X
Design Structural Ramps	5.2.4						X
Selection and design of protective system(s)	5.2.5			X			
Determine stability of adjacent structures.	5.2.10			X			
Inspecting excavation for hazardous conditions	5.2.12	X	X				X



ATTACHMENT 2
EXCAVATION INSPECTION

**THIS INSPECTION IS TO BE COMPLETED BY THE COMPETENT PERSON
 EACH DAY THAT EMPLOYEES WILL BE ENTERING AN EXCAVATION.**

Project Name: _____ Project No.: _____

Date: _____ Time: _____ Competent Person: _____

Soil Classification (see Soil Classification Worksheet): _____

Excavation Depth: _____ Excavation Width: _____

Type of Protective System Used: _____

	T		
	YES	NO	N/A
1. GENERAL:			
Surface encumbrances removed or supported			
Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation.			
Hard hats, steel-toed boots, and safety glasses worn by all employees.			
Spoils, materials, and equipment set back at least 2 feet from the edge of the excavation.			
Walkways over excavations 6 feet or more above lower levels are equipped with standard guardrails.			
Warning vest or other highly visible clothing provided and worn by all employees exposed to public vehicular			
Employees required to stand away from vehicles being loaded or unloaded.			
Warning system established and utilized when mobile equipment is operating near excavation edge.			
Employees prohibited from going under suspended loads.			
2. UTILITIES:			
Utility companies contacted and/or utility locations delineated.			
Underground installations protected, supported, or removed while excavation is open.			
3. MEANS OF ACCESS AND EGRESS:			
Lateral travel to means of egress no greater than 25 feet in trench excavations 4 feet or more in depth.			
Ladders used in excavations secured and extended 3 feet above the edge of the trench.			
Structural ramps used by employees designed by a competent person.			
Structural ramps used for equipment designed by a registered professional engineer.			
4. WET CONDITIONS:			
Precautions taken to protect from the accumulation of water.			



Water removal equipment monitored by a competent person.			
Surface water or runoff diverted or controlled to prevent accumulation in the excavation.			
Inspections made after every rainstorm or other hazard-increasing occurrence.			
5. HAZARDOUS ATMOSPHERE:			
Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficient, combustible, or otherwise hazardous atmosphere.			
Adequate precautions taken to protect employee from exposure to a hazardous atmosphere.			
Testing conducted to ensure that the atmosphere remains safe.			
Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmosphere does exist.			
6. SUPPORT SYSTEMS:			
Materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads.			
Materials and equipment used for protective systems inspected and in good condition.			
Damaged materials and equipment used for protective systems inspected by a Registered Professional Engineer after repairs and before being placed back into service.			
Protective systems installed without exposing employees to the hazards of cave-ins, collapses, or from being struck by materials or equipment.			
Members of support systems securely fastened to prevent failure.			
Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.			
Excavations below the level of the base or footings approved by a registered professional engineer.			
Removal of support systems progresses from the bottom, and members are released slowly as to note any indication of possible failure.			
Excavation of material to a level of greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth.			
Shield system placed to prevent lateral movement.			
Employees are prohibited from remaining in shield system during vertical movement.			
7. REMARKS:			
<hr/> <hr/>			



ATTACHMENT 3
SOILS CLASSIFICATION WORKSHEET

The following worksheet outlines the visual and manual tests that the competent person must perform at least once, and each time soil conditions change. At least one visual and one manual test must be performed; however, performing several tests is recommended so that the condition of the excavation is thoroughly examined.

Project Name: _____

Project Number: _____

Date: _____

Time: _____

Where was the sample taken from? _____

I. VISUAL TESTS: One or more visual tests are required for each classification and each time conditions change.

1. Estimate range of particle sizes:	a. primarily fine-grained = cohesive material b. primarily coarse-grained = granular material	
2. Observe excavated soil:	a. clumps = cohesive material b. breaks up easily = granular material	
3. Observe sides and adjacent surface area of opened excavation:	a. crack like openings = fissured material b. soil spalls off vertical sides = possible fissured material	
4. Previous excavation activities:	a. previously disturbed soil	b. not previously disturbed soil
5. Observe opened side of excavation:	a. layered systems estimate degree of slope of layers:	c. b. layers sloped towards excavation _____
6. Water condition:	a. evidence of surface water c. depth of water table :	b. water seeping from sides _____
7. Vibration present:	a. area adjacent to excavation	b. area within excavation

II. MANUAL TESTS- One or more manual tests are required for classification and each time soil conditions change.

1. Plastically- soil is cohesive if following is true:	a. mold soil samples into a small ball b. roll ball into thread $\chi \cong$ diameter c. pick up 2" length of $\chi \cong$ thread by one end without breaking
2. Dry Soil Strength:	a. crumbles on its own or with moderate pressure = granular b. falls into clumps which break into smaller clumps that are only broken with difficulty = clay with gravel, sand, or silt. c. breaks into clumps which do not break into smaller clumps and can only be broken with difficulty with no visual indication of fissures = unfissured.
3. Thumb penetration test: (These tests are to be run on a large clump of material as soon as it is excavated.)	a. can be easily indented by the thumb but penetrated by thumb only with great effort Type A b. easily penetrated several inches by thumb and molded by light finger pressure = Type C
4. Unconfined Compressive Strength: (Saturated Soil Needed)	a. Pocket Penetrometer reading (take 10 readings and average) 0 - 0.5 = Type C, 0.5 - 1.5 = Type B, 1.5 - 2.0 = Type A b. Shear Vane reading X2: 0 - 0.5 = Type C, 0.5 - 1.5 = Type B, 1.5 - 2.0 = Type A
5. Drying Test: (A dry soil sample 1" thick X 6' diameter is needed)	a. develops cracks = fissured material b. dries without cracks and breaks by hand with considerable force significant cohesive content = unfissured cohesive material. c. sample breaks easily by hand = fissured cohesive or granular material d. easily pulverize dry clumps by hand or by stepping on them = granular e. don't pulverize easily = fissured cohesive.

SOIL CLASSIFICATION: Type A Type B Type C Stable Rock Other _____

COMPETENT PERSON: _____
Print Name

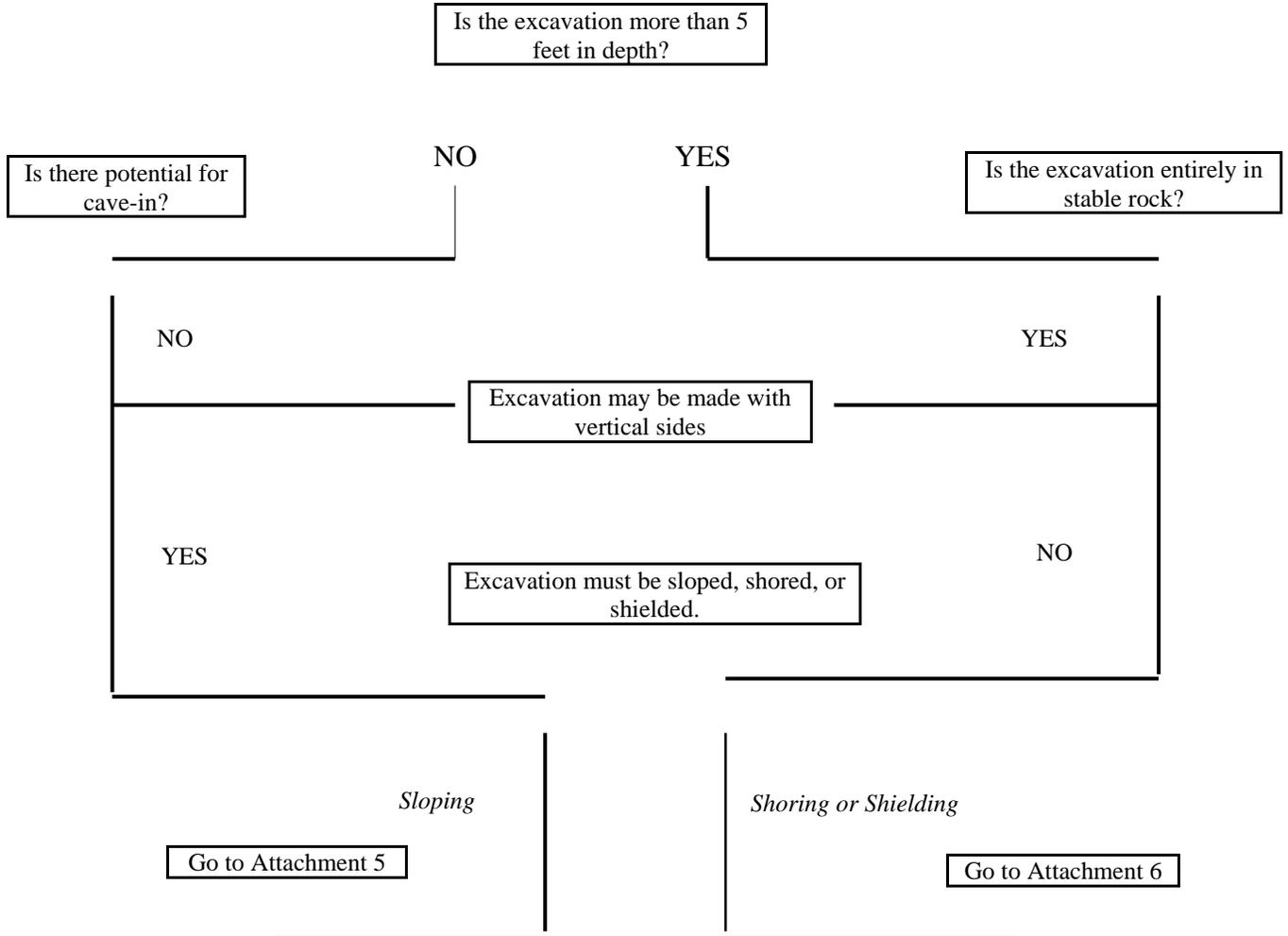
Signature

Date

ATTACHMENT 4



SELECTION OF PROTECTIVE SYSTEMS FOR EXCAVATIONS 20 FEET OR LESS IN DEPTH

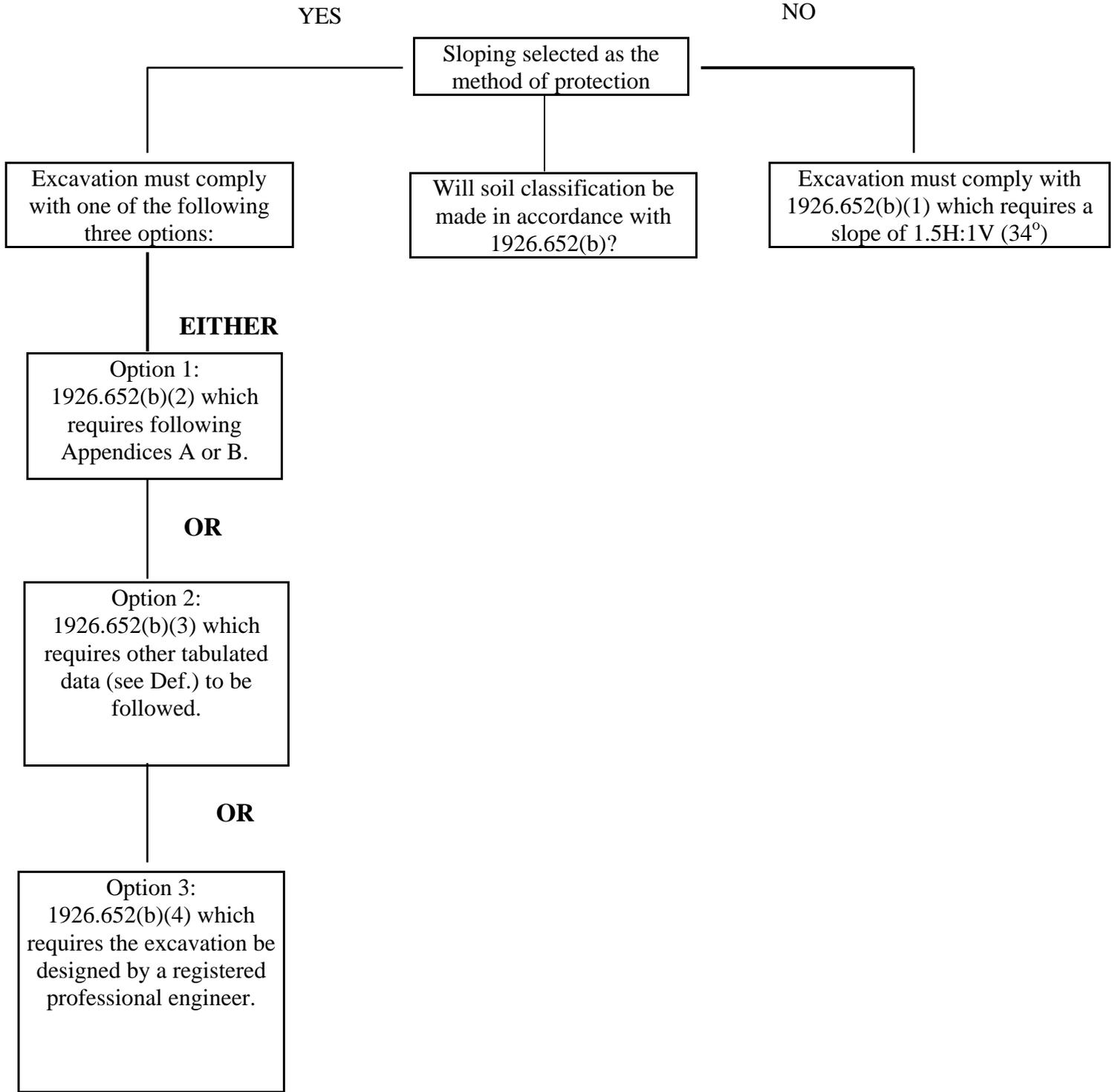


For excavations greater than 20 feet in depth, design by a registered professional engineer in compliance with 1926.652 (b) and (c) is required.



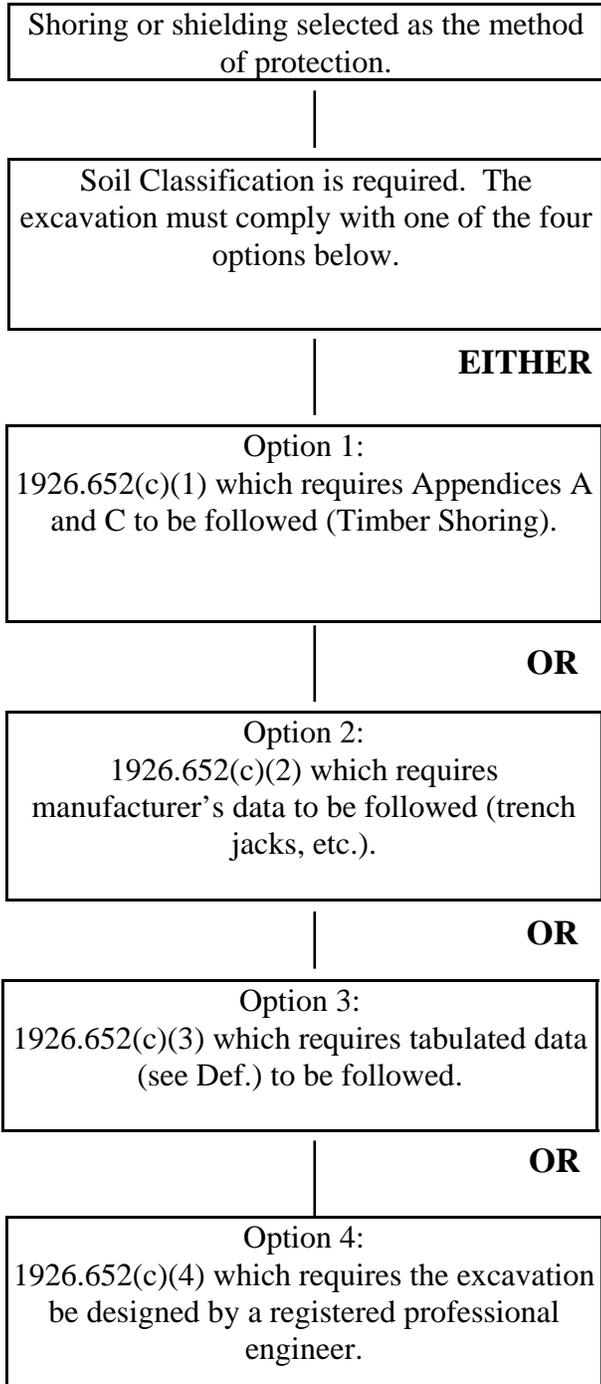
ATTACHMENT 5 OPTIONS

SLOPING





ATTACHMENT 6 SHORING OR SHIELDING OPTIONS





PROCEDURE

Subject: UNDERGROUND/OVERHEAD UTILITY CONTACT PREVENTION

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

This procedure prescribes the steps to be followed in order to prevent accidents involving the contact with or damage of underground/overhead utilities. The company provides the operational and training practices required to safely execute work where underground/overhead utility hazards may exist.

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
 - 3.1 Procedure Responsibility
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- 5.0 Text
 - 5.1 Preliminary Requirements
 - 5.2 Operating Requirements
 - 5.2.1 Underground Utilities Requirements
 - 5.2.2 Overhead Utilities Requirements
 - 5.2.3 Other Requirements
 - 5.3 Training Requirements
 - 5.4 Incident Reporting Requirements
 - 5.5 Local Jurisdiction Requirements
- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure. Also, see Attachment 1 for matrix of responsibilities.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.



4.0 DEFINITIONS

Company

All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Competent Person – Drilling Oversight (CPDO) Training

When drilling activity is to take place the Shaw's Field Team Leader (FTL) must have successfully completed Shaw's in-house training pertinent to competent person drilling oversight (CPDO Training). The FTL is required not only to have successfully completed CPDO training but to have an appropriate educational background, coupled with field experience and, the authority to make changes to correct deficiencies, or to stop the job if need be.

NOTE: The CPDO training requirement will become effective September 1st 2006. This means that every FTL will have successfully completed CPDO Training prior to August 31, 2006.

Competent Person - Excavation and Trenching

A person who is capable of identifying existing and predictable hazards in the excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. NOTE: Excavation/Trenching training is required when trenching/excavation hazards are present/anticipated (i.e. spoil piles, use of three foot (3') or larger diameter augers, or other circumstances) but only recommended when trenching/excavation hazards are not present/anticipated.

Excavation

Any manmade cut, cavity, trench or depression in an earth surface formed by earth removal.

Underground Utility

Any active or inactive subsurface or buried structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:

- Electric power lines
- Natural gas lines
- Telephone lines
- Telephone cables and fiber optic lines
- Water lines
- Steam and pneumatic lines
- Sewer lines
- Drain lines
- Underground storage tanks
- Septic tanks
- Process or product lines



Overhead Utility

Any active or inactive overhead structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:

- Overhead power lines
- Overhead telephone lines
- Overhead fiber optic lines
- Overhead cables
- Overhead supports
- Overhead piping
- Traffic lights
- Utility Bridges

One Call Center

Each state has a One Call, Dig Safe, Miss Dig, etc. dial-in number for requesting mark-out of buried public utilities, such as gas lines, electrical lines, telephone/cable lines, sewer lines, and water lines. This number is typically called a minimum of 72 hours prior to subsurface activities depending on the particular state the work will be conducted. The One Call Center will notify the local public utilities for a line location mark-out for the particular location. The individual public utilities must locate and mark-out the utilities upon request. In most cases, the markouts will not be performed on private property. A confirmation number is established and confirmation report generated and submitted to the requester.

As-Built Drawings

As-built drawings are blueprints that are usually obtained from the facility owner or client. They show original buried utilities and any modifications which have been made.

Private Utility Locating Service

A private utility locating service is a firm established to locate underground utilities using specialized locating equipment, such as ground penetrating radar location devices or radio transmitter type utility locating equipment.

Fiber Optic Service Lines

Fiber optic service lines are communication lines that are buried underground. When damaged, these lines are very expensive to replace. Fiber optic companies routinely provide on-site supervision, if requested. The company encourages this practice.

Field Team Leader (FTL)

The FTL is the person with whom the responsibility of the execution of the field work resides. This person may be the project manager, senior geologist, staff geologist, etc. This individual must have the sufficient experience, training and, field knowledge to ensure all site configuration information is collected and analyzed.



Site Survey

A site survey is an inspection of the work site to look for signs of other buried utilities that may not be indicated through as-built drawings or through utility locating services. The survey typically involves inspection of overhead electrical services, inspection of basements, utility rooms, garages, etc., for signs of old electrical conduits or fuel/water/septic lines. The FTL must contact the appropriate site representative to provide any additional information that may be marked on the as-builts.

5.0 TEXT

Underground/overhead utilities may be encountered at any job site. The guidelines established in this procedure were developed to help identify and mitigate the potential hazards associated with this type of work.

Any subsurface activity is subject to the underground utility locating regulations for the state where the work will be conducted. This procedure authorizes the use of state, local or other required practices, but requires that the practice which most limits the liability to Shaw for damaged utilities is utilized. No variance is required under these circumstances, but the project-specific Health and Safety Plan (HASP) or work plan shall fully document these more protective procedures.

5.1 Preliminary Requirements

The Project Manager or designee must visit the site to mark the boring/excavation locations so they can be clearly identified and then contact the One Call Center for the state in which the work is to be performed in to formally request a utility mark out at the particular work location(s).

Prior to assignment of work the Field Team Leader (FTL) will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings.

5.2 Operating Requirements

5.2.1 Underground Utilities Requirements

Prior to conducting any project site activities, the FTL must ensure that all existing underground/overhead utilities in the work area are located per the state or local mark-out protocols. Documentation of utility mark-out must be completed using the Utility Mark-out Documentation form (Attachment 3). No boring/excavation work is to be performed until all utility mark-outs are verified.



While on-site, the FTL must conduct a site survey to search for signs of other buried or overhead utilities. This will include areas such as garages, basements, etc. The results of such surveys must be documented on the Utility Markout Documentation form (Attachment 3). The property owner, client, or facility operator must be consulted on the issue of underground utilities. All knowledge of past and present utilities must be evaluated prior to conducting work..

After all mark outs have been completed, and the boring locations have been accepted by the FTL prior to drilling, each borehole location must be hand dug to a minimum of five feet bgs.

If the investigation requires boreholes in an area not covered by a municipal one call system (on private property), then the FTL must utilize appropriate geophysical techniques, hand held utility locating devices, a private utility locating firm, or other approved method to determine the locations of underground utilities. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. The geophysical methods can be very useful for locating buried utility lines in areas where hand digging is not possible or practical. However, it must be noted that these methods do have limitations that are a function of soil conditions, depth of investigation, imaging resolution, or other factors.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E & I Science and Technology Division, Geophysics & Mapping Group, and a variance request must be submitted and approved prior to the inception of intrusive field activity.

Should the local geology be prone to refusal or should there be any other reason the boring location cannot be cleared to a minimum of 5' bgs then the appropriate aforementioned alternative methods should be utilized to ensure the boring location is clear of utilities 5' bgs, and a variance request must be submitted for review.

5.2.2 Overhead Utilities Requirements

Overhead utility locations must be marked (warning tape, flags, etc.) where heavy equipment, or other equipment, has the potential for contacting overhead utilities. Conduct a site inspection on a daily basis to determine where activities will take place and the location of overhead utilities and overhead obstructions. Once they have been identified, place warning tape on poles and/or guy wires and attempt to plan the work so that no contact will be made with the overhead utilities or obstructions. Share the information with all site personnel during the tailgate safety meeting.



Maintain at least 10 feet from overhead power lines, up to 50 kV. For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines. If voltage is unknown, remain at least 20 feet from overhead power lines.

As a precaution, a spotter must be used at all times when it is possible to violate the minimum distance requirements for overhead utilities. If contact is deemed unavoidable, consult with the client and the respective health and safety representative to evaluate the area to determine if the particular overhead utility can be removed prior to engaging in the activity.

5.2.3 Other Requirements

Only hand digging is permitted within 3 feet of underground high voltage, product or gas lines. Once the line is exposed heavy equipment can be used but must remain at least 3 feet from the exposed line.

Only experienced, demonstrably proficient equipment operators will be used to operate such heavy equipment as drill rigs, backhoes, front-end loaders, cranes, etc.

Due the sensitivity and costs associated with damage to fiber optic cables the FTL must have documented verbal contact and an agreement with the fiber optic company for all work within 50' of the fiber optic cables. Subsurface investigations near fiber optic cables are more fully discussed in site specific HASP's. Contact your division Health and Safety Professional for specific information on this subject.

5.3 Training Requirements

Competent Person Drilling Oversight (CPDO) Training

The FTL (at least one onsite Shaw person will be performing the drilling oversight) will be required to have successfully completed the approved internal Competent Person Drilling Oversight (CPDO) training.

Prior to assignment of work the Field Team Leader (FTL) will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings.

Trenching/Excavation Training

The Field Team Leader or at least one onsite Shaw employee will be required to have successfully completed Trenching/Excavation training prior to the inception of site work activity when trenching excavation hazards (i.e. spoil piles, use of 3' diameter augers, or anytime similar hazards are present) are present/anticipated. NOTE: This training is now recommended rather than required when trenching/excavation hazards are NOT anticipated/required



5.4 Incident Reporting Requirements

Employees are required to immediately report to their direct supervisor any overhead or underground utility contact incident, or near miss incidents. Any supervisor (but preferably the supervisor directly responsible for the involved employees) with first-hand knowledge of an incident is required to investigate the incident. The Project Manager and respective Health and Safety Manager or Representative shall be informed of the incident immediately.

At a minimum, the incident investigation will require completion of the incident investigation report and General Liability Property Damage and Loss Report form found in H&S Procedure HS020.

In addition, Attachment 5 provides a “Tip Sheet” to help properly assess and investigate the incident causes and recommendations or requirements.

5.5 Local Jurisdiction Requirements

Where local jurisdictions or clients have established requirements different from those in this procedure, the practice which most limits the liability to Shaw for damaged utilities shall be utilized. No variance is required under these circumstances but the project-specific Health and Safety Plan or work plan shall fully document the alternate procedures.

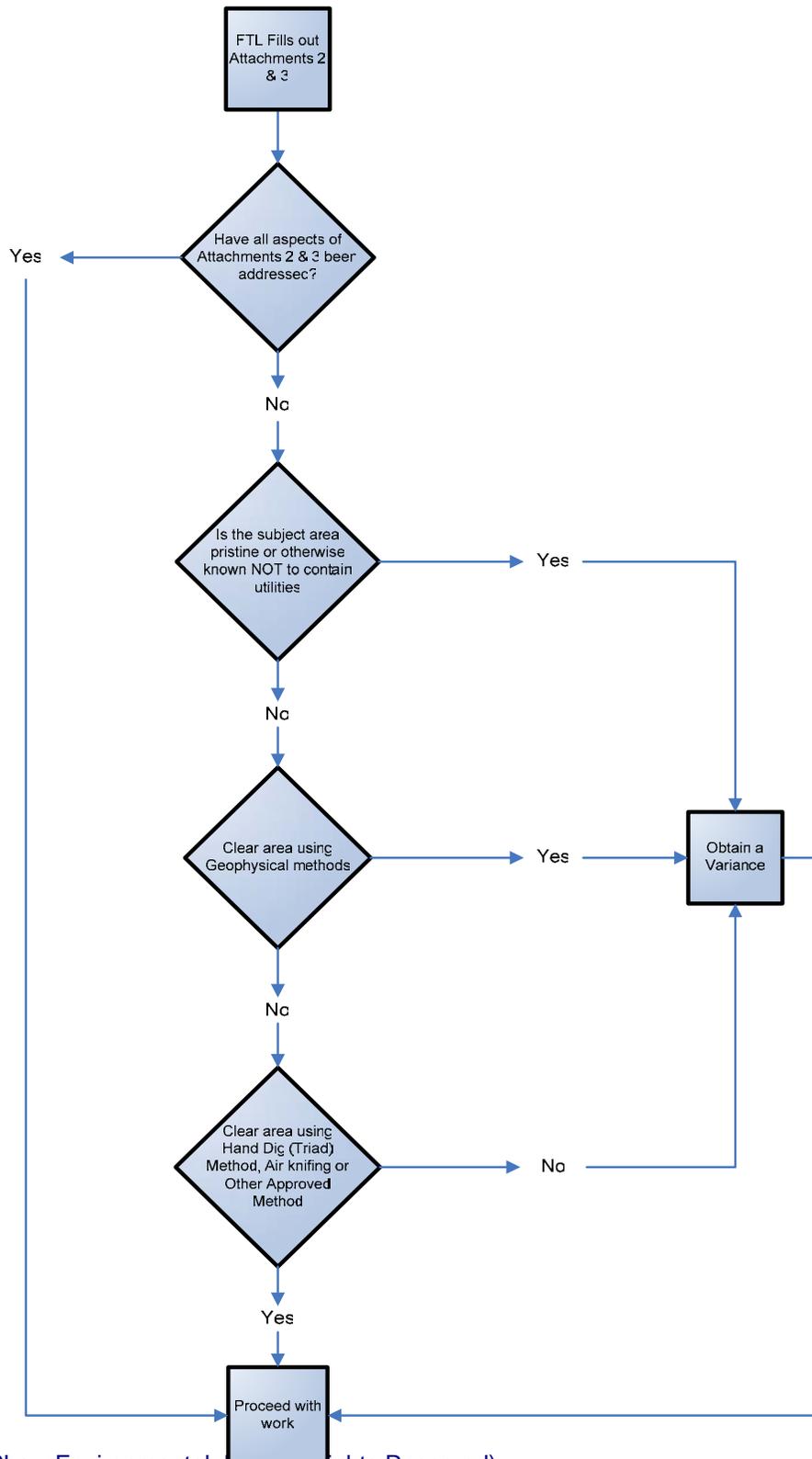
6.0 EXCEPTION PROVISIONS

Anytime a minimum of a 5’ clearance cannot be obtained by either hand digging or by using geophysical means, the FTL must obtain a variance from the Regional VP (or equivalent level such as Operations Director for Federal Business Line) or designee to proceed with drilling operations in that area. This would include an initial verbal variance documented in the field log followed up by a written (email) approval from either the Regional VP (or equivalent level or title) or designee. The record of communication will be noted in the field log for the project and, a record of the approval or denial will be placed in the project file.

A variance form can be obtained in HS 013. A flowchart to assist one in determining how and when a variance should be obtained can be found immediately following this section.



HS 308 Flow Chart





Procedure No.	HS308
Revision No.	1
Date of Last Revision	2/20/06
Last Review Date	5/5/05
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7.0 CROSS REFERENCES

HS013	Health and Safety Procedure Variances
HS020	Accident Prevention Program: Reporting, Investigation, and Review
HS050	Training Requirements
HS307	Excavation and Trenching

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Pre Drilling Checklist
3. Utility Markout Documentation
4. Underground Utility Hits – Tip Sheet for Incident Investigations
5. Frequently Asked Questions



**ATTACHMENT 1 - UNDERGROUND/OVERHEAD UTILITY CONTACT PREVENTION
 Responsibility Matrix**

Action	Procedure Section	Vice President	Project Manager	Field Team Leader	HS Representative
Project-specific HASP or Work Plan shall document the practices to be used at a particular site.	1.0		X	X	X
Contact the One Call Center for mark out of utilities at the site	5.1		X		
Complete Utility Markout Documentation Form	5.2		X	X	
As-built drawings shall be reviewed	5.2			X	
Only experienced demonstrably proficient equipment operators will be used to operate such heavy equipment as backhoes, front-end loaders, cranes, etc.	5.3			X	
Provide training*	5.3				
Incident Investigation and Reporting	5.4		X	X	X
Exceptions to Procedure	6.0	X	X	X	X

*Provided by Shaw's Training Department



ATTACHMENT 2 - PRE - DRILLING/BORING/GEOPROBE Checklist

Purpose: This form is designed to help the FTL make decisions drilling/boreholing/geoprobng around underground/overhead utilities.

DATE _____ PROJECT NAME/NUMBER _____

Field Team Leader Name: _____

DURATION/SUMMARY OF WORK TO BE PERFORMED: _____

Consideration	Check	Check	Explanation	Initial
Has the state one-call been contacted?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Are any as-built drawings available? If so, do they show any utilities?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Has a visual inspection of the work area(s) been completed?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
If one-call not available has a private locating service or Shaw S&T group been contacted?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Were any utilities identified through private locating service? If so, indicate on site drawings.	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Are there any fiber optic cables within 50 feet of hole locations?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
If fiber optic cables are within 50 feet has an agreement with the fiber optic company been established?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Can a test borehole be advanced by hand digging, probing, post hole digging, and/or air knifed to 5 feet bgs?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
If hand digging, probing, post hole digging, and or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Are you comfortable with approving this authorization?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Other considerations:				



ATTACHMENT 3 - UTILITY MARK-OUT DOCUMENTATION

Project Name: _____
 FTL Name: _____
 Utility Called: _____
 Subcontractor: _____
 County of work: _____

Location: _____
 Date: _____
 Confirmation #: _____
 Task/Activity: _____
 Municipality of work: _____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____ Confirmation No: _____

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers			
Major Utilities Marked by Color Code			
Name of Utility Company	Utility	Color Code	Emergency Telephone Number
	Water	Blue	
	Gas	Yellow	
	Electric	Red	
	Telephone/ Cable/ Communication	Orange	
	Sewer	Green	
<p>“ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE”. Accordingly, you must list other known utilities in the area that the “One Call” service will not contact:</p>			

Attach photos of the area prior to placing boreholes.
 Take photos of the area indicating minimum 5’ hand dig, post hole dig, probe, GPR or other:
 NOTE: For any borehole, should 5’ minimum clearance not be obtained, you must contact Business Line VP or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.



ATTACHMENT 5 – Frequently Asked Questions (FAQs)

During the roll-out of this revision of HS 308 a variety of questions/comments/concerns arose. These concerns have been put in the form of most frequently asked questions (FAQs) and their respective responses. These FAQs will clear up misunderstanding pertaining to this procedure, and provide valuable information that will help our workforce have a better understanding of how this procedure should be implemented. Please review the FAQs below:

- 1. No other competitor of Shaw has felt the need to do anything as extreme as this procedure to ensure minimization of utility hits. Instituting this procedure will put us out of business.*

Response: After thorough review of claims and incidents involving drilling activities and underground utilities, the committee believes that our business/client needs are best served by adopting this policy. And that the likelihood of being put out of business is much greater from continuing to do business the way we currently do it than by adopting this improved policy. The committee realized that 100% adherence to this procedure at all work sites is likely not possible. For those cases where legitimate reasons exist for non-compliance, the committee realized that an effective responsive (variance) system must be in place. The committee believes that the variance procedure, as stated in the policy, should address the exceptions as they occur.

The Committee is not aware of any specific ASTM or true “industry standard”. However, the committee is aware that best practices can vary tremendously and many times are client dependent. For example one extremely large Shaw client requires that we continuously probe. On the other end of the spectrum some clients look completely to Shaw for guidance in these matters.

- 2. Our clients want us to do the work but do not wish to pay the additional fees involved with this new procedure. Could we offer them a two tiered pricing, one to do it the old way, and one to do it the new way?*

Response: The committee believes that contacting an underground utility of any type, no matter who is at fault or who ultimately pays for fixing, the outcome is a “black eye” for all involved. When these events occur, even if Shaw is not at fault, the committee believes that continued good client relations, and the potential for obtaining future business lessens as utility hits/incidents occur. This procedure is designed to minimize health and safety risks to our workers AND to mitigate liability to Shaw. Receiving the necessary compensation for the precautionary measures outlined in the procedure would be expected, and should be itemized in the initial proposal including a statement as to what will specifically be done in the field to mitigate risks relative to underground utilities and WHY Shaw believes these steps are necessary. However, if the client is willing to assume the entire liability resulting from “hitting” an underground utility, the contract should be written to reflect this

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and a variance would be in order. Keep in mind that Shaw cannot allow a client's desires to take on liability to affect the health and safety of workers. No matter what the client desires might be, Shaw would still expect the basic procedures to be followed for health and safety purposes. The training though yet to be finalized will provide project manager's examples of wording to be used in proposals and contracts.

3. *Hand digging to 5' is impossible during frost conditions in Minnesota, Wisconsin and many northern areas. How should this be addressed?*

Response: When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and a variance must be obtained. The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. These non-invasive geophysical methods are suggested and mentioned in the procedure.

4. *What if the field crew runs into refusal during hand dig clearance?*

Response: If refusal occurs and moving to an alternate spot presents the same problem, hand digging may not be possible as mentioned in #2 above. When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and/or a variance must be obtained. Of course, we expect that the dig safe folks to be contacted, and that a private locating service be utilized if available. Should a private locating service not be available, we can use trained internal sources.

The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. These non-invasive geophysical methods are suggested and discussed in the procedures. The geophysical methods can be very useful for locating buried utility lines in areas where drilling and digging are not possible or practical, but these methods do have some limitations that are a function of soil conditions, depth of investigation, and imaging resolution.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E & I Science and Technology Division, Geophysics & Mapping Group. Of course, it is expected that the "dig safe" folks will be contacted, and that a private utility locating service be utilized when appropriate (utility location method is known to be feasible), and if available. Should a private locating service not be available, we can use trained internal Shaw E & I personnel resources to perform utility line location work. Finally, if the Project Manager has determined that a variance to the procedure is justified, a variance request should be submitted for review.



5. *Why is trenching/excavation training required for putting in Geoprobe® boreholes? This seems like tremendous overkill.*

Response: The committee believes that, in general, trenching/excavation training is a good educational tool that promotes overall health and safety awareness and provides important information/techniques for our field staff. Trenching/excavation training provides insights into fall hazards, spoil pile placement, and many other related safety issues. Many of our drilling jobs have involved oversized auger bits (3' in diameter) where a large deep borehole is created. The committee agrees that when the diameter of the borehole lessens (i.e. use of a Geoprobe®), the impact of trenching/excavation training decreases. Trenching excavation training is now a requirement only when large boreholes are created or other hazards as mentioned above are present, but only recommended training when Geoprobe® or similar equipment is being used and the result is trenching excavation type hazards do NOT exist. NOTE: Specific training pertinent to drilling/Geoprobe®/boring (CPDO training) will be provided and will be mandatory. Additionally, CPDO and trenching / excavation training are both required on projects where 3' or larger diameter boreholes are to be drilled.

6. *Are there any training requirements besides trenching/excavation training?*

Response: The committee evaluated a need for training specific to the HS 308 policy (drilling) and solicited the assistance of the training department and certain operations employees to develop CPDO training. This CPDO training includes basic steps needed to be taken from call the dig-safe number, private utility searches, geo-physical capabilities, probing, hand augering, air knifing, water pumping/knifing, hand digging and others.

7. *Hand diggings creates heat stress, tripping hazards, back injuries, and other hazards and is unnecessary.*

Response: The committee did not envision using a spade and a strong back to dig various 5' holes at the field site. The committee does envision using an air knife, water knife, probe, or other method rather than a hand shovel. The committee understands that not all methods may be acceptable in all states, municipalities or to all clients. The committee was also aware that when all else fails one could consider using a 1" diameter stainless steel auger placing 5' bgs hand borings in a triangular pattern where the auger bit could be placed in between these small hand borings. The committee envisions this theme and methodology to be expanded within the upcoming training. Additional information on augering techniques will be provided in the specific training (CPDO) mentioned above.

8. *I need to put borings in pristine farmland next door to a contamination zone. There are no and have never been any utilities in this area. What should I do?*

Response: Once you go through the proper utility locate procedure and are confident that no utilities



exist in the subject area, you need to obtain a variance. This would also hold true for pristine forest preserves, wildlife refuges, or other areas not affected by utilities.

9. *Who needs to sign off on a variance?*

Response: Variances are signed by the Area Vice President (or designee, which may be delegated to the BLM for each office) along with the Project/Program Manager/Director. When we know in advance that HS308 cannot be adhered to, one should make plans to get a formal variance approval and appropriate paperwork developed two weeks prior to field activity. Variances can also be obtained when field conditions arise that make adherence to HS308 impossible. The variance can be obtained via cell phone in the field with the PM and appropriate management with the outcome noted in the field logbook followed up by an appropriate e-mail. This e-mail should be kept in the project file as proof of variance approval. It is recommended that variances be obtained as soon as it is known that they will be required.

10. *What constitutes a “probe”? I assume a Geoprobe® is not valid?*

Response: A Geoprobe® is NOT a valid probe in that Geoprobess® have caused damage to sewer lines and other utilities. Probes are typically made of a fiberglass-like material that have a pointed end but will not damage subsurface utilities and allows for the field staff to sense if underground items are encountered.

11. *Under 5.1, is a subcontractor a designee?*

Response: Although a subcontractor can make arrangements to contact dig safe and more, Shaw must ensure that the sub has, in fact, done what they had agreed to do. It should be remembered that typically on drilling projects, from many of our customer’s perspective, the liability remains with Shaw, and they will look to Shaw, not our subs, for resolution of any events that occur. Hence, it is incumbent on Shaw to insure that our procedures are followed by Shaw and Shaw subs.

12. *Does ground surface include concrete, asphalt or other man-made coverings?*

Response: A simple NO. Some of our projects include drilling through airport runways or tarmacs which can be up to 15” in depth. Manmade surfaces do NOT count in the 5’ hand dig clearance specification. If we are attempting to advance boreholes below existing concrete surfaces, the geology below the concrete will be exposed by cutting the concrete and removal of the concrete. After the concrete is removed and the geology is exposed, a hand auger can then be used. Hopefully, the twelve concerns above and the responses to these comments will have helped users understand the implementation of this HS 308 policy. More importantly the committee realizes that information on this subject will be provided during the training mentioned above. It is the committee’s belief that once this program has been completely rolled out the need for variances will be minimal and the interactions of the safety department with operations management with this entire process will make ensure success.

PROCEDURE

Subject: HEAT STRESS

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

This procedure establishes the guidelines to protect employees from the effects of heat related illness. It describes the four major types of heat-induced illnesses, methods of prevention, types of treatment, and includes discussions on the monitoring of heat stress situations.

Some clients may have monitoring requirements that differ from those contained in this procedure. In such circumstances, the more protective monitoring requirements will be followed.

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2.0	Table of Contents
3.0	Responsibility Matrix
3.1	Procedure Responsibility
3.2	Action/Approval Responsibilities
4.0	Definitions
5.0	Text
5.1	Signs, Symptoms, and Treatment
5.1.1	Heat Rash
5.1.2	Heat Cramps
5.1.3	Heat Exhaustion
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5.2	Prevention
5.3	Monitoring
5.3.1	Wet Bulb Globe Temperature
5.3.2	Physiological
5.4	Training
6.0	Exception Provisions
7.0	Cross References
8.0	Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS



Acclimatization - Series of physiological and psychological adjustments that occur in an employee during initial exposures to hot environmental conditions that increase the employee's tolerance to elevated work environment temperature.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Maximum Heart Rate - Amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Maximum heart rate (MHR) is calculated by subtracting an employee's age from 200.

5.0 TEXT

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in deleterious health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, increased accident probability, etc., to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling. Wearing personal protective equipment places employees at considerably higher risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

5.1 Signs, Symptoms, and Treatment

5.1.1 Heat Rash

Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat soaked clothing.

Signs and Symptoms: The condition is characterized by a localized red skin rash and reduced sweating. Aside from being a nuisance, the ability to tolerate heat is reduced.

Treatment: Keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing.



5.1.2 Heat Cramps

Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood which can cause painful muscle spasms and pain.

Signs and Symptoms: Muscle spasms and pain in the extremities and abdomen.

Treatment: Remove employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or stroke.

5.1.3 Heat Exhaustion

Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within one hour.

Signs and Symptoms: Weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; fatigue.

Treatment: Remove employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continually to remove heat by convection. **CAUTION:** Do not allow the affected person to become chilled; treat for shock if necessary.

5.1.4 Heat Stroke

Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. **THIS IS A MEDICAL EMERGENCY!**

Signs and Symptoms: Red, hot, dry skin (skin may be wet from previous perspiration particularly when evaporation-preventing clothing is worn); body temperature of 105° degrees Fahrenheit (F) or higher; no perspiration; nausea; dizziness and confusion; strong, rapid pulse.

Treatment: Heat stroke is a true medical emergency. Transportation of the victim to a medical facility must not be delayed. Prior to transport, remove as much clothing as possible and wrap the victim in a sheet soaked with water. Fan vigorously while transporting to help reduce body temperature. Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102° F). If this is not possible, keep victim wrapped in a sheet and continuously douse with water and fan.



5.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a 0.1% (percent) salt water solution, a commercial mix such as Gatorade, or a combination of these with fresh water. The replacement fluid temperature should be kept cool, 50°F to 60°F, and should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All workers are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet in the prevention of heat stress and the harmful effects of excessive alcohol and caffeine consumption.

5.3 Monitoring

The initiation of heat stress monitoring will be required when employees are working in environments exceeding 90°F ambient air temperature. If employees are wearing impermeable clothing, this monitoring will begin at 78°F. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT) and physiological. Attachment 2 will be used to record the results of heat stress monitoring.

5.3.1 Wet Bulb Globe Temperature

The WBGT index is the simplest and most suitable technique to measure the environmental factors which most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25.9°C (78°F), the work regimen in Table 2 of the section, Heat Stress, in the latest edition of the American Conference of Governmental Industrial Hygiene (ACGIH) Threshold Limit Value (TLV) Booklet should be followed.

5.3.2 Physiological

Physiological monitoring can be used in lieu of or in addition to WBGT. It is anticipated that this monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Since individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The two parameters that are to be monitored at the beginning of each rest period are:

- Heart Rate - Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds



75% (percent) of their calculated maximum heart rate (MHR = 200 - age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75% (percent) of their calculated maximum heart rate.

- Temperature - Each individual will measure his/her oral temperature with a disposable thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.
- An individual is not permitted to return to work if his/her temperature exceeds 100.4°F

5.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS051 Tailgate Safety Meetings

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Heat Stress Monitoring Record



**ATTACHMENT 1
HEAT STRESS**

Responsibility Matrix

Action	Procedure Section	Responsible Party		
		Director of Health and Safety	Project Supervisor	Health and Safety Representative
Issuance, Revision, and Maintenance of Procedure	3.1	X		
Conduct Monitoring	5.3			X
Inform Employees About Procedure	5.4		X	X



PROCEDURE

Subject: COLD STRESS

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the guidelines necessary to protect employees from the adverse health effects caused by exposure to low temperature environments.

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 - 4.1.1 Frostbite
 - 4.1.2 Hypothermia
 - 4.2 Precautionary Measures
 - 4.3 Training
- 5.0 Exception Provisions
- 6.0 Cross References
- 7.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The responsibility matrix is Attachment 1.

4.0 TEXT

Most cold related worker fatalities have resulted from failure to escape low air temperatures, or from immersion in low temperature water. Employees should be protected from exposure to cold so that their deep core temperature does not fall below 96.8° degrees Fahrenheit. Core body temperatures below this level will likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.



4.1 Signs and Symptoms of Cold Stress

Several factors increase the harmful effects of cold including, being very young or old, wet clothing, having wounds or fractures, smoking, drinking alcoholic beverages, fatigue, emotional stress and certain diseases and medications. The two most prominent adverse effects from exposure to cold temperatures are frostbite and hypothermia. Treatment for cold related injuries should be administered by a person qualified in first aid or a professional medical provider.

4.1.1 Frostbite. Frostbite is the most common injury caused by exposure to cold temperatures. It occurs when cells of the body freeze restricting blood flow and causing tissue damage. The first sign of frostbite is slightly flushed skin which then changes to white or grayish yellow and finally grayish blue. Pain is sometimes initially felt but is often followed by a cold numb feeling.

4.1.2 Hypothermia. Hypothermia is the most severe form of cold stress and results from a drop in the body's core temperature. The initial signs include; shivering, numbness, confusion, weakness, impaired judgement, impaired vision, and drowsiness. Hypothermia victims typically progress through five stages of the condition including; (1) shivering, (2) apathy, (3) loss of consciousness, (4) decreasing pulse and breathing rate, and (5) death.

4.2 Precautionary Measures

It is recommended that employees wear insulated clothing to maintain core temperatures above 96.8°F when working in air temperatures below 40°F. This protective clothing may include but is not limited to:

- Insulated suits, such as whole-body thermal underwear
- Wool or polypropylene socks
- Insulated gloves and boots
- Insulated head cover, such as knit caps, hard hat liners, etc.

When conducting work in air temperatures below 35°F, the following practices shall be followed:

- If the clothing of an employee is expected to become wet, the outer layers of clothing must be impermeable to water.
- If an employees underclothing becomes wet it must be changed immediately. If the clothing becomes wet from sweating, the employee may finish the task which caused the sweating before changing into dry clothing.
- Employees will be provided a warm area (65°F or above) to change from work clothing into street clothing and for breaks.



- Hot liquids, such as soups, warm drinks, etc. shall be provided in the break area. The intake of caffeine containing products shall be discouraged due to their diuretic and circulatory effects.
- If appropriate, approved space heaters may be provided in the work area to warm the hands, feet, etc.
- The buddy system shall be practiced. Any employee observed with signs of cold stress shall immediately proceed to the break area.
- Employees will be reminded to layer their clothing, i.e., wear thinner, lighter clothing next to the body with heavier clothing layered outside the inner clothing.
- Avoid overdressing when going into warm areas or when performing activities which are strenuous. This could potentially lead to heat stress situations.
- Auxiliary heated versions of handwear, footwear, etc., can be used in lieu of mittens, insulated socks, etc. if extremely cold conditions exist.
- Employees handling liquids with high evaporation rates (gasoline, hexane, alcohol, etc.) shall take special precautions to avoid soaking of clothing with the liquids because of the added danger of cold injury caused by evaporative cooling.
- Work shall be arranged in such a way that sitting still or standing for long periods is minimized.
- If the air temperature is 20°F or below the hands shall be protected by mittens or gloves prior to contact with cold surfaces such as metal, etc.

Air temperature is not the only factor to be considered while evaluating cold stress situations. Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed the greater the risk of experiencing cold related injuries. For exposed skin, continuous exposure should not be permitted when the air speed and temperature result in an equivalent chill temperature of -25°F or less. The wind chill table provided in attachment two can be used to help assess hazardous conditions attributable to wind chill effects.

4.3 Training

Training on the contents of this procedure will be conducted during tailgate safety meetings held at project or office locations where employees are exposed to cold temperatures. Topics to be discussed during this training will include:

- Proper rewarming procedures and first aid treatment of cold related cases
- Proper clothing practices



- Eating and drinking habits
- Recognition of signs and symptoms of cold stress
- Safe cold weather work practices.

5.0 EXCEPTION PROVISIONS

Variances may be requested as described in procedure HS013; Health and Safety Procedure Variances.

6.0 CROSS REFERENCES

Shaw Environmental & Infrastructure, Inc. (Shaw E & I) Procedure HS051-Tailgate Safety Meetings

Shaw E & I Procedure HS600-Personal Protective Equipment

Threshold Limit Values and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists.

Standard First Aid Workbook, American Red Cross

7.0 ATTACHMENTS

1. Responsibility Matrix
2. Windchill Table



**ATTACHMENT 1
COLD STRESS**

Responsibility Matrix

Action	<i>Responsible Party</i>			
	Procedure Section	Employee	Local HS Representative	Director of Health and Safety
Issuance, revision and maintenance of this procedure	3.1			X
Provide training	4.2		X	
Receive training	4.2	X		



ATTACHMENT 2

Windchill Table

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In under an hour with dry skin. Maximum danger is false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											



PROCEDURE

Subject: HEARING CONSERVATION PROGRAM

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish guidelines for the company hearing conservation program. Regulatory requirements mandate that the company administer a hearing conservation program whenever employee sound exposures equal or exceed an 8-hour time-weighted average (TWA) sound level of 85 decibels (dB).

Evidence is well established that worker exposure to sound of sufficient intensity and duration can result in hearing damage. This procedure prescribes the control measures required to prevent employee exposure to excessive sound levels and includes provisions for:

- Monitoring of the workplace to determine employee exposures.
- An audiometric testing program which includes baseline and annual audiograms.
- An employee training and information program.
- Description of various control measures that can be used to decrease exposures.
- Providing hearing protection to all affected employees when administrative or engineering controls fail to reduce sound levels to below the action level.
- Recordkeeping requirements.

2.0 TABLE OF CONTENTS

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2.0	Table of Contents
3.0	Responsibility Matrix
3.1	Procedure Responsibility
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5.3	Audiometric Testing
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5.3.2	Annual Audiograms
5.4	Employee Training and Information
5.5	Control Measures



- 5.5.1 Sound Control at the Source
- 5.5.2 Sound Control in the Transmission Path
- 5.5.3 Protection for the Receiver
- 5.6 Recordkeeping
- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Action Level - An 8-hour TWA of 85 dB or a dose of 50 percent.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Standard Threshold Shift (STS) - Change in hearing threshold relative to the baseline audiogram of 10 dB or more at 2,000, 3,000, and 4,000 hertz (Hz) in either ear.

5.0 TEXT

5.1 General

The company hearing conservation program will be implemented and protection against the effects of sound exposure will be provided whenever sound levels exceed the action level.

5.2 Monitoring

Monitoring of employee exposures to sound will be conducted whenever it is anticipated that exposure may exceed the action level. This monitoring will be conducted by a qualified individual who, through professional credentials, training, or experience, has the necessary qualifications to specify and use the type of monitoring equipment (area or personal) that will best represent employee exposures. This monitoring will be repeated whenever changes in the work environment lead to the possibility of additional exposures or inadequacy of selected hearing protection. Employees will be provided the opportunity to observe monitoring and will be notified when the results exceed the action level.



Sound level monitoring instrumentation will be operated on the A-weighted scale in slow response mode. Employee sound exposures will be computed in accordance with Attachment 2 and without regard to any attenuation provided by the use of hearing protection.

5.3 Audiometric Testing

Audiometric testing will be provided to all employees exposed at or above the action level. Testing will be in accordance with Procedure HS100, Medical Policies and Procedures.

5.3.1 Baseline Audiogram. Audiometric test results obtained from the pre-hire medical examination will be used as the baseline audiogram. Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace sound. Employees will also be notified of the need to avoid high levels of non-occupational sound exposure during this 14-hour period.

5.3.2 Annual Audiograms. Annual audiograms will be conducted for all employees exposed at or above the action level during the preceding year. Each annual audiogram will be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a STS has occurred.

5.4 Employee Training and Information

All employees who are exposed to sound levels above the action level are required to participate in a formal training program. This program will be presented by a health and safety representative and include, as a minimum, the following information:

- The effects of sound on hearing.
- The purpose of hearing protection; the advantages, disadvantages, and attenuation of various types; and instructions on selection, fitting, use, and care.
- The specific nature of operations which could result in exposure to excessive sound levels.
- The purpose of audiometric testing and an explanation of the test procedures.
- The engineering controls and administrative practices associated with the employee's job assignment.

This training program will be repeated annually. Participating employees are required to complete the Hearing Protection Training Completion Record (Attachment 3). This record will be maintained by the company Training Department in Knoxville. In addition, tailgate safety meetings will be periodically used to instruct employees on the need for hearing protection in designated areas.



The project/location manager will make available to affected employees or their authorized representatives a copy of 29 Code of Federal Regulations (CFR) 1910.95 and will also post a copy in the workplace.

5.5 Control Measures

A straightforward method of controlling sound exposure is to examine the problem in terms of its three basic elements including:

- Sound arises from a source;
- Travels over a path; and
- Affects a receiver or listener.

The solution to a given sound problem might require alteration or modification of any or all of these three basic elements including:

- Modifying the source to reduce its sound output;
- Altering or controlling the transmission path to reduce the sound level reaching the listener; or
- Providing the receiver with hearing protection (but only if the sound source or path cannot be controlled).

5.5.1 Sound Control at the Source. Perhaps the best method for controlling sound at its source is the initial equipment selection process. The following summarizes those features that the buyer should look for and steps to be taken in selecting equipment:

- Low-sound certification.
- Advertisement of “quiet” operation, evidence of sound control design.
- Evidence of “lower” and “slower” operating characteristics.
- Conductance of side-by-side sound tests of equipment.
- Request an “on-site” or “in operation” inspection of mechanical equipment before purchase.

Most mechanical devices are complex sound generators. Though it is impractical to discuss all possible solutions to all sound problems, some general control measures and methods have been provided below:



- Reduce impact or impulse sound by reducing the weight, size, or height of fall of impacting mass.
- Reduce speed in machines and flow velocities and pressure in fluid conveyance systems.
- Balance rotating parts to control machinery sound and vibration of fans, fly wheels, pulleys, cams, shafts, etc.
- Reduce frictional resistance between rotating, sliding, or moving parts by frequent lubrication and proper alignment; static and dynamic balancing of rotating parts; and/or correction of eccentricity or “out-of-roundness” of wheels, gears, rollers, pulleys, etc.
- Reduce resistance in air or fluid systems by use of low flow velocities, smooth surfaces of duct or pipe systems, and long-radius turns and flared sections in pipes, etc., to reduce turbulence.
- Isolate vibration elements in machinery; install motors, pumps, etc., on most massive part of machine; use belt or roller drives in place of gear trains; use flexible hoses and wiring instead of rigid piping and stiff wiring; etc.
- Apply vibration damping materials such as liquid mastics; pads of rubber, felt, foam, or fibrous blankets; or sheet metal viscoelastic laminates or composites to vibrating machine surface.
- Reduce sound leakage from the interior of machines such as compressors by sealing or covering all openings or applying acoustical materials to machine interiors.

5.5.2 Sound Control in the Transmission Path. Another effective way to limit employee exposure to sound is through the use of transmission path controls. These controls may include, but are not necessarily limited to:

- Separation of the sound source and receiver.
- Use of sound absorbing materials on ceiling, floor, or wall surfaces.
- Use of sound barriers and deflectors in the sound path.
- Use of acoustical lining on inside surfaces of passageways, ducts, pipe chases, or electrical channels.



- Use of mufflers or silencers on all gasoline or diesel engines, regardless of size, and particularly on equipment when large quantities of high-pressure, high-velocity gases, liquids, steam, or air are discharged.
- Use vibration isolators and flexible couplers where the sound transmission path is structural in character.

5.5.3 Protection for the Receiver. When engineering controls fail to reduce sound levels to below the action level, hearing protection will be provided. Hearing protection will be provided at no cost to employees and will be replaced as necessary.

Supervisors will ensure that hearing protection is worn by all employees who are exposed at or above the action level. Employees will be given the opportunity to select their hearing protection from a variety of suitable protection devices that attenuate their exposure to the action level or below. Attenuations are determined by subtracting 7 dB from the noise reduction rating (NRR) of the protector and subtracting the remainder from the TWA sound level.

5.6 Recordkeeping

The company will maintain records of all audiometric test records required by this procedure and retain them for at least the following periods:

- Sound exposure measurement records will be retained for two (2) years.
- Audiometric test records will be retained for the duration of the affected employee's employment.

All records required by this procedure will be provided upon request to employees, former employees, representatives designated by the individual employee, and any authorized government representative.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS100 Medical Policies and Procedures

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Sound Exposure Computation
3. Hearing Protection Training Completion Record



ATTACHMENT 1
HEARING CONSERVATION PROGRAM

Responsibility Matrix

Action	Procedure Section	Responsible Party		
		Health and Safety Representative	Project/Location Manager	Vice President, Health and Safety
Issue, Revise, and Maintain Procedure	3.1			X
Monitor Employee Exposures	5.2	X		
Provide Training	5.4	X		
Make Available/Post 29 CFR 1910.95	5.4		X	



ATTACHMENT 2

SOUND EXPOSURE COMPUTATION

Computation of Employee Sound Exposure

- A. Sound dose is computed using Table 1 as follows:

When the sound level is constant over the entire work shift, the sound dose (D), in percent, is given by:

$$D = 100 C/T$$

Where C is the total length of the work day, in hours, and T is given in Table 1.

- B. When the work shift sound exposure is composed of two or more periods of sound at different levels, the total sound dose over the work day is given by:

$$D = 100 (C_1/T_1 + C_2/T_2 \dots + C_n/T_n)$$

Where C_n indicates the total time of exposure at a specific sound level and T_n indicates the reference duration for that level as given by Table 1.

- C. The eight-hour TWA sound level, in decibels, may be computed from the dose, in percent, by means of the formula:

$$TWA = 16.61 \log_{10} (D/100) + 90$$

For an eight-hour work shift with the sound level constant over the entire shift, the TWA is equal to the measured sound level.

Conversion Between ◀Dose▶ and ◀8-Hour TWA▶ Sound Level

Sound exposure is usually measured with an audio dosimeter which gives a readout in terms of “dose.” Dosimeter readings can be converted to an 8-hour TWA sound level.

In order to convert the reading of a dosimeter into TWA, use Table 2. This table applies to dosimeters that are set to calculate dose or percent exposure according to the relationships in Table 1. So, for example, a dose of 91 percent over an 8-hour day results in a TWA of 89.3 decibels and a dose of 50 percent corresponds to a TWA of 85 decibels.

If the dose as read on the dosimeter is less than or greater than the values found in Table 2, the TWA may be calculated by using the formula:

$$TWA = 16.61 \log_{10} (D/100) + 90$$

Where TWA equals 8-hour TWA sound level and D equals accumulated dose in percent exposure.



Table 1
Permissible Sound Exposure

A-Weighted Sound Level (decibels)	Permitted Duration Per Workday (T) (hours)	A-Weighted Sound Level (decibels)	Permitted Duration Per Workday (T) (hours)
80	32.0	106	0.87
81	27.9	107	0.76
82	24.3	108	0.66
83	21.1	109	0.57
84	18.4	110	0.50
85	16.0	111	0.44
86	13.9	112	0.38
87	12.1	113	0.33
88	10.6	114	0.29
89	9.2	115	0.25
90	8.0	116	0.22
91	7.0	117	0.19
92	6.1	118	0.16
93	5.3	119	0.14
94	4.6	120	0.125
95	4.0	121	0.11
96	3.5	122	0.095
97	3.0	123	0.082
98	2.6	124	0.072
99	2.3	125	0.063
100	2.0	126	0.054
101	1.7	127	0.047
102	1.5	128	0.041
103	1.3	129	0.036
104	1.1	130	0.031
105	1.0		



Table 2
Conversion From ◀Percent Sound Exposure▶ or ◀Dose▶ To ◀8-Hour TWA Sound Level▶

Dose or Percent Sound Exposure (D)		Dose or Percent Sound Exposure (D)		Dose or Percent Sound Exposure (D)		Dose or Percent Sound Exposure (D)	
	TWA		TWA		TWA		TWA
10	73.4	104	90.3	260	96.9	640	103.4
15	76.3	105	90.4	270	97.2	650	103.5
20	78.4	106	90.4	280	97.4	660	103.6
25	80.0	107	90.5	290	97.7	670	103.7
30	81.3	108	90.6	300	97.9	680	103.8
35	82.4	109	90.6	310	98.2	690	103.9
40	83.4	110	90.7	320	98.4	700	104.0
45	84.2	111	90.8	330	98.6	710	104.1
50	85.0	112	90.8	340	98.8	720	104.2
55	85.7	113	90.9	350	99.0	730	104.3
60	86.3	114	90.9	360	99.2	740	104.4
65	86.9	115	91.1	370	99.4	750	104.5
70	87.4	116	91.1	380	99.6	760	104.6
75	87.9	117	91.1	390	99.8	770	104.7
80	88.4	118	91.2	400	100.0	780	104.8
81	88.5	119	91.3	410	100.2	790	104.9
82	88.6	120	91.3	420	100.4	800	105.0
83	88.7	125	91.6	430	100.5	810	105.1
84	88.7	130	91.9	440	100.7	820	105.2
85	88.8	135	92.2	450	100.8	830	105.3
86	88.9	140	92.4	460	101.0	840	105.4
87	89.0	145	92.7	470	101.2	850	105.4
88	89.1	150	92.9	480	101.3	860	105.5
89	89.2	155	93.2	490	101.5	870	105.6
90	89.2	160	93.2	500	101.6	880	105.7
91	89.3	165	93.6	510	101.8	890	105.8
92	89.4	170	93.8	520	101.9	900	105.8
93	89.5	175	94.0	530	102.0	910	105.9
94	89.6	180	94.2	540	102.2	920	106.0
95	89.6	185	94.4	550	102.3	930	106.1
96	89.7	190	94.6	560	102.4	940	106.2
97	89.8	195	94.8	570	102.6	950	106.2
98	89.9	200	95.0	580	102.7	960	106.3
99	89.9	210	95.4	590	102.8	970	106.4
100	90.0	220	95.7	600	102.9	980	106.5
101	90.1	230	96.0	610	103.0	990	106.5
102	90.1	240	96.3	620	103.2	999	106.6
103	90.2	250	96.6	630	103.3		



ATTACHMENT 3

HEARING PROTECTION TRAINING COMPLETION RECORD

INITIAL

- 1. I have been informed about the health hazards associated with exposure to excessive sound levels and its potential effect on hearing.
- 2. I have been informed about the types of work that may result in exposure to excessive sound levels, and the necessary protective steps to prevent excessive exposure, including engineering controls and administrative practices.
- 3. I understand the purpose for, proper use, and limitations of hearing protection devices, and I have received instructions on selection, fitting, use, and care of such devices.
- 4. I have been informed about the purpose of audiometric testing and an explanation of the test procedures.
- 5. Copies of the applicable regulations governing occupational exposure to excessive sound have been made available to me.

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

Please File Completed Forms and Forward a Copy to the Knoxville Training Department

PROCEDURE

Subject: PERSONAL PROTECTIVE EQUIPMENT

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

This procedure stipulates that the company will provide the personal protective equipment necessary for employees to perform their work safely, as established by the Health & Safety Department. Head, eye, body, and foot protection are discussed in this procedure. The language covering respiratory and hearing protection is cross referenced to the appropriate company procedures.

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
- 4.0 Definitions
- 5.0 Text
 - 5.1 Eye Protection
 - 5.2 Foot Protection
 - 5.3 Head Protection
 - 5.4 Respiratory Protection
 - 5.5 Hearing Protection
 - 5.6 Body Protection
 - 5.7 Providing Personal Protective Equipment to Non-Company Personnel
 - 5.8 Management Duties
- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of H&S is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company – All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc (Shaw E & I).



5.0 TEXT

The company will provide suitable personal protective equipment as required for the nature of the job being performed, such as, but not limited to, rubber boots, protective clothing covering (e.g. Tyvek), respirators, face shields, safety eyewear, respirator ophthalmic hanger devices, hard hats, and gloves. This personal protective equipment will be specified by the Health & Safety Department prior to use, subject to an assessment of the hazards to which employees will be potentially exposed. Documentation shall be in the project-specific Health and Safety Plan (HASP) or equivalent document.

Employees shall use approved protective equipment on any task where there is potential exposure to: physical hazards such as equipment operation, objects dropping from above, or flying particles; or exposure to toxic or irritating gases, fumes, vapors, liquids, or other materials which might cause respiratory distress or skin irritation.

Employees shall be trained in the proper use, maintenance, and limitations of protective equipment. Safety equipment shall be replaced when it is damaged, contaminated, or has worn out. Training requirements are summarized in company Procedure HS050.

Employees shall wear hard hats, eye protection, and steel-toed foot protection (chemical resistant when required) at all job sites and industrial facilities, unless HASP/site rules provide exemption. It is the responsibility of all employees to report to any work site prepared to work in Level D PPE. All other protective equipment is the responsibility of the project.

5.1 Eye Protection

All employees engaged in or working in areas adjacent to eye-hazardous activities or operations shall wear appropriate eye protection.

- Safety glasses are required for impact protection, and shall meet ANSI Standard Z87.1 requirements and must include rigid side shields
- “Over the Glasses” safety glasses shall be provided to employees that require the use of prescription eyewear. Should an employee purchase their own Z87.1 prescription eyewear, the “Over the Glasses” style protective eyewear will not be required.
- No contact lenses are to be worn in work areas unless required for medical reasons and approved by the site safety officer.
- Chemical goggles are required for protection against chemical splash.
- Face shields are required for face protection from chemical splash and are not a substitute for eye protection.
- Full-face respirators can provide eye and face protection in lieu of safety glasses, goggles, or face shields.

5.1.1 Prescription Eye Protection. The company will provide all employees with protective eyewear meeting the ANSI Z87.1 standard. Should an employee



require prescription eyewear, he/she shall have two options: 1) the employee shall purchase and use approved Z87.1 prescription lenses, or; 2) the employee may purchase and use prescription eyewear that is not rated as ANSI Z87.1 and the company shall provide the employee with protective “Over the Glasses” safety glasses (meeting ANSI Standard Z87.1). In all cases, lenses shall be clear polycarbonate or plastic, the manufacturer of the glasses must be clearly marked on the frames and the Z87.1 lettering must also be clearly visible. Special tints or dark lenses can be used for special applications (e.g., extended outdoor work) with prior written approval from the local Health & Safety representative.

There are some cases whereby employees, requiring corrective lenses, are assigned to projects requiring the use of full face respirators. Many times, the employee’s corrective lenses are sized such that they fit within the respirator. In those cases where the employees’ glasses do not fit, the company shall purchase lenses and frames sized for respirators and the respirator insert.

Employees should contact their supervisor and the local H&S representative (with current lens prescription), who will coordinate with the local purchasing representative to order eyewear that will fit within the respirator.

Under the limited circumstances where the company will provide prescription safety eyewear, such purchases must be approved by the project or appropriate department/local manager responsible for paying the resulting invoice. In those limited cases whereby the project approves such purchases, the local or project EHS representative should be consulted to assist and verify that the prescription safety eyewear meet ANSI requirements. Glasses shall only be provided every two years unless damaged on-the-job, or the employee exhibits a significant change of prescription.

The company will pay for fitting services and one pair of safety glasses, however, employees will arrange and pay for the eye examination portion. Employees will be reimbursed for the actual purchase price of the prescription eyewear frames and lenses up to a maximum of \$70.00, following the verification that they meet applicable ANSI requirements.

5.2 Foot Protection

Employees are responsible for their own basic footwear and foot protection. Basic foot protection is required for all job sites and industrial locations. Specialized footwear shall be provided by the company as required by the nature of the work. Special foot protection may include, but is not limited to, chemically resistant, thermally shielded, metatarsal guards, etc.

5.2.1 Leather Safety Shoes. Safety shoes may be used in place of chemical resistant footwear when an employee will be working in a clean or uncontaminated work area. Generally, when the employee desires to use safety footwear other than the company provided standard chemical resistant footwear (e.g. rubber boots), the company considers it the responsibility of the employee to provide such protective footwear and ensure that it meets ANSI Standard Z41 (including a



defined heel, puncture resistant sole and protective toe cap). Company supervision will enforce the use of appropriate protective footwear per the requirements of the site-specific Health and Safety Plan.

Under the limited circumstances where the company will provide safety shoes, such purchases must be approved by the project or appropriate department/local manager. In those limited cases whereby the project approves such purchases, the local or project EHS representative should be consulted to assist and verify that the safety shoes meet ANSI requirements. The employee will be reimbursed for the actual purchase price of the shoes up to a maximum of \$90.00 following the verification that they meet applicable ANSI requirements.

Athletic-style safety shoes ("safety sneakers") are prohibited for all field operations due to the difficulties created by these styles in supervising proper use of protective footwear. Employees in fixed laboratory operations may wear athletic-style safety shoes with the prior approval of the Lab Director or local H&S Manager.

5.3 Head Protection

Hard hats meeting ANSI Z89.1 shall be provided to protect employees from impact, penetration, falling objects, and/or limited electrical shock and burn, as appropriate for work site hazards.

5.4 Respiratory Protection

Respirators shall be provided, in accordance with Procedure HS601, Respiratory Protection Program.

5.5 Hearing Protection

Hearing protection shall be provided, in accordance with Procedure HS402, Hearing Conservation Program.

5.6 Body Protection

Protective clothing, gloves, boots, and other protective equipment shall be provided as appropriate for the hazards associated with the tasks being performed.

5.7 Providing Personal Protective Equipment to Non-Company Personnel

The following personal protective equipment may be provided to non-company personnel:

- Hard hats
- Chemical goggles
- Safety glasses (non-prescription)
- Face shields
- Chemical resistant boots
- Chemical resistant gloves
- Hearing protectors
- Disposable chemical resistant personal protective clothing



5.8 Management Duties

It is the responsibility of the Health & Safety Department to specify safety equipment requirements for each job.

It is the responsibility of project managers or location managers to provide adequate quantities of safety equipment required for their job(s) or project(s).

It is the responsibility of supervisors to verify that required safety equipment is properly used and to ensure that any employee provided protective equipment is adequate, properly maintained and in a sanitary condition.

6.0 EXCEPTION PROVISIONS

Variations and exceptions shall be permitted pursuant to the provisions of Procedure HS013, "Health & Safety Procedure Variations".

7.0 CROSS REFERENCES

HS050 Training Requirements

HS402 Hearing Conservation Program

HS601 Respiratory Protection Program

ANSI Standard Z41, *Personal Protection - Protective Footwear*

ANSI Standard Z87.0, *Practice for Occupational and Educational Eye and Face Protection*

ANSI Standard Z89.1, *Protective Headwear for Industrial Workers*

8.0 ATTACHMENTS

1. Responsibility Matrix



ATTACHMENT 1
PERSONAL PROTECTIVE EQUIPMENT

Responsibility Matrix

Action	Procedure Section	<i>Responsible Party</i>			
		Director of H&S	Local HS Department	Project/ Location Managers	Supervisors
Issue, revise, and maintain this procedure.	3.1	X			
Approve all personal protective equipment prior to use.	5.0		X		
Coordinate reimbursement to employee for PPE purchases.	5.1.1, 5.2.1		X		
Provide adequate quantities of safety equipment as required.	5.8			X	
Verify that required safety equipment is properly used.	5.8				X



PROCEDURE

Subject: RESPIRATORY PROTECTION PROGRAM

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to prescribe the requirements of the company Respiratory Protection Program (RPP). This procedure provides information and guidance on the proper selection, medical evaluation, training, use, and care of respiratory protective equipment and complies with the requirements of 29 CFR 1910.134 (1998).

All operations which require the use of respiratory protection are subject to the provisions of this procedure.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

Program responsibilities are detailed throughout this procedure. The Responsibility Matrix summarizes these items and can be found as Attachment 1.

4.0 DEFINITIONS

Action Level (AL) - Airborne contaminant concentration which is one-half of the Permissible Exposure Guideline (PEG).

Air Purifying Respirator (APR) - Negative pressure respirator (also referred to as a cartridge respirator) which filters contaminated air through chemical or mechanical filter elements. APRs include: cartridge, canister, gas masks, and single-use respirators (single-use respirators are not approved for use by the company).

Approved Respirator - Any respirator, identified by manufacturer and model, that has been approved by NIOSH 42 CFR Part 84 and has been incorporated into the List of Approved Respiratory Protective Equipment (Attachment 2).

Assigned Protection Factor (APF) - A term that is reserved in the OSHA Standard 1910.134 (January, 1998). Attachment 3 provided PFs for the respiratory protective equipment based upon type of device and method of fit testing. The company will continue to use the PFs established by NIOSH until OSHA issues their definition of APF.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Contractor Personnel - A group of persons hired to perform a specific activity based on their expertise and ability to operate independent of direct supervision. Contractor personnel are supervised by their management group which reports to an employee of the company for project direction.

End-of-Service-Life Indicator (ESLI) - A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.



Emergency - Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Exposure Limit - Several published airborne contaminant concentration values exist which are used in establishing acceptable personnel exposures to contaminants. OSHA publishes the Permissible Exposure Limit (PEL), NIOSH publishes the Recommended Exposure Limit (REL), and the ACGIH publishes the Threshold Limit Value (TLV). All of these exposure limits are based on an 8-hour work shift, 40-hour work week, and 40-year work life. The values may vary from contaminant to contaminant as well as between publishing bodies.

Field Office - Any office or satellite office performing field activities which may require the use of respiratory protection.

Filtering Facepiece (Dust Mask) - A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fit Factor (FF) - This term means a quantitative estimate of the fit of a particular respirator to a specific individual and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn. The FF incorporates a safety factor of 10 because protection factors in the workplace tend to be much lower than the fit factors achieved during fit testing. Acceptable fit factors are 100 for a tight-fitting half facepiece and 500 for a tight-fitting full facepiece respirators.

HASP - Health and Safety Plan.

Health and Safety Representative - A member of the company Health and Safety Functional Resource Group who, through credentials, training, or experience, has the necessary qualifications and authority to specify respiratory protection and evaluate respiratory protection program elements.

Immediately Dangerous to Life or Health (IDLH) - An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Labor Pool Personnel - Temporary personnel hired for a given expertise or ability. Labor pool personnel report directly to an employee of the company.

Nuisance Level - Level of airborne contaminants which is below one-half the action level for that contaminant and presents no other health or safety hazard.

Permissible Exposure Guideline (PEG) - This term designates a specific exposure limit and is based on the best available information. The PEG will be the lower (more protective) of the values for the PEL and TLV. However, the REL shall take precedence for Hazardous Waste Operations (subject to 29 CFR 1910.120 or 1926.65) if no PEL exists, or for contaminants where no PEL or TLV exists. If there is no PEL, TLV, or REL, a Health and Safety Representative shall determine an appropriate permissible exposure guideline.



Permissible Exposure Limit (PEL) - An occupational exposure index promulgated by OSHA which carries the force of law. This value represents the allowable concentration to which it is believed an employee may be exposed to 8 hours a day, 40 days a week, for a 40-year working life without experiencing adverse health effects.

Positive Pressure Respirator - A respirator in which the pressure inside the respirator exceeds the ambient air pressure outside the respirator.

Powered Air Purifying Respirator (PAPR) - A positive pressure APR which incorporates a fan and a battery pack unit. The system pulls contaminated air through the filter elements before delivery to the facepiece under positive pressure. Air pressure in the mask must remain above ambient pressure.

Qualitative Fit Test - A procedure for assuring that the respirator provides adequate protection based on a pass/fail fit test that relies on the individual's response to the test agent. Standard fit test protocol will utilize the irritant smoke methods as described in Attachment 4.

Quantitative Fit Test - A fit test that provides an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Respiratory Protection Program Coordinator (RPP Coordinator) - A person designated by the Health and Safety Representative to administer and supervise the respiratory program at a local facility or project location. This person will have the necessary training or credentials to execute this task.

Recommended Exposure Limit (REL) - An occupational exposure index published by NIOSH which is a recommended guideline for employee protection. This value represents the allowable concentration to which it is believed an employee may be exposed to 10 hours a day, 40 hours a week, for a 40-year working life without experiencing health effects.

Supplied Air Respirator (SAR) - Positive pressure respirator which supplies an independent source of breathing air to the user. Two types of SARs are available: self-contained breathing apparatus (SCBA) and airline.

Threshold Limit Value (TLV) - An occupational exposure index published by ACGIH which is recognized as an industry guideline and represents the concentration to which it is believed that nearly all employees may be exposed to 8 hours a day, 40 hours a week without experiencing adverse health effects.

5.0 TEXT

The company will employ engineering controls (e.g., enclosure, ventilation, material substitution, etc.) as the primary method to limit employee exposure. However, for those situations where engineering and administrative controls are ineffective at controlling employee exposure, the use of respiratory protective equipment may be required.



This RPP provides specific requirements for selection, assignment, training, and medical evaluation for persons expected to wear respiratory protection.

5.1 Assignment of Equipment to Contractor/Labor Pool Personnel

Contractor personnel shall provide their own respiratory protective equipment and shall also confirm meeting all other requirements of their own RPP and that of the company's RPP (i.e., medical clearance, training, etc.).

The company may provide the following respiratory protective equipment to Contractor Personnel:

- Disposable equipment such as filter elements.
- Hardware for airline systems (up to, but not including, the airline and facepiece) which employees are sharing.

The company will not provide the following respiratory protective equipment to Contractor Personnel:

- APR or PAPR facepieces.
- SCBAs, SAR respirators, or airline.

The company may provide respiratory protective equipment to Labor Pool Personnel if the following have been established:

- The labor pool personnel have successfully completed training as required by 29 CFR 1910.134 and other applicable regulations.
- The labor pool personnel have been fit tested in relation to projected exposure levels and contaminants to be encountered.
- The labor pool personnel have been medically approved to wear respirators.
- All other RPP requirements have been met.

5.2 Approval, Selection, and Purchase of Respiratory Protective Equipment

The following requirements are designed to guide correct selection of respiratory protective equipment.

5.2.1 Approval. The Vice President, Health and Safety has approved respirators manufactured by Survivair as the primary respirators for use by employees. For employees who cannot achieve a satisfactory fit or comfort factor in Survivair respirator, Mine Safety Appliance (MSA) respirators will be selected. The list of approved model respirators is included in Attachment 2. Contractor personnel may select any respiratory protective equipment that has received approval from NIOSH.



5.2.2 Selection. The Health and Safety Representative shall base the selection of respiratory protective equipment upon an assessment of potential respiratory hazards that may be encountered. This assessment may utilize a variety of written information such as the NIOSH Pocket Guide to Chemical Hazards, Material Safety Data Sheets, analytical data, air monitoring results, or other applicable information. The selection process shall incorporate the following guidelines:

- Respiratory protection is to be selected by Health and Safety Representatives only. Full facepiece respirators are the usual preference because of superior protection factor and the face/eye protection afforded. Half facepiece respirators can only be used in situations where less than one-half the PEG is expected. The type of respirator selected will be documented in the Project HASP.
- Selection of the appropriate respiratory protective equipment shall include factors such as the chemical state and physical form of the chemical contaminant, atmospheric concentration during routine and emergency events, potential physical hazards, expected job task requirements, and the performance of the respirator in providing the appropriate level of protection against these hazards.
- Consideration shall be given to the nature of the hazardous operation, location of the hazardous area relative to nonhazardous breathing air supply, duration of wear, activities to be performed, and characteristics and function of the respiratory protective equipment to be worn.
- Selected respirators (i.e., Survivair or MSA) shall be NIOSH certified and used in compliance with the conditions of its certification when employees are exposed to toxic materials or other hazardous atmospheres.
- Respirators must provide adequate face and eye protection for the expected task.
- If an APR or PAPR is used, the respirator shall be equipped with an end-of-service life-indicator (ESLI) certified by NIOSH for the contaminant. If an ESLI is not available for the contaminant, a cartridge element change schedule shall be implemented which is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. This information will be described in the HASP.
- The PF for the respirator selected (Attachment 3) shall be used according to the following relationship with the PEG to establish justification for selection:

$$PF \times PEG > \text{Maximum anticipated contaminant concentration}$$



If this equation is false, a respirator with a greater PF must be selected. Also review Attachment 3 to determine the required fit testing for the expected maximum anticipated contaminant concentration. The Health and Safety Representative may determine that a more conservative approach (e.g., 50 percent PF) may be needed. Decision to do so should be documented in the Project HASP.

- Manufacturer-established limitations of the APR filter elements relative to the contaminants of concern shall be used to establish further justification for the selected respirator should the APR's FF not disqualify its use (e.g., maximum anticipated contaminant concentration).

5.2.3 Purchase. The purchase request of respiratory protective equipment (including cartridges, airlines, compressed air) should be reviewed by a Health and Safety Representative to indicate that the ordered material meets established requirements. **Under no circumstances may anyone (purchasing, warehouse, project manager, etc.) purchase or provide other than the specific respiratory protection equipment selected by the Health and Safety Representative.**

5.3 Medical Evaluation

No employee shall be assigned to a task that requires the use of a respirator unless it has been determined that he/she is physically able to perform the work while using the required respirator. The medical evaluation must be conducted prior to fit testing and work requiring the use of respiratory equipment.

The medical evaluation shall be performed by a physician typically in conjunction with a physical examination meeting the requirements of 29 CFR 1910.120 (f) *Medical Surveillance*. The physician will be informed of the type of work expected of the employee, the types of respiratory protection and personal protective equipment required, and other information indicating the expected stresses of the task. The company medical director shall be given a copy of the company RPP and a copy of 1910.134 (e) *Medical Evaluation*.

The company medical director shall provide a written recommendation regarding the employee's ability to use respiratory protection. The company shall ensure that the company medical director supplies the employee with a copy of this recommendation.

Additional medical evaluations will be provided to the employee if:

- Any medical signs or symptoms due to respirator use are reported by the employee, supervisory, or health and safety personnel.
- A change in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.



5.4 General Program Requirements

5.4.1 Responsibilities. The following information describes the responsibilities for the selection, use, and maintenance of respiratory protective equipment based upon job function:

Management

- Management shall take necessary and cost-effective measures to reduce, where possible, the need for respiratory protective equipment (e.g., enclosed cabs on heavy equipment to reduce airborne dust, operations performed upwind, etc.)
- Respiratory protective equipment shall be provided by management whenever it is determined that such equipment is necessary to protect the health of the employee or when requested by an employee and approved by the Health and Safety Representative.
- Management shall assign work tasks requiring the use of respiratory protective equipment to only those employees who are medically qualified to wear respiratory protective equipment.
- Management shall ensure that employees are trained in the use of respiratory protection prior to being assigned to an activity that requires its use.
- Management shall provide the means for the maintenance of respiratory protection as required.

Health and Safety Representative

- Health and Safety Representatives shall determine appropriate respiratory protection for each job. The decision logic for this selection shall be documented in the Project HASP.
- Health and Safety Representatives shall monitor compliance with the various aspects of this program, provide technical assistance regarding respirator selection and use, evaluate the effectiveness of the RPP, and support respirator training and fit testing at locations under their control.
- Health and Safety Representatives shall conduct regular audits to determine compliance with this procedure. This audit can include a review of maintenance, training, medical and air monitoring records, and review the status of this procedure with regard to current regulatory requirements.



- Health and Safety Representatives shall maintain or oversee maintenance of all other records required by this RPP and shall provide for the training and fit testing of personnel assigned respiratory protective equipment.
- Health and Safety Representatives shall appoint a RPP Coordinator for each location which uses or may have a need to use respiratory protection. The Health and Safety Representative must assure the RPP Coordinator has the necessary training to fulfill his/her responsibilities.

RPP Coordinator

- The RPP Coordinator shall be responsible for cleaning, maintenance, and storage of all respirators not routinely used or not individually assigned.
- The RPP Coordinator shall maintain respirator supplies, including spare parts; submit purchase requests for new equipment; and assure that sufficient quantities of cartridges are available for each field office/project.
- The RPP Coordinator shall assure that air supply and emergency respiratory protection is properly inspected and maintained.
- Respirators shall be repaired by either qualified personnel under the direction of the RPP Coordinator, or by contracted supplier.
- The RPP Coordinator shall maintain models and sizes of respirators available for selection and fitting.
- The RPP Coordinator shall conduct fit testing.

Training Department

- Records pertaining to training and fit testing will be maintained by the Training Department.

Employee

- The employee shall use the provided respiratory protective equipment when instructed to do so in accordance with training received.
- The employee shall clean, disinfect, and properly store the assigned respirator, unless other arrangements are made on a project level.
- The employee shall guard against damage to the assigned respirator.
- The employee shall inspect the respirator before each use and after cleaning.



- The employee shall report any malfunction of the respirator immediately to their supervisor and/or the RPP Coordinator.
- The employee shall report to their supervisor any change in their medical status that may impact their ability to wear a respirator safely.

5.4.2 Use of Corrective Lens Eyewear. In general, contact lenses are permitted to be worn when respiratory protection is used. Although in certain instances, client- or project-specific rules may not allow for their use.

If an employee chooses not to wear contact lenses, management shall assure that the appropriate frames or ophthalmic device attachments are obtained and provided at no cost to the employee.

5.4.3 Obstruction of Face Seal. Employees who wear respirators are required to be clean shaven to the extent that there is no obstruction between the wearer's skin and the facepiece. Trimmed mustaches and facial hair which does not interfere with the seal are allowable.

In addition, respirators shall not be worn when conditions prevent a good face-to-facepiece seal such as corrective lenses or goggles, or other personal protective equipment.

5.5 Instruction, Training, and Fit Test

5.5.1 Instruction and Training. The Training Department shall provide a standard respiratory protective equipment training program for use by qualified personnel such as the Health and Safety Representative or RPP Coordinator. The Training Department will support training at the project location if the project does not have the qualified personnel and/or the equipment to support its own program. As an alternative, the project location may use a respiratory manufacturer's training program if the program meets company requirements, a competent person conducts the training, adequate equipment is available for demonstration, and fit testing is conducted along guidelines established in this procedure. The Training Department must approve all alternative training methods.

The basic respirator training program shall include, as a minimum, the following:

- Training and annual retraining of employees in the selection, use, maintenance, and limitation of each respirator type used.
- Instruction on the nature of the respiratory hazards and potential health effects resulting from exposure.
- Opportunity for "hands on" experience with the respiratory protective equipment.



- Proper fitting, including demonstrations and practice in wearing, adjusting, and determining the fit of the respirator. A selection of respirators shall be available to determine the most comfortable respirator and the best fit.
- Instruction on how to test the face-to-facepiece seal.
- A familiarization period of wear in ambient air.
- For APRs, wearing the respirator in a test atmosphere (typically irritant smoke) for qualitative fit testing. The qualitative fit test shall follow the guidelines outlined in Section 5.5.2.
- Training to recognize and cope with emergency situations (including respirator failure)
- Training and fit testing shall be repeated annually, unless specific OSHA regulations require a more frequent time period (e.g., asbestos, lead operations). Each person receiving training shall complete the Respirator Fit Test Form (Attachment 5).
- Training records will be maintained by the Training Department and the location Health and Safety Representative. On-site records of training and fit testing will be maintained as required by specific regulation (e.g., asbestos work) (refer to Section 5.8).
- It is the responsibility of the RPP Coordinator to verify that all project personnel meet the requirements of this RPP.

5.5.2 Fit Testing. Prior to the use of any negative or positive pressure tight-fitting facepiece, the employee must be fit tested.

- All employees assigned to operations requiring the use of respiratory protective equipment shall have been fit tested within 12 months, or as required by specific regulations (e.g., asbestos, lead operations). Fit test and qualification cards (or a copy of the completed Attachment 5) must be available during operations.
- The employee shall be fit tested with the same size and model as they are expected to wear.
- Qualitative fit test (QLFT) shall be used when a protection factor of 10 or less is required for a negative pressure respirator.
- Quantitative fit test (QNFT) shall be used when a protection factor of greater than 10 is required for a negative pressure respirator. When



executing the QNFT, the acceptable test result is 100 for tight fitting half-facepiece respirators and 500 for full-facepiece respirators.

- Fit testing for tight-fitting atmosphere supplying respirators and tight-fitting APRs shall be in a negative pressure mode regardless of the mode of operation that is used for respiratory protection.
- Assessment of comfort shall be made after allowing adequate time for this evaluation. This evaluation shall include reviewing the following points with the employee: positioning of the mask on nose, room for eye protection if required, room to talk, and positioning of the mask on the face and cheeks.
- The following criteria shall be used to help determine the adequacy of the respirator fit: chin properly placed, strap tension, fit across the nose bridge, and tendency to slip.
- If physical obstruction (e.g., facial hair, eyeglasses) interferes with the face-to-facepiece seal, then it shall be altered or removed so as to eliminate any interference and allow for a satisfactory fit. If the employee refuses to alter the physical obstruction, then they shall be denied a satisfactory fit report and referred to his/her supervisor for consideration.
- The fit test protocol (Attachment 4) shall be followed. The Health and Safety Representative and Training Department shall determine which fit test protocol shall be followed depending upon the situation.

5.6 Maintenance Program

Each RPP Coordinator is responsible for verifying the respirator maintenance program is implemented in an effective manner for the facility or project site, the working conditions, and the potential hazards involved. As a minimum, the following aspects must be implemented:

- Inspection
- Cleaning and sanitizing
- Repair
- Respirator storage
- Inspection and repair documentation, as required
- Compliance with manufacturer recommendations.

Detailed information regarding cleaning, inspection, maintenance, and storage is found in Attachment 7. The RPP Coordinator shall verify compliance with the maintenance program by periodic inspections and field audits.



5.6.1 Inspection

- All respiratory protective equipment systems shall be inspected by the wearer for defects and/or deterioration immediately prior to and after each use.
- Any defects shall be reported to their supervisor immediately and the respirator removed from use until it can be repaired or replaced.
- Respiratory protective equipment systems not used routinely (including all SCBAs and equipment designated only for emergency use) shall be inspected before and after each use and at least every 30 days. Cylinders shall be recharged whenever the pressure falls below 90 percent of the manufacturer's recommended pressure level. This inspection shall be documented by some method on the unit (i.e., tag). Records of inspections shall be kept through appropriate documentation. Attachment 6 provides an example of inspection documentation for SCBAs. At a minimum, these records will include: date, inspector, and any unusual finding or condition. Any repairs or modifications shall be documented in detail.
- General field inspection shall include a check of the following: tightness of all connections, facepiece, valves, and any connecting tubes or filtering elements.
- Employees who are manufacturer-qualified repair technicians shall be used for all maintenance beyond field inspections, tests, and user-performed cleaning.
- Air supplied respiratory systems shall be inspected by a manufacturer's authorized representative at the manufacturer's recommended schedule. Manufacturers typically require an annual flow test and a complete overhaul every 5 to 7 years.
- **Specific inspection procedures are outlined in Attachment 7.**

5.6.2 Cleaning and Sanitizing. Employees maintaining their own respirators shall be thoroughly briefed on how to clean and disinfect them. On projects where employees clean their own respirator, the generally accepted procedure involves washing with detergent and warm water using a soft brush, submersion in sanitizing agent, thoroughly rinsing in clean water, drying in a clean place, and storage in sealed plastic bags or equivalent. Precautions to be taken to prevent damage from rough handling during this procedure are detailed in Attachment 7.

At locations where employees share respirators, a centralized cleaning and maintenance facility with specialized equipment and/or materials and personnel



trained in respirator maintenance must be established. Cleaning and inspection is primarily the responsibility of the user.

5.6.3 Repair. The company will only use respiratory protective equipment that is physically sound.

- If defects are found during any inspection, two remedies are possible. If parts and trained personnel are available, repair and/or adjustment may be made immediately. If parts or trained repair people are unavailable, the device shall be removed from service until it can be repaired. Under no circumstances shall a device that is known to be defective remain in service.
- Replacement or repair shall be done by adequately trained personnel. For negative pressure respirators, the Health and Safety Representative or RPP Coordinator may train or supervise personnel in the replacement of items such as inhalation/exhalation valves, head harness, cartridge adapters, and lenses. For air-supplied respirators, field repairs are limited to replacement of head harness and lenses. All other work must be completed by a factory-certified repair person.

Repair shall only be made with parts designed for the respirator. Substitution of parts from a different brand or type invalidates the respirator's approval and is prohibited.

5.6.4 Storage. Respirators must be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and mechanical damage.

- Respirators shall be stored in such a manner that the facepiece, exhalation valve, and straps are not distorted.
- Respirators shall be stored in sealable containers (e.g., ziplock bags) after cleaning and disinfecting.
- The storage location of emergency respiratory protection shall be readily accessible and prominently identified.
- Respirators shall be stored in an area free of contamination.

5.7 Field Use

The following guidelines for the use of respirators (or equivalent) shall be incorporated into the Project HASP as appropriate. Additional guidelines may be required based on working conditions and hazards involved. Each location where respiratory protective equipment is required or worn shall include in the Project HASP justification for the selected respiratory protective equipment systems worn as outlined in Section 5.2 of this procedure.



5.7.1 General Requirements. The following general requirements shall be followed whenever respiratory protection is used:

- Employees shall be allowed to leave the regulated area to readjust the facepiece or to wash their faces and to wipe clean the facepieces of their respirators in order to minimize potential skin irritation associated with respirator use.
- Respiratory protective equipment shall not be passed on from one person to another until it has been cleaned and sanitized, per program requirements.
- Respirators will be inspected, and a positive/negative pressure test performed prior to each use.
- Entry into oxygen-deficient (< 19.5 percent O₂) atmospheres, Immediately Dangerous to Life and Health (IDLH) atmospheres, or areas requiring EPA Level A protection is prohibited without the prior approval of the Vice President, Health and Safety or the CIH assigned to the business line.
- Head coverings such as Tyvek hoods shall not be allowed to pass between the face-to-facepiece seal.
- The harness straps of tight-fitting respirators shall not be positioned or worn over hard hats.

5.7.2 Specific Requirements. The following information details specific requirements by respirator class:

Air Purifying Systems

- When APRs are worn, new filter elements shall be installed at the beginning of operations. The filter elements shall be changed whenever the ESLI (color indicators) indicates that cartridge life has expired (e.g., mercury cartridges). When no ESLIs are available, filter replacement will be based on the calculations performed by the Health and Safety Representative. Additionally, the cartridges will be replaced if "breakthrough" is perceived or whenever an increase in breathing resistance is detected. In most cases, the cartridges will be replaced a minimum of once daily, usually at the end of the work shift.

Powered Air Purifying Systems

- When PAPRs are worn, employees shall change filter elements after each day's activities. The filter elements shall be changed whenever the ESLI (color indicators) indicates that cartridge life has expired (e.g., mercury



cartridges). When no ESLIs are available, filter replacement will be based on the calculations performed by the Health and Safety Representative. Additionally, the cartridges will be replaced if "break-through" is perceived or when airflow through filter elements decreases to an unacceptable level as indicated by the manufacturer's test device.

Compressed Air

- Compressed air used for breathing shall meet at least the requirements of the specification for Grade D breathing air or better (D, E, or G; not A, K, or L) as described in the American National Standard Commodity Specification for Air, ANSI/CGA G-7.1-1989. Further information is provided in Attachment 7, Guide to Respiratory Protective Equipment Cleaning, Inspection, Maintenance, and Storage.
- Breathing air suppliers must provide certification of analysis stating conformance, as a minimum, to Grade D breathing air standards as previously referenced for each cylinder and/or air lot.
- Air delivered in bulk, e.g., tube trailers, shall have each tube or unit, or a representative number of tubes or units verified as to oxygen content prior to using that tube.
- Pure oxygen shall NOT be used at any time in open-circuit SCBAs or airline respirators.
- Breathing air cylinders shall be legibly identified with the word "AIR" by means of stenciling, stamping, or labeling as near to the valve end as practical.
- Breathing air cylinders may be stored on their sides provided the valve caps are in place.

Supplied Air Breathing Systems

- Airline couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of airline respirators with nonrespirable gases or oxygen.
- Standard airline couplings for breathing air systems are Foster quick connect fittings with locking dots. Hansen quick connect fitting may also be used, but must not be used where they can be inadvertently actuated and disconnected. For example, Hansen fittings could be used at the regulator connection, but not on the airline unless protected from disconnection by some other means.



- The hose line length shall not exceed 300 feet from the air bank regulator to the user.
- No more than three connections, excluding the connection to the regulator and final connection to the respirator, shall be between the breathing air cylinders and the user.
- Breathing air hose shall be protected from direct contact with chemical materials which may permeate the hose. Acceptable methods of protection include suspension of the hose from the surface or covering with a commercially available sleeve or visqueen. Breathing air hose which has become contaminated will be removed from service and disposed of properly.
- The breathing air regulator shall be adjusted to provide air pressure as per the manufacturer's recommendations. For Survivair units, this pressure shall be between 80 to 125 psi pressure.
- Cascade systems shall be equipped with low pressure warning alarms or similar warning devices to indicate air pressure in the manifold below 500 psi.
- When a cascade system is used to supply breathing air, a worker outside the Exclusion Zone shall be assigned as safety standby within audible range of the low pressure alarm.
- When a cascade system is used to recharge SCBA air cylinders, it shall be equipped with a high-pressure supply hose and coupling rated at a capacity of at least 3,000 psi. The supply hose and coupling shall be relatively short (≤ 3 feet) and secured to prevent whipping when pressurized.
- Large supplied air cylinders shall be stored and handled to prevent damage to the cylinder or valve. Cylinders shall be stored upright with the protective valve cover in place and in such a way (e.g., supported with substantial rope or chain in the upper one-third of the cylinder, or in racks designed for the purpose) as to prevent the cylinder from falling. Cylinders shall not be dropped, dragged, rolled, or allowed to strike each other or to be struck violently. Cylinders shall never be exposed to temperatures exceeding 125 degrees F. Cylinders with visible external damage, evidence of corrosion, or exposure to fire shall not be accepted or used.
- Only cylinders within current hydrostatic test periods shall be used. For fiber wrapped bottles designated by the DOT-E label, hydrostatic testing shall be completed every 3 years. Maximum service life for these cylinders is 15 years. Steel or aluminum cylinders shall be



hydrostatically tested every 5 years. No maximum service life is established for steel or aluminum cylinders.

- SCBAs shall only be used in the positive pressure mode when in the Exclusion Zone.
- Standby SCBA equipment must be present when air supply systems are used in IDLH or potentially IDLH atmospheres.

Escape/Egress Units

- These respirators are intended for use in areas where escape with a short-term (5 minute) air supply is necessary. They may be used as adjuncts to airline respirators as a backup air supply, or as independent emergency devices in areas where respiratory protective equipment is not normally required.
- Appropriate training shall be accomplished and documented prior to assigning employees to tasks or locations subject to the use of these respirators.
- Escape/egress units (5-minute air supply) shall never be used as primary standby respirators for confined space entry.
- Escape/egress units shall never be used to enter, or continue working in, a hazardous atmosphere.

5.7.3 IDLH Atmospheres. For all IDLH atmospheres, the company shall ensure that:

- One employee or, when needed, more than one employee is located outside the IDLH atmosphere.
- Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.
- The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue.
- The employer or designee is notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue.
- The employer or designee authorized to do so by the employer, once notified, provides necessary assistance appropriate to the situation.
- Employee(s) located outside the IDLH atmosphere are equipped with:



- Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied air respirator with escape/egress unit.
- Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry. Equivalent means of rescue can be considered.

5.8 Recordkeeping

The following documents must be part of the site recordkeeping program:

- Employees' medical clearances for respirator use
- Respirator training and fit testing forms.

5.9 Program Evaluation

This RPP shall be reviewed annually at the direction of the Vice President, Health and Safety.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

Title 29, Code of Federal Regulations, Section 1910.134.

AIHA, *Respiratory Protection, A Manual and Guideline*, 1980.

American National Standards Institute Practices for Respiratory Protection Z88.2-1992 (or most recent publication)

NIOSH, *Certified Equipment List* (most recent version)

Company Health and Safety Procedures:

- HS013 Health and Safety Procedure Variances
- HS040 Stop Work Authority
- HS050 Training Requirement
- HS052 Health and Safety Plans
- HS102 Management of Employee Exposure and Medical Records
- HS104 Employee Notification of Industrial Hygiene Monitoring Records
- HS300 Confined Spaces
- HS304 Compressed Gas Cylinders
- HS600 Personal Protective Equipment



8.0 ATTACHMENTS

1. Responsibility Matrix
2. List of Approved Respiratory Protective Equipment
3. Respirator Type, Protection Factor, and Fit Testing Method
4. Mandatory Respirator Fit Test Protocol
5. Respirator Fit Test Form
6. Emergency Respiratory Protective Equipment Monthly Inspection Checklist
7. Guide to Respiratory Protective Equipment Cleaning, Inspection, Maintenance, and Storage



ATTACHMENT 1
RESPIRATORY PROTECTION PROGRAM

Responsibility Matrix

Action	Procedure Section	Responsible Party					
		Employee	Health and Safety Representative	Project/ Location Management	VP, Health and Safety	Training	RPP Coordinator
Issue, Revise, and Maintain Procedure	3.1				X		
Assure Proper Selection of Respirators	5.2.2		X				
Review Purchase Requests for Respiratory Equipment	5.2.3		X				
Conduct Fit Testing	5.4		X				X
Assure Compliance with RPP	5.4		X	X			X
Assure Training	5.4		X	X			X
Audit Program Compliance	5.4		X		X		X
Assist/Approve Local Training Program	5.4					X	
Maintenance Program	5.6	X	X	X			X
Field Use	5.7	X	X	X			X
Recordkeeping	5.8	X	X			X	X
Program Evaluation	5.9				X		



ATTACHMENT 2

LIST OF APPROVED RESPIRATORY PROTECTIVE EQUIPMENT

AIR PURIFYING RESPIRATORS (APR)					
Respirator Class	Respirator Type	Respiratory Performance	Manufacturer	Model Name	Model Number
Standard APR	Half-Face	Negative Pressure	Survivair MSA	Blue 1 Comfo II	2100-10 S 2200-10 M 2300-10 L 479529 S 479428 M 479530 L
	Full-Face	Negative Pressure	Survivair MSA	20/20 Ultra Twin	202062 S 202072 M 202082 L 480263 S 480259 M 480267 L
Powered APR	Hood	Continuous Positive Pressure	Survivair MSA	PAPR Optimair 6	5200-15 480251 S 480247 M 480255 L

SUPPLIED AIR RESPIRATORS (SAR)					
Respirator Class	Respirator Type	Respiratory Performance	Manufacturer	Model Name	Model Number
Airline SAR	Full-Face	Positive Pressure Demand	Survivair	Panther	P968455
			MSA	Premaire	497291
SCBA SAR	Full-Face	Positive Pressure Demand	Survivair MSA	Cougar MMR WorkMask 2216	P 9643310 Varies on Components
Emergency	Escape/Egress Unit	Continuous Flow	Survivair	5 min. EEGA	9750870
			MSA	Custom Air V	484353



ATTACHMENT 3

RESPIRATOR TYPE, PROTECTION FACTOR, AND FIT TESTING METHOD

Respirator Type	Protection Factor	QLFT	QNFT
Half-Face, Negative Pressure (<100 Fit Factor) ¹	10	Yes	Yes
Full-Face, Negative Pressure (<100 Fit Factor) Used in Atmosphere up to 10 Times the PEG	10	Yes	Yes
Full-Face, Negative Pressure (>100 Fit Factor) Used in Atmospheres Over 10 Times the PEG ²	50	No	Yes
PAPR	100	Yes	Yes
SCBA/SAR Used in Positive Pressure (Pressure Demand Mode)	10,000	Yes	Yes

Footnotes:

1. If quantitatively fit tested, the device must demonstrate a fit factor of at least 100.
2. If quantitatively fit tested, the device must demonstrate a fit factor of at least 500.



ATTACHMENT 4

MANDATORY RESPIRATOR FIT TEST PROTOCOL

OSHA-Accepted Fit Test Protocols

A. Fit Testing Procedures - General Requirements

The company shall conduct fit testing using the following procedures. The requirements in this attachment apply to all OSHA-accepted fit test methods, both QLFT and QNFT. There are several OSHA-accepted fit test protocols for QLFT. This procedure includes only the irritant smoke protocol since it requires less equipment and is more practical for field use.

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.
3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.
4. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.
5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following Item A.6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.
6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
 - a. Position of the mask on the nose;
 - b. Room for eye protection;
 - c. Room to talk; and
 - d. Position of mask on face and cheeks.
7. The following criteria shall be used to help determine the adequacy of the respirator fit:
 - a. Chin properly placed;
 - b. Adequate strap tension, not overly tightened;
 - c. Fit across nose bridge;
 - d. Respirator of proper size to span distance from nose to chin;
 - e. Tendency of respirator to slip; and
 - f. Self-observation in mirror to evaluate fit and respirator position.



8. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.
9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache, or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.
10. If a test subject exhibits difficulty in breathing during the tests, he/she shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing his/her duties.
11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.
12. *Exercise Regimen:* Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.
13. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.
14. *Test Exercises:* The following test exercises are to be performed for all fit testing methods prescribed in this attachment, except for the controlled negative pressure (CNP) method. A separate fit testing exercise regimen is contained in the CNP protocol.

Each test exercise shall be performed for one minute, except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

The test subject shall perform exercises, in the test environment, in the following manner:

- a. *Normal Breathing:* In a normal standing position, without talking, the subject shall breathe normally.
- b. *Deep Breathing:* In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.
- c. *Turning Head Side to Side:* Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.



- d. *Moving Head Up and Down:* Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
- e. *Talking:* The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can count backward from 100, recite a memorized poem or song or read from a prepared text such as the Rainbow Passage.

Rainbow Passage:

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

- f. *Grimace:* The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)
- g. *Bending Over:* The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.
- h. *Normal Breathing:* Same as Item A.14.a.

B. Qualitative Fit Test (QLFT) Protocols

- 1. General:
 - a. The employer shall ensure that persons administering QLFT are able to perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.
 - b. The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.
- 2. Irritant Smoke (Stannic Chloride) Protocol: This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.
 - a. General Requirements and Precautions:
 - 1. The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).
 - 2. Only stannic chloride smoke tubes shall be used for this protocol.
 - 3. No form of test enclosure or hood for the test subject shall be used.



4. The smoke take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.
 5. The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the buildup of irritant smoke in the general atmosphere.
- b. Sensitivity Screening Check: The person to be tested must demonstrate his/her ability to detect a weak concentration of the irritant smoke.
1. The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.
 2. The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.
 3. The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.
- c. Irritant Smoke Fit Test Procedure:
1. The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).
 2. The test subject shall be instructed to keep his/her eyes closed.
 3. The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.
 4. If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.
 5. The exercises identified in Item A.14 of this attachment shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.
 6. If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.



7. Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

8. If a response is produced during this second sensitivity check, then the fit test is passed.

C. Quantitative Fit Test (QNFT) Protocols

The following quantitative fit testing procedures have been demonstrated to be acceptable: quantitative fit testing using a nonhazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit; quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

1. General:

- a. The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.
 - b. The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.
2. Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol: The ambient aerosol CNC quantitative fit testing (Portacount^b) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for quantitative fit tests. A probed respirator has a special sampling device, installed on the respirator, that allows the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator and a minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

a. Portacount^b Fit Test Requirements:

1. Check the respirator to make sure the sampling probe and line are properly attached to the facepiece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e.g., NIOSH 42 CFR 84 Series 100, Series 99, or Series 95 particulate filter) per manufacturer's instruction.
2. Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the



wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.

3. Check the following conditions for the adequacy of the respirator fit: chin properly placed; adequate strap tension, not overly tightened; fit across nose bridge; respirator of proper size to span distance from nose to chin; tendency of the respirator to slip; and self-observation in a mirror to evaluate fit and respirator position.
4. Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting facepiece, try another size of the same model respirator, or another model of respirator.
5. Follow the manufacturer's instructions for operating the Portacount^b and proceed with the test.
6. The test subject shall be instructed to perform the exercises in Item A.14 of this attachment.
7. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

b. Portacount^b Test Instrument:

1. The Portacount^b will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.
 2. Since the pass or fail criterion of the Portacount^b is user programmable, the test operator shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance in this attachment.
 3. A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.
3. Controlled Negative Pressure (CNP) Quantitative Fit Testing Protocol - The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CNP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit for negative pressure respirators. The CNP instrument manufacturer, Dynatech Nevada, also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator. To perform the test, the test subject closes his/her mouth and holds his/her breath, after which an air pump removes air from the respirator facepiece at a pre-selected constant pressure. The facepiece fit is expressed as the leak rate through the facepiece, expressed as milliliters per minute. The quality and validity



of the CNP fit tests are determined by the degree to which the in-mask pressure tracks the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in the form of a real-time pressure trace of the in-mask pressure is provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a half-mask respirator and a minimum fit factor of at least 500 is required for a full facepiece respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

a. CNP Fit Test Requirements:

1. The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.
2. The CNP system defaults selected for test pressure shall be set at 15 mm of water (-0.58 inches of water) and the modeled inspiratory flow rate shall be 53.8 liters per minute for performing fit tests.

(Note: CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and gender situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with medium cartridge resistance at a low-moderate work rate, will allow inter-test comparison of the respirator fit.)

3. The individual who conducts the CNP fit testing shall be thoroughly trained to perform the test.
4. The respirator filter or cartridge needs to be replaced with the CNP test manifold. The inhalation valve downstream from the manifold either needs to be temporarily removed or propped open.
5. The test subject shall be trained to hold his/her breath for at least 20 seconds.
6. The test subject shall don the test respirator without any assistance from the individual who conducts the CNP fit test.
7. The QNFT protocol shall be followed according to Item C.1 of this attachment with an exception for the CNP test exercises.

b. CNP Test Exercises:

1. Normal Breathing: In a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject needs to hold head straight ahead and hold his/her breath for 10 seconds during the test measurement.
2. Deep Breathing: In a normal standing position, the subject shall breathe slowly and deeply for 1 minute, being careful not to hyperventilate. After the deep breathing exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during test measurement.
3. Turning Head Side to Side: Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side for 1 minute. The head shall be held at each extreme momentarily so the subject can inhale at each side. After the



turning head side to side exercise, the subject needs to hold head full left and hold his/her breath for 10 seconds during test measurement. Next, the subject needs to hold head full right and hold his/her breath for 10 seconds during test measurement.

4. Moving Head Up and Down: Standing in place, the subject shall slowly move his/her head up and down for 1 minute. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold his/her head full up and hold his/her breath for 10 seconds during test measurement. Next, the subject shall hold his/her head full down and hold his/her breath for 10 seconds during test measurement.

5. Talking: The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement.

6. Grimace: The test subject shall grimace by smiling or frowning for 15 seconds.

7. Bending Over: The test subject shall bend at the waist as if he/she were to touch his/her toes for 1 minute. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement.

8. Normal Breathing: The test subject shall remove and re-don the respirator within a one-minute period. Then, in a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of a respirator shall be tried.

c. CNP Test Instrument:

1. The test instrument shall have an effective audio warning device when the test subject fails to hold his/her breath during the test. The test shall be terminated whenever the test subject failed to hold his/her breath. The test subject may be refitted and retested.

2. A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.



ATTACHMENT 6

**EMERGENCY RESPIRATORY PROTECTIVE EQUIPMENT
MONTHLY INSPECTION CHECKLIST**

INSPECTED BY (Print): _____

DATE:

BACKPACK#: _____

AIR CYLINDER#:

			PASS	FAIL
A. Backpack and Harness Assembly	1. Straps	Inspect for complete set Inspect for damaged straps	<input type="checkbox"/>	<input type="checkbox"/>
	2. Buckles	Inspect for mating ends Check locking function	<input type="checkbox"/>	<input type="checkbox"/>
	3. Backplate and Cylinder Lock	Inspect backplate for cracks, missing screws/rivets Inspect cylinder hold down strap Inspect strap tightener	<input type="checkbox"/>	<input type="checkbox"/>
B. Cylinder and Cylinder Valve Assembly	1. Cylinder	Cylinder tight to backplate Current Hydrostatic Test Inspect cylinder for dents, gouges Is cylinder at least 90% filled?	<input type="checkbox"/>	<input type="checkbox"/>
	2. Head and Valve Assembly	Inspect cylinder valve lock for presence Inspect cylinder gauge for condition Proper function of cylinder valve lock Test for cylinder leakage	<input type="checkbox"/>	<input type="checkbox"/>
C. Regulator and High Pressure Hose	1. High Pressure Hose and Connector	Leakage in hose Leakage in hose to cylinder connector	<input type="checkbox"/>	<input type="checkbox"/>
	2. Regulator and Low Pressure Alarm	Read regulator gauge (at least 1,000 psi) Low pressure alarm sounds at 500 psi Test integrity of diaphragm Test for positive pressure Test bypass system	<input type="checkbox"/>	<input type="checkbox"/>
D. Facepiece and Corrugated Breathing Tube	1. Facepiece	Inspect harness for deterioration Inspect facepiece body for deterioration Inspect lens Inspect exhalation valve	<input type="checkbox"/>	<input type="checkbox"/>
	2. Breathing Tube and Connector	Inspect breathing tube for deterioration Inspect connector for threads and gasket	<input type="checkbox"/>	<input type="checkbox"/>
	3. Leak Test and Cleaning	Perform negative pressure test on facepiece/ breathing tube Clean and sanitize facepiece	<input type="checkbox"/>	<input type="checkbox"/>

Note: Any item marked ◀Fail▶ will place the equipment out of service until repaired or replaced.



ATTACHMENT 7

GUIDE TO RESPIRATORY PROTECTIVE EQUIPMENT: CLEANING, INSPECTION, MAINTENANCE, AND STORAGE

A program for the maintenance of respirators shall include the following:

- Cleaning and sanitizing
- Inspection for defects
- Maintenance and repair
- Storage
- Assurance of breathing air quality.

The following maintenance, inspection, and storage program is recommended.

1. **Cleaning and Sanitizing**

Respirators issued to an individual shall be cleaned and sanitized regularly. Each respirator shall be cleaned and sanitized before being worn by different individuals. Respirators intended for emergency use shall be cleaned and sanitized after being used. The following shall be completed in addition to the manufacturer's instruction for cleaning:

- a. Remove, when necessary, the following components of respiratory inlet covering assemblies before cleaning and sanitizing:
 1. Filters, cartridges, canisters
 2. Speaking diaphragms
 3. Valve assemblies
 4. Any components recommended by the respirator manufacturer.
- b. Wash respiratory inlet covering assemblies in warm (43 degrees C or 110 degrees F maximum temperature) cleaner sanitizer solution. A stiff bristle (not wire) brush may be used to facilitate removal of dirt or other foreign material.
- c. Rinse the respirator inlet covering assemblies in clean, warm (43 degrees C or 110 degrees F maximum temperature) water.
- d. Drain all water, and air dry the respiratory inlet covering assemblies.
- e. Clean and sanitize all parts removed from the respiratory inlet covering assemblies as recommended by the manufacturers
- f. If necessary to remove foreign material, hand wipe respiratory inlet covering assemblies, all parts, and all gasket- and valve-sealing surfaces with damp, lint-free cloth.
- g. Inspect parts and replace any that are defective.



- h. Reassemble parts on respirator inlet covering assemblies.
- i. Visually inspect and, where possible, test parts and respirator assemblies for proper function.
- j. Place assembled respirators in appropriate containers for storage.

Machines may be used to expedite the cleaning, sanitizing, rinsing, and drying of large numbers of respirators. Extreme care shall be taken to ensure against tumbling, agitation, or exposure to temperatures above those recommended by the manufacturer (normally 43 degrees C or 100 degrees F maximum), as these conditions are likely to result in damage to the respirators.

Ultrasonic cleaners, clothes washing machines, dishwashers, and clothes dryers have been specially adapted and successfully used for cleaning and drying respirators.

Cleaner sanitizers that effectively clean the respirator and contain a bactericidal agent are commercially available. The bactericidal agent frequently used is a quaternary ammonium compound. Strong cleaning and sanitizing agents and many solvents can damage rubber or elastomeric respirator parts. These materials must be used with caution.

Alternatively, respirators may be washed in a detergent solution and then sanitized by immersion in a sanitizing solution. Some sanitizing solutions that have proven effective are: (a) a hypochlorite (bleach) solution (50 parts per million chlorine), 2-minute immersion; (b) an aqueous iodine solution (50 parts per million of iodine), 2-minute immersion; or (c) a quaternary ammonium solution (200 parts per million of quaternary ammonium compounds in water with less than 500 parts per million total hardness), 2-minute immersion.

Inflammation of the skin of the respirator user (dermatitis) may occur if the quaternary ammonium compounds are not completely rinsed from the respirator. The hypochlorite and iodine solutions are unstable and break down with time; they may cause deterioration of rubber or other elastomeric parts and may be corrosive to metallic parts. Immersion times should not be extended beyond the mentioned time periods, and the sanitizers shall be thoroughly rinsed from the respirator parts.

Respirators may become contaminated with toxic materials. If the contamination is light, normal cleaning procedures should provide satisfactory decontamination; otherwise, separate decontamination steps may be required before cleaning.

2. **Inspection**

The user shall inspect the respirator immediately prior to each use to ensure that it is in proper working condition. After cleaning and sanitizing, each respirator shall be inspected to determine if it is in proper working condition, if it needs replacement parts or repairs, or if it should be discarded. Each respirator stored for emergency or rescue use shall be inspected at least monthly.



Respirator inspection shall include a check for tightness of connections; for the condition of the respiratory inlet covering, head harness, valves, connecting tubes, harness assemblies, hoses, filters, cartridges, canisters, end-of-service indicators, electrical components, and shelf-life date(s); and for the proper function of regulators, alarms, and other warning systems. Each rubber or other elastomeric part shall be inspected for pliability and signs of deterioration. Each air and oxygen cylinder shall be inspected to ensure that it is fully charged according to the manufacturer's instructions.

A record of inspection dates shall be kept for each respirator maintained for emergency or rescue use. Respirators that do not meet applicable inspection criteria shall be immediately removed from service (a temporary replacement assigned) and repaired or permanently replaced.

Inspection of hoop-wrapped air cylinders will follow the recommendations set forth in the Compressed Gas Association, Inc. publication CGA C-6.2-1988, "Guidelines for Visual Inspection & Requalification of Fiber Reinforced High Pressure Cylinders," and will be examined for the following five types of damage:

- Abrasion is damage caused by wearing, grinding, or rubbing away by friction. Abrasions less than 0.005 inch (0.127 mm) deep are acceptable and should have no adverse effects on the safety of the cylinder. Abrasions with isolated groups of fibers exposed or flat spots with a depth greater than 0.005 inch (0.127 mm) but less than 0.0075 inch (0.191 mm) are acceptable if the damage is repaired. Cylinders abraded in excess of 0.0075 inch (0.191 mm) should be taken out of service until professionally inspected.
- Cuts are damage inflicted by a sharp object. Cuts or scratches less than 0.005 inch (0.127 mm) deep are acceptable regardless of length, number, or direction. For cuts greater than 0.005 inch (0.127 mm) deep and up to a depth of 0.015 inch (0.038 mm) with a maximum 1- or 2-inch (25.4 mm or 50.8 mm) length transverse to the fiber direction, the cylinder should be removed from service until repaired. Cylinders with cuts greater than 0.015 inch (0.038 mm) with a maximum greater than 2 inches (50.8 mm) length transverse to the fiber direction or with bare metal showing through must be condemned.
- Impact damage is caused by a cylinder striking or being struck by another object. Impact damage is considered slight if a frosted area is noted in the impact area. These cylinders may be returned to service. Impact damage is severe if evidence of fiber cutting, delamination, and possible structural damage is apparent. Cylinders sustaining severe impact damage should be evaluated using the guidelines for cuts and structural damage.
- Structural damage is damage which causes a visual change in original cylinder configuration. This change can include any evidence of bulges, a cocked end fitting, concave areas on the domes or on the cylinder section, or, if by visual inspection of the cylinder interior, there is evidence of damage involving deformation of the liner. Structurally damaged cylinders must be immediately removed from service and condemned.



- Heat or fire damage to a cylinder is evident by discoloration, charring, or burning of the composite, labels, paint, or plastic components of the valve. Such damage would cause a cylinder to be removed from service and condemned. Note: If the cylinder is only soiled from smoke or other debris and is found to be intact underneath, it may be returned to service.

3. Maintenance and Repair

Replacement of parts or repairs shall be done only by persons trained in proper respirator maintenance and assembly. Replacement parts shall be only those designated for the specific respirator repaired. Reducing or admission valves, regulators, and alarms shall be adjusted or repaired by the respirator manufacturer or a technician trained by the manufacturer. Instrumentation for valve, regulator, and alarm adjustments and tests should be calibrated to a standard traceable to the National Institute of Standards and Technology (NIST), at a minimum of every 3 years.

4. Storage

Respirators shall be stored in a manner that will protect them against physical and chemical agents such as vibration, shocks, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators shall be stored to prevent distortion of rubber or other elastomeric parts. Respirators shall not be stored in such places as lockers and tool boxes, unless they are protected from contamination, distortion, and damage. Emergency and rescue respirators that are placed in the work areas shall be quickly accessible at all times, and the storage cabinet or container in which they are stored shall be clearly marked.

5. Assurance of Breathing Air Quality

Compressed gaseous air, compressed gaseous oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Compressed gaseous air shall meet at least the requirements of the specification for Type I-Grade D breathing air, and liquid air shall meet at least the requirements for Type II-Grade B breathing air as described in ANSI/CGA G-7.1-1989.

The CGA designation for Grade D and Grade E breathing air is as follows:

- Grade D breathing air, as per ANSI/CGA G-7.1-1989, shall contain between 19.5 and 23.5 percent oxygen with the balance predominantly nitrogen, a maximum of 5 mg/m³ oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, and a maximum of 1,000 ppm carbon dioxide.
- Grade E breathing air, as per ANSI/CGA G-7.1-1989, shall contain between 20 and 22 percent oxygen with the balance predominantly nitrogen, a maximum of 5 mg/m³ oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, a maximum of 500 ppm carbon dioxide, and 25 ppm total hydrocarbon content (as methane).
- Note: The quality verification for oil is not required for synthesized air whose oxygen and nitrogen components are produced by air liquefaction. Carbon monoxide quality verification is not required for Grade D breathing air if synthesized air when nitrogen component was previously analyzed and meets National Foundry (NF) specification and



when the oxygen component was produced by air liquefaction and meets United States Pharmacopeia (USP) specification.

Compressed gaseous air may contain low concentrations of oil introduced from equipment during processing or normal operation. If high-pressure oxygen passes through an oil- or grease-coated orifice, an explosion or fire may occur. Therefore, compressed gaseous oxygen shall not be used in supplied air respirators or in open-circuit type self-contained breathing apparatus that have previously used compressed air. Oxygen concentrations greater than 23.5 percent shall be used only in equipment designed for oxygen service or distribution.

The dew point of air used to recharge self-contained breathing apparatus shall be -65 degrees F or lower (less than 25 ppm water vapor). The driest air obtainable (dew point of -100 degrees F or lower) should be used for recharging SCBA cylinders to be used in environments with ambient temperatures below -25 degrees F. The dew point of breathing air used with supplied air respirators should be lower than the lowest ambient temperature to which any regulator or control valve on the respirator or air-supplied system will be exposed.

Breathing air couplings shall be incompatible with outlets for nonrespirable plant air or other gas systems to prevent inadvertent servicing of supplied air respirators with nonrespirable gases. **It is recommended that Foster or Hansen fittings be reserved for breathing air systems.** Breathing air outlets shall be labeled.

Breathing air may be supplied to supplied air respirators from cylinders or air compressors. Cylinders shall be tested and maintained in accordance with applicable DOT specifications for shipping containers (49 CFR 173 and 178). Breathing gas containers shall be marked in accordance with ANSI/CGA C-4-1990. Specific test recommendations for purchased breathing air are given in the following table.

Method of Preparation	Analysis Recommended
Compression: Supplier does not fill cylinders with any other gases.	Check 10% of cylinders from each lot for ppm CO and odor.
Compression: Supplier fills cylinders with gases other than air.	Analyze all cylinders for percent oxygen. Check 10% of cylinders from each lot for ppm CO and odor.
Reconstitution.	Analyze all cylinders for percent oxygen. Check 10% of cylinders from each lot for ppm CO and odor.

A compressor shall be constructed so as to avoid entry of contaminated air. For all air compressors, including portable types, the air intake location shall be carefully selected, and monitored closely to ensure continued quality of air supply to the compressor. The system shall be equipped as necessary with a suitable in-line air-purifying sorbent bed and filter to further assure breathing air quality. Maintenance and replacement/refurbishment of compressor and associated air-purifying/filter media shall be performed periodically, by trained personnel following manufacturer's recommendations and instructions.



As part of acceptance testing, and prior to initial use, representative sampling of the compressor air output shall be performed to ensure that it complies with the requirements in Paragraph 1 of this section. To ensure a continued high-quality air supply, and to account for any distribution system contaminant input, a representative sample should be taken at distribution supply points. Samples should be collected on a periodic basis, as directed by the Program Coordinator. Specific test recommendations are given in the following table.

Type/Sample	Oil Lubricated	Non-Oil Lubricated	Combustion Engine Powered
Water Vapor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Carbon Monoxide	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Condensed Hydrocarbon	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Carbon Dioxide			<input checked="" type="checkbox"/>
Odor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

- NOTES:
1. When using air compressors, intake location shall be carefully selected and monitored closely to ensure air supplied to the compressor is of adequate quality.
 2. No frequency for periodic checks of air quality is specified, due to wide variation in equipment types, use, working environments, and operating experience.
 3. Continuous monitoring of temperature and carbon monoxide are not required.
 4. For non-oil lubricated compressors that operate at less than 35 psi, no sampling for water is required.
 5. These requirements apply to systems designed for breathing air, other air-supply systems need to be evaluated on a case-by-case basis for the type and frequency of testing.

Further details on sources of compressed air and its safe use can be found in CGA G-7-1988.



PROCEDURE

Subject: MOTOR VEHICLE OPERATION: GENERAL REQUIREMENTS

UNCONTROLLED WHEN PRINTED

1.0 PURPOSE AND SUMMARY

This procedure prescribes the general requirements for the operation of motor vehicles on company business. All operators of company owned, leased, and rented vehicles, as well as personal vehicles used on company business, are covered by this procedure. U.S. Department of Transportation (DOT) regulated personnel must also comply with the guidelines contained in Procedure HS810. Key elements of this procedure include:

- All employees who drive or may drive on company business must be familiar with the requirements of this procedure and certify their acceptance of the Company Rules for Motor Vehicle Operation (Attachment 2). This certification will be evaluated via the established point system to determine driving privilege status.
- All new hire candidates shall complete and be familiar with the company Rules for Motor Vehicle Operation (Attachment 2). This certification will be evaluated via the established point system to determine driving privilege status.
- Employees must report all vehicular citations incurred while on company business to their supervisor as soon as possible, but not longer than 24 hours after the occurrence. Once reported, the established evaluation criteria in Section 5.4 will be used to determine corrective actions.
- Employees have the responsibility to keep track of their non-work related vehicular citations and utilize the established evaluation criteria found in Section 5.3 to determine if their overall MVR citations exceed the Overall Driving Record limits (See Section 5.3.2).
- Employees utilizing vehicles while on company business are required to review this procedure and attend a company-designated driver training class at least once every two years.
- Requests for the re-instatement of denied or revoked driving privileges can be made to the appropriate business line Vice-President and the Director of Health & Safety.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Chargeable Vehicle Accident - Any at fault vehicle accident meeting any one of the following criteria:

- An individual other than an employee of the company is a party in the accident.
- Property owned by a person or entity other than the company is damaged.
- When only company employees, company owned or leased (not rented) vehicles and property is involved and damage exceeds \$2,500.00.



Company - Shaw Environmental & Infrastructure, Inc. (Shaw E & I) and its subsidiaries and affiliates.

Motor Vehicle - Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. This includes personal vehicles operated on company business. For the purpose of this procedure, off-road vehicles, such as ATV's (Four Wheelers) earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles. The use of motorcycles on company business is prohibited

Project Assigned Employees – Any employee that is assigned to a field operations project position. This designation includes Project Managers, Site Managers/Supervisors, Foremen, Technicians, Scientists, Geologists, Project Business Accountants, etc. This does not include employees that are typically assigned to an office but are visiting a site for brief periods of time, such as to provide technical assistance, perform audits, perform program reviews, etc.

5.0 TEXT

5.1 Company Rules for Motor Vehicle Operation

All employees who will or may be required to operate a company owned, leased, or rented motor vehicle or a personal vehicle used on company business shall acknowledge acceptance of the Company Rules for Motor Vehicle Operation & Employee Driving Record Certification (Attachment 2) prior to such operation. The signed form shall be retained by the Baton Rouge, LA Health & Safety Records Department. Each year, the company shall reserve the right to require covered employees to sign a copy of the most current Company Rules for Motor Vehicle Operation.

FAILURE OF EMPLOYEES TO COMPLY WITH COMPANY RULES FOR MOTOR VEHICLE OPERATION OR THIS POLICY SHALL BE SUBJECT TO DISCIPLINARY ACTION UP TO AND INCLUDING (BUT NOT LIMITED TO) REVOCATION OF DRIVING PRIVILEGES FOR COMPANY BUSINESS AND TERMINATION OF EMPLOYMENT.

Those employees who are assigned to use an Employer vehicle which they take home with them must meet the following conditions:

- a) The Employee's supervisor signs an Authorization for Assignment Form (See Attachment 7)
- b) The Employee signs and agrees to be bound to a Vehicle Usage Agreement (See Attachment 8)
- c) The Employee provides proof of insurance on the Employee's personal vehicle which lists the Employee as an insured driver on the insurance and such insurance contains minimum coverage required by law and acknowledges that the Employee's personal insurance will provide primary coverage of the Employee's use of a Company owned vehicle when such use is not in the course and scope of employment. The



authorizing supervisor shall attach a copy of the proof or personal insurance to Attachment 8 for future reference.

The Vehicle Usage Agreement is an agreement by the Employee that his own personal vehicle insurance will be primary as to any claims arising from the Employee's **NON COMPANY** use of Company Vehicles.

Employees operating Company Vehicles without compliance with these requirements, as well as any supervisor who allowed or granted such use, will be deemed to be in violation of Company policy and will be subject to discipline up to and including termination from employment.

5.1.1 Project Assigned Employee Vehicle Use Requirements

The following requirements are set forth as it pertains to Project Assigned Employees.

- Project-assigned employees are not permitted to operate company vehicle (owned, leased or rented) on non-company business after 10:00 p.m. without written authorization from the project manager or the appointed Site Manager/Supervisor with jurisdiction over the vehicle. In those cases where there is shift work, a non-traditional workday (i.e. 3PM to 11PM workday, etc.) or other non-typical circumstances, it is understood that the after 10:00 PM restriction would not be appropriate. However, even in these non-typical circumstances, the Project Manager or the appointed site manager/supervisor shall be required to execute the required written authorization for use of a company vehicle, including the time frame in which employees shall be permitted to use the vehicle after their non-traditional workday.
- Project assigned personnel that are residing in temporary housing / hotels are granted permission to drive to and from the temporary residence and work. Additionally, the Project Manager, or the appointed Site Manager/Supervisor his/her designee (Site Manager, Supervisor, etc.) is required to evaluate and optimize the potential of carpooling of project assigned personnel in an effort to reduce the number of company vehicles being driven to and from the project site.
- Project assigned employees shall not use company vehicles for sight seeing or any other personal/recreational activities.
- Vehicles may be used in support of “daily life activities” such as going to restaurants for dinner, laundromats, local retail stores, grocery stores, etc.
- A maximum distance for “daily life activity” driving shall be no further than 20-miles from the temporary housing in which an employee resides. In those cases where the maximum allowed distance does not permit daily



life activities to be conducted, a written authorization, from the Project Manager or the appointed Site Manager/Supervisor, is required to travel further distances.

- For normal routine travel to and from work, employees shall utilize their own personal transportation.
- If an employee is assigned to a project site that is located within driving distance from the employee's permanent residence, but is too far away to allow for a daily commute, that employee shall utilize their own personal transportation to drive to and from their permanent residence and the project site. (i.e. for initial assignment arrival to the project, trips home on rotation, etc.) Upon arrival to the site, employees shall be allowed to use a company vehicle as required to perform project activities. In these cases, the employee will also be required to drive their personal vehicle to and from the project site from their temporary housing / hotel residence, for personal "daily life activities", etc.
- Employees may drive a Shaw-owned, leased or rented vehicle home during off hours only when authorized in writing by a business line manager, who must hold a position at least one level above the site / project manager to whom the authorized employee reports. In other words, the approval must be signed by the employee's, supervisor's, supervisor or a higher level manager.
- In making vehicle use decisions the authorizing manager shall consider the risk of vehicle accidents, Shaw's liability risks, client and project specific needs, distances to be traveled, employee driving history, and any other relevant factors. Attachments 7 and 8, (Authorization for Assignment and Vehicle Use Agreement forms), shall be used to facilitate this process.

5.2 Pre-employment Evaluation

Human Resources shall distribute a copy of this procedure to all new hire candidates for the completion of Attachment 2 & 3. Information provided should be evaluated via the point system in Section 5.3. Human Resources and the hiring manager will be advised regarding any hiring or driving privilege restrictions that may apply. Hiring of persons with regular driving duties (e.g., field technicians and leadmen, sales persons, or others with assigned company motor vehicles) may only proceed after the information contained in Attachment 3 is evaluated.

Once Attachment 3 is completed, it is to be faxed to the Baton Rouge, LA Corporate Health and Safety Records Department at (225) 987-3714. The driving status of the prospective employee will be reported to the appropriate Human Resources Department. Health & Safety will notify the appropriate Human Resources manager when the attachments are not returned.



Discrepancies between the certified driving record report and Attachment 3 shall be reviewed with the prospective employee. Deliberate falsification of driving record information will disqualify prospective employees from being hired.

5.3 Driving Record Point System

The following point system will be used to evaluate the driving record of all existing employees and new hire candidates that can reasonably be expected to operate a motor vehicle during their employment. This data is to be collected through Motor Vehicle Records (MVR) search and by the employee completing Attachment 2 of this policy. Attachment 2 is to be completed by the new hire candidate and reviewed by the regional H&S Assistant to ensure compliance.

Driving Record Point System	
Description	Assigned Point Value
Overweight, loss of load, vehicular equipment infraction, etc.	1
Moving violation: speeding, failure to stop, failure to signal, etc.	2
At-fault accident, seatbelt violation	3
Major citation: reckless driving, tailgating, suspended license, speed contest, improper lane usage, Open Container (Non-Work Related), etc.	6
Driving under the influence, Hit and Run (leaving the scene)	8
Open Alcohol Container (Work Related)	8

5.3.1 Pre-Employment Driving Record Point System Evaluation

If a new hire candidate has accumulated three (3) points or less in the last twelve (12) months or five (5) points or less in the last twenty-four (24) months, they will be given the privilege to drive motor vehicles on company business without restrictions.

If a new hire has accumulated four (4) to six (6) points in the last twelve (12) months or six (6) to eight (8) points in the last twenty-four (24) months, they will be placed on probation for a period of twelve (12) months. They will be afforded the privilege to drive motor vehicles on company business during this probationary period. Any driving infractions (i.e., speeding tickets, at-fault accidents, citations, etc.) accumulated during this probationary period will result in termination of the privilege to drive a motor vehicle on company business.

If the new hire candidate has accumulated seven (7) to eleven (11) points in the last twelve (12) months or nine (9) to fifteen (15) points in the last twenty-four (24) months, they will not be eligible for company driving privileges. Employment can only be offered with the strict understanding of denial of the privilege to drive motor vehicles on company business. After the first twelve (12) months of employment, the employee can petition the appropriate business line Vice President and the Director of Safety and Health for reconsideration of driving privileges.



If a new hire candidate is expected to drive a vehicle, to fulfill the responsibilities of his/her role, and there has been an accumulation of twelve (12) points or more in the last twelve (12) months or sixteen (16) points or more in the last twenty-four (24) months, the candidate shall not be hired. See Table below:

Candidate's Driving Privilege Status Description	Past 12 Months	Past 24 Months
Can drive without restriction.	0 to 3 points	0 to 5 points
Can drive with understanding of probationary status.	4 to 6 points	6 to 8 points
Not eligible for company driving privileges for first 12 months of employment.	7 to 11 points	9 to 15 points
Candidate not eligible for hire.	12 points or more	16 points or more

5.3.2 Existing Employee Driving Record Point System

An acceptable traffic record is one requirement for continued driving privileges. Accordingly, all affected employee's MVR traffic record is subject to periodic and annual review to ensure compliance with state and federal regulations, as well as company policy.

WORK RELATED TRAFFIC VIOLATIONS

It is the responsibility of all affected employees to provide verbal notice to their supervisor of any work related traffic violations that have occurred as soon as practicable but not longer than 24 hours after the occurrence. This verbal notice shall be followed by the employee completing an updated "Company Rules for Motor Vehicle Operation & Employee Driving Record Certification" (Attachment 2), and "Notification of Work Related Citation" form (Attachment 3). Both Attachment 2 and 3 shall then be immediately forwarded to the Baton Rouge, LA Health and Safety Records office.

NON-WORK RELATED TRAFFIC VIOLATIONS

Employees have the responsibility to keep track of their non-work related vehicular citations and utilize the established evaluation criteria, as described below, to determine if their overall traffic citations exceed acceptable company limits. It is not necessary for employees to report non-work related citations to their supervisor as they occur. However, if an employee's overall MVR record (work related or not) exceeds the company's established points system criteria, the employee must verbally inform their supervisor as soon as practicable but not longer than the following business day after the occurrence. This verbal notice shall be followed by the employee completing an updated Attachment 2 (Company Rules for Motor Vehicle Operation & Employee Driving Record Certification), and it shall then be immediately forwarded to the Baton Rouge, LA Health and Safety Records office.

OVERALL DRIVING RECORD EVALUATION

If it is determined that an employee has accumulated three (3) points or less in the last twelve (12) months or five (5) points or less in the last twenty-four (24)



months, they will be allowed to continue with the privilege to drive motor vehicles on company business without restrictions.

If an employee has accumulated four (4) to six (6) points in the last twelve (12) months or six (6) to eight (8) points in the last twenty-four (24) months, the employee will be placed on probation for a period of twelve (12) months. The employee can continue to drive motor vehicles on company business during this probationary period.

If the employee has accumulated seven (7) to eleven (11) points in the last twelve (12) months or nine (9) to fifteen (15) points in the last twenty-four (24) months, they will not be eligible for company driving privileges. Continued employment may only be extended with the strict understanding of denial of the privilege to drive company owned, leased or rented motor vehicles on company business. After the first twelve (12) months following driving privilege revocation, the employee can petition their respective Business Line VP and the Director of Safety and Health for reconsideration of driving privileges. See Table below:

Employee's Driving Privilege Status Description	Past 12 Months	Past 24 Months
Can drive without restriction.	0 to 3 points	0 to 5 points
Can drive with understanding of probationary status.	4 to 6 points	6 to 8 points
Company driving privileges are revoked.	7 to 11 points	9 to 15 points

5.4 Employee Evaluation Criteria

All employees who may operate a motor vehicle on company business will become familiar with the requirements of this procedure, complete the currently-designated company driver training class, and complete Attachment 2 prior to such operation. The employee driving evaluation criteria is based upon all infractions including those incurred while on company business and during off-work hours. It is imperative that employees notify their supervisors immediately as possible and no later than 24 hours following a work-related citation/accident. Once notified, the supervisor will ensure the completion of Attachment 2 , forward it to the Baton Rouge, LA H&S Records Office, and initiate one of the following corrective actions as required. Additionally, as it relates to non-work related and work related traffic violations, it is the employee's responsibility to ensure that their overall driving record does not allow for the exceeding of the driving records points system. Should the employee's driving record points exceed the system limits, that they must notify their supervisor immediately, complete an updated "Company Rules for Motor Vehicle Operation & Employee Driving Record Certification" (Attachment 2 & 3) and forward it to the Baton Rouge, LA Health & Safety Records Department.



5.4.1 Work-Related Minor Citation

When an employee is given a work related minor citation (i.e., speeding ticket, moving violation, failure to signal turn, loss of load, etc.), the employee's supervisor will meet with the employee to discuss the corrective action that must be taken so that further violations do not occur. At a minimum, the supervisor shall require the employee to attend a recognized course in defensive driving on his/her own time and the cost of this training will be borne by the employee. This course shall be pre-approved by the Division Health & Safety Manager. The supervisor will provide written direction to the employee regarding the assigned corrective action(s). The supervisor shall forward a copy of an updated Company Rules for Motor Vehicle Operation & Employee Driving Record Certification form (Attachment 2 & 3) and a form of verification showing the employee's successful completion of an approved defensive driving course to the appropriate regional Human Resources Department for inclusion in the employee's personnel file. These documents shall also be forwarded to the **Baton Rouge, LA Health & Safety Records Department.**

5.4.2 Work Related Major Citation

When an employee is given a work related major citation (i.e., reckless driving, tailgating, suspended license, speed contest, etc.), the supervisor will hold a meeting with the employee, at which time the supervisor will complete the company Disciplinary Action Form (Procedure HR207) thereby informing the employee that any additional infractions will lead to more severe disciplinary action. In addition, the employee will be required to attend a recognized defensive driving course on his/her own time, as described in section 5.4.1, and will be suspended from work for one day without pay. A copy of the Disciplinary Action Form shall be forwarded to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

5.4.3 Failure to Notify

Should an employee fail to notify his/her supervisor of any work or non-work related citation or accident within the required reporting time, his/her company driving privilege may be revoked. The supervisor will also take disciplinary action that is appropriate for the unreported event. If the unreported event is work related and is either an at-fault accident, driving under the influence case or a hit and run violation, the termination process will be initiated. All disciplinary actions shall be documented to the employee by the supervisor. This copy, and any written response by the employee, shall be forwarded to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.



5.4.4 At-Fault Accident

Whenever an employee is operating a company owned/leased/rented vehicle or their personal vehicle on company business and is involved in an at-fault vehicle accident, an Accident Review Board shall be convened and recommend the corrective action to be taken. At a minimum, the action shall include the completion of a recognized driver safety course on their time and at their expense, as described in section 5.4.1. All disciplinary actions resulting from at-fault vehicle accidents will be reviewed for consistency by the appropriate Safety Council.

Depending upon the circumstances and severity of the accident, termination of the employee can be considered. As above, this must be approved by the appropriate Human Resources Department. All communication to the employee regarding the accident and resulting action shall be in writing with a copy to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

5.4.5 Driving Under the Influence, Hit & Run (Leaving The Scene) and Open Container

If an employee is charged with Driving Under the Influence, Hit and Run or an Open Alcohol Container violation, he/she will have their driving privileges temporarily suspended pending final resolution of the charge. If the charge is resolved in the employee's favor, with a final adjudication holding no penalty, driving privileges may be re-instated. However, if any penalty is attached, such as probation, license restrictions, etc., the employee may be considered unqualified to drive for the company. Whenever an employee is convicted or pleads no contest to a company-related driving under the influence, hit and run or open container charge, he/she will be immediately terminated.

In a case that is not work related, and an employee is convicted or pleads no contest to a hit and run or driving under the influence charge, the employee shall notify his supervisor. Accordingly, the employee's company driving privileges will then be revoked for twelve (12) months. After the first twelve (12) months following driving privilege revocation, the employee can petition their respective Business Line VP and the Director of Safety and Health for reconsideration of driving privileges.

5.5 Training

All employees who will, or may reasonably be expected to, drive a company owned/leased/rented vehicle or their personal vehicle on company business shall review this procedure and complete the currently-designated company driver training class prior to such operation. This class is designed to be taught either via the company's Web-based training program or by local Health and Safety personnel and must include the following elements: federal/state/local driving rules, company driving rules, emergency/accident procedures, and defensive driving techniques. Specific information



on the vehicle to be operated will be provided locally. Personnel conducting this class shall provide the Knoxville Health and Safety Training Department with a copy of the course attendance sheet for inclusion in individual training records. All affected employees shall complete a driver safety training class at least once every two years.

5.6 Reinstatement of Driving Privilege

Any employee who has had his/her privilege to drive a motor vehicle on company business revoked or denied, and who desires to reinstate this privilege, must apply to the business line Vice President and the Director of Health and Safety for reinstatement. The Director of H&S, or his designee, shall specify rehabilitation program (if applicable), an external safe driving course, and any other requirements in which he/she deems appropriate. Once the employee completes the program, documentation of successful completion must be formally presented to the appropriate Vice President and the Director of H&S. If the documentation is accepted, the driving privilege may be reinstated. Copies of all documents shall then be forwarded, by the responsible H&S Manager, to Human Resources and to the Baton Rouge, LA Health & Safety Records Department.

Reinstatement of the driving privilege may occur one (1) time, at the discretion of the Director of Health & Safety and the responsible Business Line Vice President. If employee driving performance leads to a subsequent revocation of this privilege, such revocation shall be permanent.

5.7 Non-Shaw Employee Vehicle Use Requirements

Only approved non-Shaw employees (client, subcontractor or temporary/temp agency employees) who have completed and signed the "Non-Shaw Employee Driver Questionnaire" (HS800 Attachment 5) will be allowed to drive a Shaw owned, leased, or rented vehicle. Upon completing the questionnaire and prior to the driver operating a Shaw vehicle, the subject questionnaire must be signed, dated and placed on file at the job site. The primary vehicle operator or the Shaw Project Management representative shall review the questionnaire and determine whether the non-Shaw employee satisfies the driver qualification requirements of HS800. The driver qualification point system can be found in section 5.3 of this policy.

In addition to the above requirement, it is also a requirement of the responsible Shaw Project Manager to forward a fully executed, company specific version of the correspondence that is found in Attachment 6, to the employer of the non-Shaw driver. This correspondence should not be modified except for the fields that specify the name and address of the subcontractor or client to which the letter is being written. This written correspondence will serve to notify that any employee that is assigned by their company to a Shaw project, and is required to operate/drive a Shaw owned, leased, or rented vehicle, will be subject to either meeting or exceeding the operator requirements for Shaw employees.



As the employer of individuals who are assigned to a Shaw project, the authorized non-Shaw employer representative shall sign and return Attachment 6 to the respective Shaw Project Manager. By signing Attachment 6, the non-Shaw employer is acknowledging that they are either adopting the requirements set forth in this policy (HS800, Motor Vehicle Operation) or have developed a similar policy that meets or exceeds these requirements. Failure of a non-Shaw employer to comply with the requirements set forth in HS800 shall result in the prohibition of their employees driving any Shaw owned, leased or rented vehicles.

5.8 DRIVER SAFETY NOTIFICATION STICKER

A safety notification bumper sticker shall be applied to all Shaw owned / leased vehicles in an effort to ensure continued compliance with driving safety regulations. The notification service will be managed by a third party fleet safety management company and will serve as the recipient of all calls that are placed concerning unsafe driving behavior. The Findlay, OH equipment division will serve as the first point of contact as it pertains to notifications that are received from the third party company who administers the bumper sticker safety call in service. Upon receiving a report from the third party administrator, the equipment division shall determine what business line the vehicle / driver is located within and then contact the respective business line Divisional H&S Manager. The Divisional H&S Manager will then contact the affected employee and the employee's supervisor for a counseling/discussion meeting, concerning the complaint. Upon conclusion of the meeting, the information will be reviewed by the supervisor and the Divisional H&S Manager for determination of corrective or disciplinary action.

The company shall endeavor to ensure that all company owned/leased fleet vehicles shall have a safety notification bumper sticker applied to the rear of the vehicle. It is the responsibility of the driver, who is deemed the primary / responsible operator of the vehicle, to ensure that the sticker remains on the vehicle and remains legible and in no way defaced. If the vehicle is project or program assigned and there is no designated primary operator, then the Project Manager will be considered the primary / responsible operator. The primary / responsible operator shall contact the Equipment Division in Findlay, OH, at 1-800-225-6464 ext. 6051 or direct dial 419-425-6051, immediately upon recognizing that the sticker is defaced or removed such that a new one can be re-applied. Failure, on the part of the primary operator, to ensure that a legible sticker remains on the vehicle shall result in disciplinary action, up to and including vehicle usage being revoked, in addition to possible termination of employment.

6.0 EXCEPTION PROVISIONS

Variances and exceptions, not explained herein, may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.



7.0 CROSS REFERENCES

HR207 Employee Disciplinary Action
HS013 Health and Safety Procedure Variances
HS020 Accident Prevention Program: Reporting, Investigation, and Review
HS810 Motor Vehicle Operation: Federal Motor Carrier Safety Regulations for Driver Qualifications

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Company Rules for Motor Vehicle Operation
3. Driving Record Certification
4. Notification of Work-Related Citation
5. Non-Shaw Employee Driver Questionnaire
6. Memo Template for Employers of Non-Shaw Drivers
7. Vehicle Use Authorization Form



ATTACHMENT 1
MOTOR VEHICLE OPERATION: GENERAL REQUIREMENTS RESPONSIBILITY MATRIX

Action	Procedure Section	Responsible Party					
		Local Health & Safety Assistant	Business Line Health and Safety Manager	Supervisor	Accident Review Board	Corporate Human Resources	Director of H&S
Issue, Revise, and Maintain This Procedure	3.1						X
Ensure Employees Complete Attachment 2	5.1			X		X	
Distribute HS800 to New Hire Candidates for Completion of Attachment 2	5.2					X	
Request Evaluation of New Hire Driving Record	5.2	X		X		X	
Obtain Driving Record and Determine Driving Status	5.2	X					
Initiate Corrective Actions	5.4			X		X	
Ensure Completion and Distribution of Attachment 3	5.4	X					
Accident Review	5.4.4				X		
Ensure Drivers Meet Training Requirements	5.5		X	X			
Specify Program for Reinstatement of Driving Privilege	5.6						X
Reinstatement of Driving Privilege	5.6						X
Non-Shaw Employee Vehicle Use Requirements	5.7			X			
Contact Employee to discuss report from Safety Notification Sticker Service	5.8		X	X			



ATTACHMENT 2
COMPANY RULES FOR MOTOR VEHICLE OPERATION

1. Prior to motor vehicle operation, all motor vehicle operators are required to provide the company with current documentation of licensing for the motor vehicle(s) to be operated. Supervisors shall review and approve said documentation.
2. The motor vehicle operator is responsible for the vehicle, and for conducting a pre-trip, walk around inspection prior to use (including load evaluation, if applicable). No vehicle with any mechanical defect, which endangers the safety of the driver, passengers, or the public, shall be used. The motor vehicle operator is also responsible for the Driver Safety Notification sticker (Sec. 5.8)
3. All company owned/leased trucks, should have small convex mirrors attached to the side mirrors.
4. The operator shall drive defensively at all times and is responsible for complying with all state and local traffic laws, as well as customer regulations concerning motor vehicle operation.
5. The operator and all passengers shall use seat belts at all times when the vehicle is in motion.
6. No employee shall operate a motor vehicle when abnormally tired, temporarily disabled, or under the influence of alcohol or drugs.
7. No employee shall allow a company owned, leased, or rented motor vehicle to be operated by an unauthorized employee or non-employee. (See also: unauthorized personal use of company vehicles) (Sec. 5.7)
8. The operator shall not allow for any open alcoholic beverage containers within a company vehicle or within a personal vehicle while it is being utilized for company business.
9. No employee shall drive beyond any barricades or into any area with designations such as HAZARDOUS, DO NOT ENTER, etc.
10. Use caution when driving through congested areas, or near where personnel and equipment are working.
11. Whenever possible, a spotter shall be used for backing all vehicles. This may be a fellow company employee, or a non-company employee who is willing to help.
12. Unless required, such as on a client's property, keys shall not be left in an unattended vehicle.
13. Employees shall not leave the driver's seat of a vehicle while the motor is running. Exemption: Vehicles equipped with a power take-off device with parking brake set and chocks in place.
14. No motorcycles are to be operated on company business.
15. Radar detectors are prohibited in all company owned, leased, or rented vehicles or in personal vehicles while being used for company business.
16. Analytical samples will be transported in accordance with 49 CFR regulations. Regulated hazardous substances shall not be transported in personal vehicles.
17. In case of an accident, the following steps shall be taken:
 - A. Stop.
 - B. Call for medical assistance in case of injuries.



- C. Notify police.
 - D. Complete Vehicle Accident Report and submit to your supervisor as soon as possible.
18. Whenever a vehicle is stopped upon the traveled portion of a highway or the shoulder of a highway, for any cause other than necessary traffic stops, the driver shall, as soon as possible, place or activate the warning devices with which the vehicle is equipped.
 19. Employee must notify the supervisor as soon as possible, but not longer than 24 hours after occurrence, for work related citations, accidents, and license expiration, suspension, or revocation.
 20. No employee is authorized to operate a company vehicle (including rentals) after having been on duty for a period of 16 hours. No employee may drive for more than 12 hours in any single on-duty period. Once either of these criteria has been met, a period of 8 consecutive hours off duty is required before driving duties may be resumed. These are maximum, not minimum, requirements and employees may be unfit to drive after shorter on-duty periods. Commercial DOT drivers are subject to the more restrictive hours of service regulations described in Procedure HS810.
 21. Project-assigned employees are not permitted to operate company owned, leased, or rented vehicles after 10:00 p.m. without written authorization from their supervisor. (See section 5.1.1)
 22. Employees shall not operate company vehicles for any type of personal use, no exceptions. Personal use includes any usage that is not directly related to company business. See section 5.1.1 for definitions concerning "daily life activities" for Project Assigned Employees.
 23. Employees shall not use a company vehicle to visit an establishment that has a primary function of providing nighttime entertainment including the dispensing of alcoholic beverages.
 24. Temporary or non-Shaw employees shall be allowed to utilize Shaw company vehicles only after the driver has completed Attachment 5 and has satisfied the point system requirements set forth in Section 5.3 of this policy. In addition, the employer of that driver shall have satisfied the requirement set forth in section 5.7 of this policy and signed a copy of the memo set forth in Attachment 6. This includes clients or subcontractors.
 25. Employees shall not transport family members, friends or any other unauthorized guest passenger unless it is arising out of course and scope of company business.
 26. Employees may not drive company owned, leased, or rented vehicles home when off of duty except when authorized in writing by a designated business line manager and in accordance with Sec. 5.1.1.
 27. Employees needing to use a mobile phone or engage in other potentially distracting activity while operating a Motor Vehicle are advised to pull off the road when safe to do so for the duration of the activity.

I have read and understand company procedure HS800 and the company rules for Motor Vehicle Operation and agree to abide by all requirements

Employee's Name (Printed)

Employee Signature

Date



ATTACHMENT 3
DRIVING RECORD CERTIFICATION

Fair Credit Reporting Act Disclosure Statement

In accordance with the provisions of Section 604 (b)(2)(A) of the Fair Credit Reporting Act, Pubic Law 91-508, as amended by the Consumer Credit Reporting Act of 1996 (title II, Subtitle D, Chapter I, of Pubic Law 104-208), you are being informed that reports verifying your driving record may be obtained on you for employment purposes. These reports are required by Sections 382.413, 391.23 and 391.25 of Federal Motor Carrier Safety Regulations. You have the right to receive a copy of the reports and have the prescribed allotment of time by law to have any errors corrected and the reports obtained after corrections have been posted.

	Assigned Point Value
Overweight, loss of load, vehicular equipment infraction, etc.	1
Moving violation: speeding, failure to stop, failure to signal turn, etc.	2
At-fault accident, seatbelt violation	3
Major citation: reckless driving, tailgating, suspended license, speed contest, improper lane usage, open container (non-work related)	6
Driving under the influence or Hit and Run (Leaving the Scene)	8
Open Alcohol Container (Work Related)	8

In the space provided below, please list all violations and accidents currently listed on your driving record by the state issuing your driver's license (include all states for which you have held a driver's license during the last two [2] years). Determine the number of points assigned from the table above, and write in column labeled Points.≡ Finally, write the sum total of all points where indicated.

<u>Violations/Accidents</u>	<u>Driver License #/State</u>	<u>Date (mo/yr)</u>	<u>Points</u>
-----------------------------	-------------------------------	---------------------	---------------

Total Points _____

I hereby certify that the information provided is a complete and accurate statement of my driving record for the previous twenty-four (24) months. I authorize the company to obtain a copy of my driving record from the state of issuance of my license(s). I understand that falsification of data will disqualify me from being hired or may result in revocation of my company driving privileges.

Driver's License No. _____
 Expiration Date _____

Driver's Lic. State of Issuance _____
 Date of Birth _____

Print Name _____

Social Security Number _____

Signature _____

Date _____



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PLEASE FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT AT (225) 987-3714



ATTACHMENT 4
NOTIFICATION OF WORK-RELATED CITATION

This form is to be completed by employees incurring a work-related vehicular citation. Once complete, it is to be signed by the employee's supervisor and forwarded to the appropriate Human Resources Department for inclusion in the employee's personnel file.

Employee Name _____ Employee No. _____ Date _____

Nature of Citation _____

Location of Citation (City, State) _____

Date/Time Citation Received _____

Is Citation Being Contested? No Yes Details _____

Employee Signature _____ Date _____

Corrective Action Being Taken _____

Supervisor Signature _____ Date _____

PLEASE FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT AT (225) 987-3714



ATTACHMENT 5
Non-Shaw Employee Driver Questionnaire

_____ *Date*

_____ *Time*

_____ *Vehicle is assigned to what Shaw Employee?*

_____ *Signature of Shaw Employee*

_____ *Non-Shaw Driver's Name*

Do you have a valid driver's license? Yes No

State in which license was issued, DL Number and Exp Date _____

Have you had any citations or accidents in the past 24 months? Yes No

If yes, please list type of citations and the associated dates below:

(Refer to HS800, Section 5.3, to determine driver eligibility based on the points system provided)

By signing below, I, the temporary driver, am acknowledging that the above information is true and accurately represents my driving record. I understand and agree that any misrepresentation or omission of material fact on this questionnaire will constitute sufficient grounds for your removal from the project site and will restrict the future use of Shaw vehicles.

I have read and fully understand the above:

_____ *Signature of Non-Shaw Driver*

_____ *Date*



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ATTACHMENT 6

Address
Address
Phone
Fax:

Memorandum

Date:

To:

CC:

From: Project Manager

RE: Requirements for Motor Vehicle Operation

Attached is Shaw Environmental & Infrastructure, Inc. (Shaw) policy HS800 - Motor Vehicle Operation: General Requirements. As you can see, this policy applies to all operators of Shaw owned, leased, or rented vehicles, as well as personal vehicles used on Shaw business.

Accordingly, you are hereby notified that any employee that is assigned by your company to a Shaw Environmental & Infrastructure, Inc project and is required to operate/drive Shaw owned, leased, or rented vehicles, will be subject to either meeting or exceeding the operator requirements for Shaw employees. Please be aware that as the employer of individuals who are assigned to a Shaw project, you must ensure that your company either adopts the requirements set forth in policy HS800 (Motor Vehicle Operation) or develop a similar policy that meets or exceeds those requirements

Only approved non-Shaw employees, who have completed and signed the "Non-Shaw Employee Driver Questionnaire" (HS800 Attachment 5) will be allowed to drive a Shaw vehicle. Furthermore, prior to the driver operating a Shaw vehicle, the subject questionnaire must be completed and placed on file at the job site. The primary vehicle operator or responsible Shaw management representative shall review the questionnaire and determine whether the non-Shaw employee satisfies the driver qualification requirements of HS800.

Failure to comply with the requirements of this correspondence or the requirements set forth in HS800 shall result in disciplinary action up to and including driving privilege revocation or removal of an affected non-Shaw employee from a project site. If the duties of your employees are expected to include driving a Shaw owned, leased or rented vehicle, please complete Attachment 5, for all of your affected personnel, and provide these to Shaw's site management. Alternatively, please be aware and make your employees aware that they are not authorized to drive a Shaw owned, leased, or rented vehicle without such compliance.

By signing this document, I, an authorized employee and agent of the subject company/employer, am acknowledging acceptance of the above information and agree to my employer's compliance with the referenced requirements stated herein.

Signature / Title

Date



ATTACHMENT 7
AUTHORIZATION FOR ASSIGNMENT FORM

I, the hereby undersigned Supervisor / Manager, give my consent and approval for the Employee listed below to be assigned a Company Owned and/or Rented vehicle ("Company Vehicle") as specified herein and in accordance with the Company Motor Vehicle Use Policy and the Company Rules for Motor Vehicle Operation. I have given a copy of the Rules and the Policy to the Employee listed below and the Employee has signed and agreed to be bound by the Vehicle Usage Agreement.

Employee Name _____
 VIN Number of Vehicle _____
 Company Vehicle ID Number _____
 Period of Allowance _____
 Phone: _____
 Company by which employed: _____

I, the undersigned Supervisor, personally attest that the following things have been done and are in proper order: *(Please check off when complete and attach appropriate documents)*

- Employee Driving Record Complete within the last six months
- Employee Driving Record rating allows operation of motor vehicle in accordance with policy
(List Rating _____ Date Completed _____)
- Employee has presented a valid driver's license *(attach a copy)*
- Employee has signed the Vehicle Use Agreement and a copy has been obtained by the Company
(attach a copy)
- Employee has been given a copy of Motor Vehicle Use Policy and Company Rules for Motor Vehicle Operation
- Employee has provided sufficient Proof of Insurance as required by the Policy *(attach a copy)*

SUPERVISOR SIGNATURE: _____
 Printed Name: _____
 Date: _____
 Phone Number: _____

FAX A COPY OF THIS FORM TO THE EQUIPMENT DIVISION IN FINDLAY, OHIO @ 419-425-6295. ALSO NOTE THAT THE AUTHORIZED EMPLOYEE AND THE AUTHORIZING MANAGER IS RESPONSIBLE FOR MAINTAINING COPIES OF THIS FORM FOR FUTURE REFERENCE AND AUDITING.

DO NOT FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT



ATTACHMENT 8
VEHICLE USE AGREEMENT

THIS VEHICLE USE AGREEMENT made and entered into this _____ day of _____, _____, between the undersigned Employee listed below (“Employee”) and the undersigned Company below (“Company”)

WITNESSETH:

WHEREAS, Employee has been granted permission to be assigned a Company owned/leased vehicle (“Company Vehicle”) as is set forth and approved on the AUTHORIZATION FOR ASSIGNMENT FORM

In consideration of being assigned use of a Company Vehicle, Employee agrees to the following:

1. Employee will not use the Company Vehicle for personal use. .
2. Employee will follow all rules and requirements set forth in the Company’s Motor Vehicle Use Policy, a copy of which Employee has received;
3. Employee certifies that Employee has automobile insurance on a personal vehicle of Employee, Employee has provided to Company a copy of such insurance, and a copy is attached to this agreement;
4. Employee agrees that for any claims for damage, injury or death related to Employee’s operation of the Company Vehicle while operating the vehicle on non-company business (personal use), that Employee’s own personal automobile liability insurance will be primary and will pay the claim **FIRST AND BEFORE** any insurance of Company. In the event that Employee fails to secure and maintain personal automobile insurance coverage and there is a claim for damage or injury related to Employee’s operation of the vehicle for personal use, the Employee will then be responsible and accepts liability for any claims paid by Company up to the minimum limits of insurance required in the state of the Employee’s permanent residence.
5. Employee understands that violation of this Agreement or any policy or provision or rule contained in the Motor Vehicle Use Policy or any other Policy of the Company will subject the Employee to discipline including the potential loss of driving privileges for the Company or suspension or termination.

I am a person who is able to read in English and I have read this document and agree to all of its terms and conditions. I understand that the privilege to be assigned a Company Vehicle to take home can be withdrawn by the Company at any time for any reason (and without cause) with notice to me. I agree to comply with return of the vehicle when requested by the Company.

Employee _____
 Date: _____
 Address: _____
 Phone: _____

COMPANY Supervisor / Manager:
 Name (Print & Sign): _____ Date: _____

FAX A COPY OF THIS FORM TO THE EQUIPMENT DIVISION IN FINDLAY, OHIO @ 419-425-6295. ALSO NOTE THAT THE AUTHORIZED EMPLOYEE AND THE AUTHORIZING MANAGER IS RESPONSIBLE FOR MAINTAINING COPIES OF THIS FORM FOR FUTURE REFERENCE AND AUDITING.

DO NOT FAX THIS FORM TO THE BATON ROUGE H & S RECORDS DEPARTMENT



UNCONTROLLED WHEN PRINTED

PROCEDURE

Subject: Commercial Motor Vehicle Regulations and DOT Compliance

1.0 PURPOSE AND SUMMARY

The objective of this policy is to outline the policies and procedures that govern Commercial Motor Vehicle Regulations and Department of Transportation (DOT) Compliance for the operation of commercial motor vehicles used for Company business. All operators of Company owned, leased, rented and personal vehicles are required to comply with this policy in conjunction with policy HS800.

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
- 4.0 Definitions
- 5.0 Policy
- 6.0 Procedure
- 7.0 Exception Provision
- 8.0 Cross References
- 9.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

- 3.1.1 The Vice President of Health & Safety is responsible for the issuance, revision and maintenance of this procedure.

3.2 Action/Approval Responsibilities

- 3.2.1 See Responsibility Matrix, Attachment 1

4.0 DEFINITIONS

4.1 General

- 4.1.1 General definitions can be found in DOT Regulations 49 CFR 390.5. Other definitions can be found at the beginning of the regulatory reference for each section of this procedure.
- 4.1.2 In accordance with FMCSR 390.5(a): "Commercial motor vehicle means any self-propelled or towed vehicle used on public highways in interstate commerce to transport passengers or property when...the vehicle has a gross weight rating or gross combination weight rating of 10,001 or more pounds"
- 4.1.3 CMV = Commercial Motor Vehicle
- 4.1.4 CDL = Commercial Drivers License
- 4.1.5 DOT = Department of Transportation
- 4.1.6 FMCSR = Federal Motor Carrier Safety Regulations
- 4.1.7 CFR = Commercial Federal Regulations

4.2 **Commercial Motor Vehicle Requiring CDL Driver**

- 4.2.1 In accordance with Federal Motor Carrier Safety Regulations (FMCSR) 383.91, there are three vehicle classes which require CDL drivers. The three Commercial Motor Vehicle (CMV) classes are defined as follows:

Class A - "Any combination of vehicles with a GCWR of 26,001 or more pounds provided the GVWR of the vehicle(s) being towed is in excess of 10,000 pounds. (Holders of a Class A license may, with any appropriate endorsements, operate all vehicles within Classes B and C.)"

Class B - "Any single vehicle with a GVWR of 26,001 or more pounds, or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR (Holders of a Class B license may, with any appropriate endorsements, operate all vehicles within Class C.)"

Class C - "Any single vehicle, or combination of vehicles, that does not meet the definition of Class A or Class B as contained herein, but that either is designed to transport 16 or more passengers including the driver, or is placarded for hazardous materials."

- 4.2.2 All CDL drivers must:
- Meet or exceed the minimum requirements per the DOT regulations
 - Provide in a timely manner all required documentation to the DOT Compliance Administrator Findlay, OH. The Drivers Qualification (DQ) File will be approved, maintained and updated by the DOT Compliance Administrator
 - Submit completed **Driver's Daily Logs** which are required to agree with Daily Time Cards. Driver's Daily Logs are to be submitted weekly to the DOT Compliance Administrator Findlay, OH
 - Hold a valid Commercial Driver's License (CDL)

4.3 **Commercial Motor Vehicle NOT Requiring CDL Driver**

- 4.3.1 The CMV described in 4.1.2 is not covered in FMCSR 383.91 and thus would not require a driver to hold a CDL. However, since the vehicle is considered a CMV by the CFR, any employee operating such a vehicle must:
- Meet or exceed the minimum requirements per the DOT regulations
 - Provide in a timely manner all required documentation to the DOT Compliance Administrator Findlay, OH. The Drivers Qualification (DQ) File will be approved, maintained and updated by the DOT Compliance Administrator
 - Submit completed **Driver's Daily Logs** which are required to agree with Daily Time Cards. Driver's Daily Logs are to be submitted weekly to the DOT Compliance Administrator Findlay, OH
 - Hold a valid Driver's License

5.0 **POLICY**

This policy enforces the Department of Transportation (DOT) regulations; FMCSR = Federal Motor Carrier Safety Regulations and CFR = Commercial Federal Regulations regarding the operation and maintenance of commercial motor vehicles. Requirements are based upon



interstate activity, activity in non-agreement states and **intrastate** drug and alcohol testing. Shaw employees are authorized to use applicable state regulations for **intrastate** activity, but must fully comply with Federal regulations whenever an **intrastate** unit engages in **interstate** activity. All Commercial Motor Vehicle drivers **must** contact both;

- 5.1 DOT Compliance Administrator in Findlay, OH for DOT compliance and training
- 5.2 Corporate Health & Safety in Baton Rouge, LA for required enrollment in the random drug testing program

6.0 PROCEDURE

6.1 General Requirements

- 6.1.1 All locations operating commercial motor vehicles shall maintain a current copy of the Federal Motor Carrier Safety Regulations (FMCSR) and the Hazardous Materials Regulations (HMR), both of which are found in Title 49 of the Commercial Federal Regulations.
- 6.1.2 Training requirements for all drivers include attending these training classes:
 - Safe Driver Training (SDT)
 - Hazardous Waste Hauling (HWH)
 - Vacuum Truck Safety Training (VTST) (Note: Vacuum truck operators only)
 - Defensive Driving refresher training is required every two (2) years
- 6.1.3 All locations operating commercial motor vehicles shall include safe commercial motor vehicle operation in their safety incentive and awareness programs
- 6.1.4 All locations operating commercial motor vehicles shall monitor overall compliance in accordance with:
 - HS021; Accident Prevention Program: Management Safety Audits and Inspections
 - HS018; Safety Councils
- 6.1.5 A person is qualified to operate a commercial motor vehicle if they
 - are at least 21 years old;
 - can read and speak the English language sufficiently to converse with the general public, to understand highway traffic signs and signals in the English language, to respond to official inquiries, and make entries on reports and records;
 - can by reason of experience and training safely operate the type of motor vehicle he or she drives
 - can by reason of experience and training determine whether the cargo to be transported has been properly stored, distributed and secured in or on the motor vehicle;
 - are familiar with methods and procedures for securing cargo in or on the motor vehicle; and
 - have a complete and current Driver Qualification File (DQ) with the DOT Compliance Administrator Findlay, OH. (see Section 6.4)

6.2 Motor Carrier Insurance and Financial Responsibility



- 6.2.1 Corporate Risk Management shall provide and maintain insurance and financial responsibility information as required by 49 CFR 387.
- 6.2.2 Corporate Risk Management shall execute DOT MCS90, with a copy forwarded to the DOT Compliance Administrator Findlay, OH.
- 6.2.3 See 49 CFR 387 for additional regulations.

6.3 Accident Notification and Reporting

- 6.3.1 All accidents and near misses shall be reported in accordance with:
 - HS020; Accident Prevention Program: Reporting, Investigation and Review
 - HS091; Serious Injury and Fatality Reporting Requirements
 - Monthly Loss Reports
- 6.3.2 Commercial Federal Regulations require that motor carriers maintain, for a period of one year after an accident occurs, an "Accident Register" containing specific information. This applies to all commercial vehicle accidents. Corporate Health & Safety will maintain the Register. The Register must include: date and time of accident, city/state, driver's name, number of injuries and/or fatalities, and whether hazardous materials other than fuel were released. Motor carriers are also required to maintain copies of all accident reports required by State and/or other governmental entities or insurers. **Motor carriers must continue to retain copies of all accident reports previously submitted to FHWA for a period of three (3) years after the date of the accident.** (49 CFR 390, Subpart A)
- 6.3.3 Corporate Health & Safety must be notified by telephone or fax of all commercial vehicle accidents within 24 hours, or not later than the next business day. Per HS020 the **Vehicle Accident Report** shall be used.
- 6.3.4 The Accident Register shall include the most reliable information on "reportable accidents" available to the motor carrier. A "reportable accident" means an occurrence involving a commercial motor vehicle operating on a public road which results in:
 - A fatality; defined as any injury which results in the death of a person at the time of the motor vehicle accident or within 30 days of the accident
 - Bodily injury to a person who, as a result of the injury, immediately receives medical treatment away from the scene of the accident; or
 - One or more vehicles incurring disabling damage as a result of the accident, requiring the vehicle(s) to be transported away from the scene by a tow truck or other vehicle
- 6.3.5 The term "accident" does **not** include:
 - An occurrence involving only boarding and alighting from a stationary motor vehicle;
 - An occurrence involving only the loading or unloading of cargo; or
 - An occurrence in the course of the operation of a passenger car or a multipurpose passenger vehicle (as defined in 571.3 of 49 CFR) by a motor carrier and is not transporting passengers for hire or hazardous materials of a type and quantity that require the motor vehicle to be marked or placarded in accordance with 177.823 of 49 CFR.



6.3.6 "Disabling damage" means damage which precludes departure of a motor vehicle from the scene of the accident in its usual manner in daylight after simple repairs.

6.3.6.1 Inclusions

- Damage to motor vehicles that could have been driven, but would have been further damaged if so driven

6.3.6.2 Exclusions:

- Damage which can be remedied temporarily at the scene of the accident without special tools or parts;
- Tire disablement without other damage even if no spare tire is available;
- Damage to turn signals, horn or windshield wipers which make them inoperative.

6.3.7 All Vehicle Accident Reports shall include the most reliable information available to the motor carrier on the following subjects:

- Date of accident;
- Time of accident;
- Location (city, state) of the accident;
- Name of driver;
- Number of persons injured;
- Number of persons killed; and
- Whether hazardous materials were released (other than fuel).

6.3.8 Follow-up action with drivers involved with vehicle accidents shall be per HS800 Motor Vehicle Operation: General Requirements and the Shaw progressive discipline system.

6.3.9 See 49 CFR 390 for additional regulations.

6.4 **Qualifications of Drivers**

6.4.1 All hiring of drivers shall be done in accordance with the requirements of HS800 Motor Vehicle Operation: General Requirements and 49 CFR 391.

6.4.2 All prospective drivers shall be interviewed to verify the accuracy of information on the application.

6.4.3 All prospective drivers shall be required to show proof of current automobile insurance prior to hiring.

6.4.4 All locations shall track and verify that the following driver documents are current: Driver's License, Driver's Certification of Violations, Annual Review of Driving Record and Medical. **The Employee's Records Expiration Dates form** may be used for this purpose.

6.4.5 Prior to being allowed to operate a commercial motor vehicle, all drivers will be required to provide a **Driver Qualification File** with the following requirements to the DOT Compliance Administrator, Findlay, OH and their Home Terminal.

6.4.5.1 Driver Qualification File - Commercial Drivers License (CDL)

- **Combination Vehicle (Class A)** - Any combination of vehicles with a Gross Combination Weight Rating (GCWR) of 26,001 or more pounds provided the GVWR of the vehicle(s) being towed is in excess of 10,000 pounds.
- **Heavy Straight Vehicle (Class B)** - Any single vehicle with a GVWR of 26,001 or more pounds, or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR.
- **Small Vehicle (Class C)** - Any single vehicle, or combination of vehicles, that meets neither the definition of Class A nor that of Class B as contained in this section, but that either is designed to transport 16 or more passengers including the driver, or is used in the transportation of materials found to be hazardous for the purposes of the Hazardous Materials Transportation Act and which require the motor vehicle to be placarded under the Hazardous Materials Regulations (49 CFR Part 172, Subpart F).
- (See 49 CFR 383.91 Figure 1 for additional regulations on vehicles and CDL Classes.)

6.4.5.2 **Driver Qualification File - Driver's License** - A driver operating a combination vehicle with a gross combined weight rating exceeding 10,001 pounds, but never operating a vehicle in one of the CDL classes (A,B,C), may perform these duties with a valid driver's license. No CDL is required.

6.4.5.3 Driver Qualification File – Additional Requirements

- Receipt for Federal Motor Carrier Safety Regulations (FMCSR)
- Application for Employment
- DOT Driver Supplemental Application for Employment
- Driver's Road Test Examination
- Written Examination - This exam will be reviewed by the examiner and incorrect responses will be reviewed and corrected with the driver. Examiner and driver shall initial test when complete.
- Certification of Road Test and Written Examination - A copy of this form must be provided to the driver.
- Annual Driver's Certification of Violations
- Inquiry to Previous Employers - This form pertains to experience operating commercial motor vehicles.
- Alcohol & Controlled Substance Test Information Inquiry to Previous Employers - This is a Federal requirement which went into effective January 1, 1995. Whereas the Inquiry to Previous Employers regarding experience does not require a response, this form requires a response from the previous employer with 14 days of the driver being qualified. If a response is not received within the specified time, the driver is automatically disqualified.
- Periodic inquiry to State Agencies for Driver's Record
- Annual Review of Driving Record.
- Driver Data Sheet



- Medical Examiner's Certificate - The certificate must be signed by the driver and Shaw's Medical Review Officer. A copy must also be provided to the driver.
- DOT Long Form
- Medical Clearance and Drug and Alcohol Test Report
- **NOTE:** All drug and alcohol test results for commercial drivers must be retained with DOT Compliance Administrator, Findlay, OH and Health and Safety, Baton Rouge, LA. Medical Clearance must be endorsed for DOT and signed on back by supervisor and driver. DOT requires examination every two years. Shaw requires examination every year due to hazardous waste operations duties. Also note that issuance of medical clearance signifies a negative drug test result for baseline and update exams. See Shaw HS100 Medical Policies and HS101 Drug and Alcohol Testing for further information.
- Vehicle Types - This list details which vehicles a driver is qualified and/or authorized to operate based on his CDL class and endorsements. Applicable to all states.
- Certification of Drug and Alcohol Awareness Training

6.5 Driving of Motor Vehicles

- 6.5.1 Use, possession, or sale of drugs, alcohol, or other illicit substances is generally prohibited. Specific procedures are found in HR024 Illegal Drugs, Alcohol, and Other Substances and HS101 Drug and Alcohol Testing.
- 6.5.2 Authorized passengers are limited to employees of Shaw and those subcontractor, client or regulatory personnel who are integral in performing a project task.
- 6.5.3 Management shall monitor compliance with speed laws by reviewing daily miles of operation versus actual driving time. Runs in excess of 500 miles shall have documentation attached that speed laws and hours of service rules were not violated (e.g. areas where speed laws exceed 55 mph).
- 6.5.4 See 49 CFR 392 for additional regulations.

6.6 Inspection, Repair, and Maintenance

- 6.6.1 All commercial motor vehicles shall be included in a scheduled preventive maintenance program. Service intervals shall be in terms of miles or hours of operation. Service intervals and service requirements shall be per the manufacturer's recommendations with manufacturer recommendations documented in the Vehicle Maintenance File in Findlay.
- 6.6.2 Whenever manufacturer service recommendations either fail to cover company's utilization of the equipment or are unavailable, preventative maintenance shall be done in accordance with Shaw Procedure EQ008, Repairs and Maintenance.
- 6.6.3 All drivers operating a commercial motor vehicle shall conduct and document a pre-trip inspection in accordance with 49 CFR 396.13 and a post-trip inspection in accordance with 49 CFR 396.11 using the **Driver's Daily Vehicle Inspection Report**. No vehicle shall be operated unless the following parts and accessories

are in good working order: service brakes (including trailer brake connections), parking brake, steering mechanism, lighting devices and reflectors, tires, horn, windshield wiper(s), rear-vision mirror(s) and coupling devices, wheels and rims and emergency equipment. When there is a defect or deficiency which would likely affect the safety operation of the vehicle, a copy is required to be submitted to the Maintenance Service Manager and the original is to remain with the vehicle until correction is performed.

- 6.6.4 When repairs are needed, a **Work Order Request Form** will be completed. Upon approval of the needed repair, the work will be performed in accordance with manufacturer service recommendations. Once the work is complete, the mechanic will record on the **Work Order Form** the work that was performed and will file the form in the Vehicle Maintenance File Findlay, OH. The agent performing the repairs will sign the original **Driver's Daily Vehicle Inspection Report** in the vehicle. The on-coming driver shall verify that repairs have been made, sign the **Driver's Daily Vehicle Inspection Report** and forward the original to the DOT Compliance Administrator Findlay, OH with a copy forwarded to Maintenance Department Findlay, OH. In conjunction with, the **Driver's Daily Vehicle Inspection Report** for long-term projects, a **Weekly Vehicle Inspection Form** may be completed.
- 6.6.5 All **Driver's Daily Vehicle Inspection Reports** shall be forwarded to the DOT Compliance Administrator Findlay, OH not later than the twentieth day of the following month, and retained there for three months.
- 6.6.6 All Commercial Motor Vehicles shall be subject to an annual safety inspection in accordance with 49 CFR 396.17. A copy of this inspection shall be forwarded to the DOT Compliance Administrator and Maintenance Department Findlay, OH. Note that the vehicle must carry a copy of the inspection and be marked with a sticker/decal displaying the information required in 49 CFR 396.17(c)(2).
- 6.6.7 A limited safety inspection is required no less often than 90 days.
- 6.6.8 Inspectors shall meet the qualification requirements in 49 CFR 396.19. The DOT Compliance Administrator is responsible to approve qualified inspectors per DOT requirements upon completion of the **Inspector Qualifications Form**. Certification of qualifications must be on file with DOT Compliance Administrator Findlay, OH.
- 6.6.9 Brake inspectors shall meet the qualification requirement in 49 CFR 396.25, which generally includes completion of an approved training program or one year of documented experience. The DOT Compliance Administrator is responsible to approve qualified inspectors per DOT requirements upon completion of the **Brake Inspector Qualifications Form**. Any driver making brake adjustments must also have certification of qualifications on file with DOT Compliance Administrator Findlay, OH.
- 6.6.10 Where an outside vendor is used for inspection and repair, DOT Compliance Administrator Findlay, OH shall verify that the vendor understands and will comply with inspector qualification requirements.



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- 6.6.11 The **Vehicle Service and Maintenance Record Form** shall be used to check completeness of Vehicle Maintenance File Findlay, OH.
 - 6.6.12 49 CFR 396.9 must be complied with in determining the service status of all commercial motor vehicles. Vehicles shall be marked out-of-service that would result in its mechanical breakdown or affect the safety of operation of the vehicle. Any vehicle identified as out-of-service will not be operated until such repairs have been performed.
 - 6.6.13 All cargo tanks shall have a copy of the manufacturer's data report and required recertification in the maintenance file. Qualifications for recertification vendors shall be on file with the DOT Compliance Administrator. Recertification requirements can be found in 49 CFR 180.
 - 6.6.14 All exempt vehicles or trailers are required to carry a copy of the exemption within in the trailer.

6.7 **Hours of Service of Drivers**

- 6.7.1 Drivers shall not operate a commercial motor vehicle under the following conditions:
 - More than 11 hours following 10 consecutive hours off-duty;
 - For any period after having been on duty for 14 hours; or
 - For any period after having been on duty for 70 hours during the period of eight consecutive days with the eighth day being the current date.
 - A driver may restart a 7 and or 8 consecutive day period after taking 34 or more consecutive hours off duty.
- 6.7.2 All drivers shall record their duty status on the Driver's Daily Log (see DOT Manual), including recap. Logs shall be completely filled out and submitted to home terminal management daily, or no less often than every 13 days for extended trips. Note that a driver's daily log must match a driver's timesheet but cannot replace a time card.
- 6.7.3 Local management shall carefully review all Drivers' Daily Logs. They shall require the driver to correct any errors, and take follow-up action (training or progressive discipline) where regulations or company procedures have been violated.
- 6.7.4 Dispatchers shall track driver's hours of service via the driver's recap for local service and via recap and daily phone calls during extended trips.
- 6.7.5 The DOT Log Book Compliance Checklist shall be used by management to review Driver's Daily Logs.
- 6.7.6 All original Drivers' Daily Logs are to be forwarded to the DOT Compliance Administrator in Findlay by the twentieth day of the following month, and retained there for six months. Copies must also be retained at the local office for six months.
- 6.7.7 See 49 CFR 395 for additional regulations.

6.8 **Transportation of Hazardous Materials Driving and Parking Rules**



- 6.8.1 A motor vehicle containing hazardous materials must not be operated near an open fire unless its driver has first taken precautions to ascertain that the vehicle can safely pass the fire without stopping.
- 6.8.2 A motor vehicle containing hazardous materials must not be parked within 300 feet of an open fire.
- 6.8.3 No person may smoke or carry a lighted cigarette, cigar, or pipe on or within 25 feet of:
- A motor vehicle which contains explosives, oxidizing materials, or flammable materials; or
 - An empty tank motor vehicle which has been used to transport flammable liquids or gases and which, when so used, was required to be marked or placarded in accordance with the rules in subsection 177.823 or 49 CFR.
- 6.8.4 When a motor vehicle which contains hazardous materials is being fueled:
- Its engine must not be operating, and
 - A person must be in control of the fueling process at the point where the fuel tank is filled.
- 6.8.5 A motor vehicle transporting hazardous materials of a kind or quantity that require the vehicle to be marked or placarded in accordance with subsection 177.823 of 49 CFR must also display the information required in subsection 390.21 of 49 CFR, including USDOT 197183 (the Shaw DOT number).
- 6.8.6 Special consideration shall be given to avoidance of heavily populated areas when hauling hazardous material/waste loads.
- 6.9 **Carriage by Public Highway**
- 6.9.1 All loads of hazardous materials or hazardous wastes shall be accompanied by shipping papers or hazardous waste manifest, respectively. These documents shall be prepared in accordance with 49 CFR 177.817 and 49 CFR 172 Subpart C. All documents shall be retained for at least three years. Shipping documents using any generic descriptions (e.g. "n.o.s.") must also contain the technical name of the hazardous substance in parentheses following the basic description.
- 6.9.2 Shipping documents shall be within the drivers reach and readily visible. When the driver is out of the cab, they shall be in the driver's door pocket or on the driver's seat.
- 6.9.3 All hazardous materials/wastes loads shall be marked, labeled, and placarded in accordance with 49 CFR 192 Subparts D, E, and F, respectively.
- 6.9.4 All hazardous materials/wastes loads shall be reported and segregated in accordance with 49 CFR 177.848.
- 6.9.5 Spill incidents meeting any of the criteria listed below shall be reported to the DOT Compliance Administrator on DOT Form F 5800.1 (Attachment 2):
- Any quantity of hazardous waste,
 - A reportable quantity (RQ) of hazardous material,



***** Criteria listed below require immediate phone notification *****

- A fatal injury or hospitalization occurs;
- Property damage exceeds \$50,000;
- Radioactive materials are spilled;
- The general public is evacuated for more than one hour; or
- Etiologic agent(s) are discharged.

6.9.6 49 CFR 177 for additional regulations.

7.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with procedure HS013 Health & Safety Procedure Variances.

8.0 CROSS REFERENCES

HS018 Safety Councils
HS020 Accident Prevention Program: Reporting, Investigation and Review
HS021 Accident Prevention Program: Management Safety Audits and Inspections
HS091 Serious Injury and Fatality Reporting Requirements
HS100 Medical Policies
HS101 Drug and Alcohol Testing
HS800 Motor Vehicle Operation: General Requirements
EQ008 Repair and Maintenance
DOT DOT Forms in DOT Manual

9.0 ATTACHMENTS

Attachment 1 Responsibility Matrix
Attachment 2 Hazardous Materials Incident Report (Form DOT F 5800.1)



ATTACHMENT 1
COMMERCIAL MOTOR VEHICLE OPERATION AND MAINTENANCE

Responsibility Matrix

Action	Procedure Section	Responsible Party			
		DOT Administrator	Risk Mgmt. Dept.	Corporate HS	Driver
Verify driver meets general requirements, including training	6.1	X		X	
Maintain statutory financial responsibility	6.2		X		
Accident Reporting: Internal	6.3	X			X
Accident Reporting: External	6.3			X	
Document driver qualification: Establish DQ file	6.4	X			
Maintain DQ file	6.4	X			
Monitor driver performance	6.5	X			
Maintain, inspect and service vehicles, and document (retain working copy)	6.6	X			
Hold maintenance documents	6.6	X			
Verify drivers comply with and document hours of service requirements	6.7	X			
Hold Drivers Daily Logs for 374 days	6.7	X			



**ATTACHMENT 2
 HAZARDOUS MATERIALS INCIDENT FORM**

DEPARTMENT OF TRANSPORTATION Form Approved DMB No. 2137 0039 HAZARDOUS MATERIALS INCIDENT REPORT				
INSTRUCTIONS: Submit this report in duplicate to the Information Systems Manager, Office of Hazardous Materials Transportation, DHM-63, Research and Special Programs Administration, U.S. Department of Transportation, Washington, D.C. 20590. If space provided for any item is inadequate, complete that item under Section IX, keying to the entry number being completed. Copies of this form, in limited quantities, may be obtained from the Information Systems Manager, Office of Hazardous Materials Transportation. Additional copies in this prescribed format may be reproduced and used, if on the same size and kind of paper.				
I. MODE, DATE, AND LOCATION OF INCIDENT				
1. MODE OF TRANSPORTATION <input type="checkbox"/> Air <input type="checkbox"/> Highway <input type="checkbox"/> Rail <input type="checkbox"/> Water <input type="checkbox"/> Other				
2. DATE AND TIME OF INCIDENT (Use Military time [e.g., 8:30 am=0830, Noon=1200, 6 pm=1800, Midnight=2400]) Date: _____ Time: _____				
3. LOCATION OF INCIDENT (Include airport name in ROUTE/STREET if incident occurs at an airport.) CITY: _____ STATE: _____ COUNTY: _____ ROUTE/STREET: _____				
II. DESCRIPTION OF CARRIER, COMPANY, OR INDIVIDUAL REPORTING				
4. FULL NAME			5. ADDRESS (Principal place of business)	
6. LIST YOUR OMC MOTOR CARRIER CENSUS NUMBER, REPORTING RAILROAD ALPHABETIC CODE, MERCHANT VESSEL NAME AND ID NUMBER OR OTHER REPORTING CODE OR NUMBER.				
III. SHIPMENT INFORMATION (From Shipping Paper or Packaging)				
7. SHIPPER NAME AND ADDRESS (Principal place of business)			8. CONSIGNEE NAME AND ADDRESS (Principal place of business)	
9. ORIGIN ADDRESS (If different from Shipper address)			10. DESTINATION ADDRESS (If different from Consignee address)	
11. SHIPPING PAPER/WAYBILL IDENTIFICATION NO.				
IV. HAZARDOUS MATERIAL(S) SPILLED (NOTE: REFERENCE 49 CFR SECTION 172.101.)				
12. PROPER SHIPPING NAME		13. CHEMICAL/TRADE NAME	14. HAZARD CLASS	15. IDENTIFICATION NO. (i.e., UN 2020)
16. IS MATERIAL A HAZARDOUS SUBSTANCE? <input type="checkbox"/> YES <input type="checkbox"/> NO			17. WAS THE RO MET? <input type="checkbox"/> YES <input type="checkbox"/> NO	
18. ESTIMATED QUANTITY HAZARDOUS MATERIAL RELEASED (Include measurement)		19. FATALITIES	20. HOSPITALIZED	21. NON-LIZED INJURIES
22. NUMBER OF PEOPLE EVACUATED				
23. ESTIMATED DOLLAR AMOUNT OF LOSS AND/OR PROPERTY DAMAGE, INCLUDING COST OF DECONTAMINATION OR CLEANUP (Round off in dollars):				
A. PRODUCT LOSS	B. CARRIER DAMAGE	C. PUBLIC/PRIVATE PROPERTY DAMAGE	D. DECONTAMINATION/ CLEANUP	E. OTHER
24. CONSEQUENCES ASSOCIATED WITH INCIDENT: <input type="checkbox"/> VAPOR (GAS) DISPERSION <input type="checkbox"/> MATERIAL ENTERED				



<input type="checkbox"/> SPILLAGE	<input type="checkbox"/> FIRE	WATERWAY SEWER	<input type="checkbox"/> EXPLOSION	<input type="checkbox"/>
			ENVIRONMENTAL DAMAGE	
			<input type="checkbox"/> NONE	<input type="checkbox"/>
			OTHER	

VI. TRANSPORT ENVIRONMENT

25. INDICATE TYPE(S) OF VEHICLE(S) INVOLVED: <input type="checkbox"/> TANK CAR <input type="checkbox"/> RAIL CAR	<input type="checkbox"/> CARGO TANK <input type="checkbox"/> TOFC/COFC <input type="checkbox"/> OTHER _____	<input type="checkbox"/> VAN TRUCK/TRAILER <input type="checkbox"/> AIRCRAFT	<input type="checkbox"/> FLAT BED TRUCK TRAILER <input type="checkbox"/> BARGE	<input type="checkbox"/> SHIP
26. TRANSPORTATION PHASE DURING WHICH INCIDENT OCCURRED OR WAS DISCOVERED: <input type="checkbox"/> EN ROUTE BETWEEN ORIGIN/DESTINATION		<input type="checkbox"/> LOADING		<input type="checkbox"/> UNLOADING
27. LAND USE AT INCIDENT SITE: <input type="checkbox"/> INDUSTRIAL		<input type="checkbox"/> COMMERCIAL <input type="checkbox"/> AGRICULTURAL <input type="checkbox"/> UNDEVELOPED		<input type="checkbox"/> RESIDENTIAL <input type="checkbox"/>
28. COMMUNITY TYPE AT SITE:		<input type="checkbox"/> URBAN	<input type="checkbox"/> SUBURBAN	<input type="checkbox"/> RURAL
29. WAS THE SPILL THE RESULT OF A VEHICLE ACCIDENT/DERAILMENT? IF YES AND APPLICABLE, ANSWER PARTS A THRU C.		<input type="checkbox"/> YES	<input type="checkbox"/> NO	

A. ESTIMATED SPEED:	B. HIGHWAY TYPE: <input type="checkbox"/> DIVIDED/LIMITED ACCESS <input type="checkbox"/> UNDIVIDED	C. TOTAL NUMBER OF LANES: [] ONE [] THREE [] TWO [] FOUR OR MORE	SPACE FOR DOT USE ONLY
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VII. PACKAGING INFORMATION: If the package is overpacked (consists of several packages [e.g., glass jars within a fiberboard box]), begin with A for information on the innermost package.

ITEM	A	B	C
30. TYPE OF PACKAGING. INCLUDE INNER RECEPTACLES (drum, tank car)			
31. CAPACITY OR WEIGHT PER UNIT PACKAGE (e.g., 55 gallons, 65 lbs.)			
32. NUMBER OF PACKAGES OF SAME TYPE WHICH FAILED CAL MANNER			
33. NUMBER OF PACKAGES OF SAME TYPE IN SHIPMENT			
34. PACKAGE SPECIFICATION IDENTIFICATION (e.g., DOT 17E, DOT 105A 100, UN1A1 or none)			
35. ANY OTHER PACKAGING MARKINGS (e.g., STC, 18/16-55-88, Y1.4/150/87)			
36. NAME AND ADDRESS, SYMBOL OR REGISTRATION OF PACKAGING MANUFACTURER			
37. SERIAL NUMBER OF CYLINDERS, PORTABLE TANKS, TANKS, TANK CARS			
38. TYPE OF LABELING OR PLACARDING APPLIED			
39. IF RECONDITIONED OR REPAIRED	A. REGISTRATION OR SYMBOL		
	B. DATE OF LAST TEST OR REPAIR		
40. EXEMPTION/APPROVAL/COMPETENT AUTHORITY			



IF APPLICABLE (e.g., DOT E1012)

<p>41. ACTION CONTRIBUTING TO PACKAGING FAILURE:</p> <p>A B C</p> <p>a. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> TRANSPORT VEHICLE COLLISION</p> <p>b. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> TRANSPORT VEHICLE OVERTURN</p> <p>c. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OVERLOADING/OVERFILLING</p> <p>d. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> LOOSE FITTINGS, VALVES</p> <p>e. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> DEFECTIVE FITTINGS, VALVES</p> <p>f. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> DROPPED</p> <p>g. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> STRUCK/RAMMED</p> <p>h. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> IMPROPER LOADING</p> <p>i. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> IMPROPER BLOCKING</p>	<p>42. OBJECT CAUSING FAILURE:</p> <p>A B C</p> <p>a. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OTHER FREIGHT</p> <p>b. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> FORKLIFT</p> <p>c. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> NAIL/PROTRUSION</p> <p>d. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OTHER TRANSPORT VEHICLE</p> <p>e. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> WATER/OTHER LIQUID</p> <p>f. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> GROUND/FLOOR/ROADWAY</p> <p>g. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ROADSIDE OBSTACLE</p> <p>h. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> NONE</p> <p>i. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OTHER</p>
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<p>43. HOW PACKAGE(S) FAILED:</p> <p>A B C</p> <p>a. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> PUNCTURED</p> <p>b. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> CRACKED</p> <p>c. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> BURST/INTERNAL PRESSURE</p> <p>d. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RIPPED</p> <p>e. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> CRUSHED</p> <p>f. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RUBBED/ABRADED</p> <p>g. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RUPTURED</p> <p>h. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OTHER_</p>	<p>44. PACKAGE AREA THAT FAILED:</p> <p>A B C</p> <p>a. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> END, FORWARD</p> <p>b. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> END, REAR</p> <p>c. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> SIDE, RIGHT</p> <p>d. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> SIDE, LEFT</p> <p>e. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> TOP</p> <p>f. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> BOTTOM</p> <p>g. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> CENTER</p> <p>h. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OTHER_</p>	<p>45. WHAT FAILED ON PACKAGE(S):</p> <p>A B C</p> <p>a. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> BASIC PACKAGE MATERIAL</p> <p>b. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> FITTING/VALVE</p> <p>c. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> CLOSURE</p> <p>d. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> CHIME</p> <p>e. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> WELD/SEAM</p> <p>f. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> HOSE/PIPING</p> <p>g. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> INNER LINER</p> <p>h. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> OTHER</p>
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IX. DESCRIPTION OF EVENTS: Describe the sequence of events that led to incident, action taken at time discovered, and action taken to prevent incidents. Include any recommendations to improve packaging, handling, or transportation of hazardous materials. Photographs and diagrams should be attached when necessary for clarification. ATTACH A COPY OF THE HAZARDOUS WASTE MANIFEST FOR INCIDENTS INVOLVING HAZARDOUS LIQUIDS. Continue on additional sheets if necessary.

46. NAME OF PERSON RESPONSIBLE FOR PREPARING REPORT (Please Print)	47. SIGNATURE	
48. TITLE OF PERSON RESPONSIBLE FOR PREPARING REPORT	49. TELEPHONE NUMBER (Area Code)	50. DATE REPORT SIGNED
	() -	

VIII. DESCRIPTION OF PACKAGING FAILURE: Check all applicable boxes for the package(s) identified above.

APPENDIX C

ACTIVITY HAZARD ANALYSES

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING

Analysis Completed By: **Kym Edelman, CSP**

Reviewed on: _____

Date: **December 2008**

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Clearing and Grubbing	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals 	Hard hat, safety glasses and steel toe work boots	
	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways, work areas of equipment, tools, vegetation, and debris • Clean mud and grease from your boots before mounting equipment. Watch for slippery/unstable ground when dismounting equipment • Exit equipment slowly and maintain three point contact 		
	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Use Dozer or Track hoe to move logs and brush 		
	Eye Injuries	<ul style="list-style-type: none"> • Wear face shield, goggles when operating powered clearing / grubbing equipment 	Face shield, goggles	

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING

Analysis Completed By: Kym Edelman, CSP

Reviewed on: _____

Date: December 2008

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use • Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation 	Leather gloves	
	Insect/ Snake Bites	<ul style="list-style-type: none"> • Review injury potential and types of snakes with workers • Avoid insect nests areas, likely habitats of snakes outside work areas • Emphasize The Buddy System where such injury potential exists • Use insect repellent, wear PPE to protect against sting/bite injuries 	Tyvek® coveralls (duct tape bottom of coveralls to boots)	
	Contact Dermatitis	<ul style="list-style-type: none"> • Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants • Identify and review poisonous plants with workers • Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions 	Tyvek® coveralls, (duct tape bottom of coveralls to boots)	

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING

Analysis Completed By: Kym Edelman, CSP

Reviewed on: _____

Date: December 2008

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
	Operations of power clearing tools (brush saws, weed whackers)	<ul style="list-style-type: none"> • .. Wear eye, face, hand & hearing protection when operating power clearing equipment • .. Shut-off / idle power tools walking between work areas • .. Store flammable liquids in well ventilated areas, away from work areas • .. Shut off equipment during re-fueling • .. Prohibit smoking while operating clearing equipment • .. Provide ABC (or equivalent) fire extinguishers for all work 	Full-face shield, goggles, leather work gloves, chainsaw chaps, (if applicable), hearing protection, and steel toe work boots	
	High Noise Levels	<ul style="list-style-type: none"> • .. Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) 	Hearing protection	
	High/Low Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration 		
	Inhalation and Contact with Hazardous Substance (particularly during grubbing) <ul style="list-style-type: none"> • Metals, • pesticides, • petroleum products 	<ul style="list-style-type: none"> • Review potential hazardous properties of site contaminants with workers before operations begin • Monitor breathing zone air and work area to determine levels of contaminants • Dampen soil using light water spray to prevent fugitive dust emission 	Tyvek® coveralls, leather work gloves. Boot covers if walking on contaminated soil.	

ACTIVITY HAZARD ANALYSIS FOR CLEARING AND GRUBBING

Analysis Completed By: Kym Edelman, CSP

Reviewed on: _____

Date: December 2008

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
EQUIPMENT REQUIRED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
<ul style="list-style-type: none"> • Excavator and/or dozer • Power clearing tools (brush saws, weed whackers) 		<ul style="list-style-type: none"> • Daily equipment inspections as per manufacturers requirements • Inspect all safety equipment (fire extinguishers, first aid kits and eye washes) 	<ul style="list-style-type: none"> • Review the Site Specific Health and Safety Plan and Addendum • Review AHA with all task personnel • Review operations/safety manuals for all equipment utilized • Review potential hazardous plants and insects/animals 	

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION

Analysis Completed By: Kym Edelman, CSP

Reviewed on: _____

Date: December 2008

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Excavation	Underground/ Overhead Utilities	<ul style="list-style-type: none"> • Identify all utilities around the site before work commences • Cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • Utility clearance shall conform with 29 CFR 1926.955 (high voltage >700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance • Refer to Shaw Health and Safety Procedure # HS308 		
	Excavation Wall Collapse	<ul style="list-style-type: none"> • Construct diversion ditches or dikes to prevent surface water from entering excavation • Provide good drainage of area adjacent to excavation • Collect ground water/rain water from excavation and dispose of properly • Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face • Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth • Place ladders no more than 25 feet apart laterally • Treat excavations over 4 feet deep as confined spaces • Complete confined space permit entry procedure • Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency • Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required • Assign a competent person to inspect, decide soil 	Hard hat, safety glasses, steel toe work boots	

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION

Analysis Completed By: **Kym Edelman, CSP**

Reviewed on: _____

Date: **December 2008**

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
		classification, proper sloping, the correct shoring, or sheeting <ul style="list-style-type: none"> • Inspect excavations (when personnel entry is required) daily, any time conditions change • Provide at least two means of exit for personnel working in excavations • Refer to Shaw Health and Safety Procedure # HS307 Excavation and Trenching 		
	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> • Wear reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals 	Warning vests, hard hat, safety glasses, steel toe work boots	
	Handling Heavy Objects	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use 	Leather gloves	

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION

Analysis Completed By: Kym Edelman, CSP

Reviewed on: _____

Date: December 2008

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions • Evaluate fall hazards above 4 ft.; use fall protection equipment (harness/lanyard), standard guardrails or other fall protection systems when working on elevated platforms above 6 ft. • Use heavy duty industrial (type IA) ladders • Install and inspect scaffolds according to manufacturers requirements • Only trained operators are permitted to use aerial lifts • Tie-off all straight/extension ladders or manually hold by co-worker at base • Anchorage points for fall arrest systems must support at least 5,400 pounds for each worker 		
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dB A over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dB A TWA 	Hearing protection	
	Inhalation, Ingestion and Contact with Hazardous Substances: <ul style="list-style-type: none"> • Metals, • pesticides, 	<ul style="list-style-type: none"> • Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Avoid unnecessary contact with contaminated materials • Review hazardous properties of site contaminants with workers before operations begin • Monitor breathing zone air to determine levels of contaminants 		

ACTIVITY HAZARD ANALYSIS FOR EXCAVATION

Analysis Completed By: Kym Edelman, CSP

Reviewed on: _____

Date: December 2008

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
	<ul style="list-style-type: none"> • petroleum products. 	<ul style="list-style-type: none"> • Dampen soil using light water spray to prevent fugitive dust emissions • Cover stockpiled soil with plastic sheeting to prevent fugitive dust emissions • Conduct air monitoring / sampling to determine exposure levels 		
	High/Low Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration 		
EQUIPMENT REQUIRED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
<ul style="list-style-type: none"> • Back hoe, Excavators • Dump trucks, other vehicles • Barriers/cones/flagging tape • Miscellaneous tools 		<ul style="list-style-type: none"> • Daily equipment inspections as per manufacturers requirements and forms • Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers, eye wash stations) 	<ul style="list-style-type: none"> • Review AHA with all task personnel • Review SSHP and Addendum • Review operations/safety manuals for all equipment utilized 	

ACTIVITY HAZARD ANALYSIS FOR PRE AND POST REMOVAL SURVEY ACTIVITIES

Analysis Completed By: Kym Edelman, CSP

Reviewed on: _____

Date: December 2008

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Survey of Site	Struck By/ Against Motor Vehicles/ Operating Equipment	<ul style="list-style-type: none"> • Wear reflective warning vests when exposed to vehicular traffic • Isolate potential equipment swing areas • Avoid/isolate survey activities in high traffic areas, warehouse ship/receive areas • Make eye contact with vehicle operators before approaching/crossing high traffic areas • Understand and review hand signals • Emphasize The Buddy System where injury potential exists 	Hard hat, safety glasses, steel toe work boots	
	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways, work areas of equipment and tools • Mark, identify, or barricade other obstructions 		
	Handling Heavy Objects	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe 	Leather gloves	

ACTIVITY HAZARD ANALYSIS FOR PRE AND POST REMOVAL SURVEY ACTIVITIES

Analysis Completed By: Kym Edelman, CSP

Reviewed on: _____

Date: December 2008

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
		condition <ul style="list-style-type: none"> • Keep guards in place during use • Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation 		
	Insect/ Animal Bites	<ul style="list-style-type: none"> • Review injury potential with workers • Avoid insect nests areas, habitats outside work areas • Emphasize The Buddy System where such injury potential exists • Use insect repellent to protect against sting injuries 	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	
	Contact Dermatitis	<ul style="list-style-type: none"> • Wear long sleeveshirts / trousers to avoid skin contact with plants or other skin irritants • Identify and review poisonous plants with workers • Avoid unnecessary clearing of plant/vegetation areas • Cover vegetation with plastic(visqueen) where survey position raises exposure potential • Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions 	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	
	High/Low Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat/Cold stress in accordance with Shaw Health and Safety Procedures # HS400, HS401 • Provide fluids to prevent worker dehydration 	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

ACTIVITY HAZARD ANALYSIS FOR PRE AND POST REMOVAL SURVEY ACTIVITIES

Analysis Completed By: Kym Edelman, CSP

Reviewed on: _____

Date: December 2008

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
		<ul style="list-style-type: none"> Follow work/rest schedule in SSHSP. 		
EQUIPMENT TO BE USED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
<ul style="list-style-type: none"> Survey Instruments Hand tools 		<ul style="list-style-type: none"> Equipment inspections Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers) 	<ul style="list-style-type: none"> Review SSHSP Review site-specific AHA with all task personnel 	

ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION

Analysis Completed By: Kym Edelman, CSP

Reviewed on: _____

Date: December 2008

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
Site Restoration	Struck by/ Against Heavy Equipment, Protruding Objects	<ul style="list-style-type: none"> • Wear 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 	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear, walkways of equipment, tools, debris, other materials • Mark, identify, or barricade other obstructions 		
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period) • Assess noise level with sound level meter if possibility exists that level may exceed 85dBA TWA 	Hearing protection	
	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits (60 lb. per person for manual lifting) • Use mechanical lifting equipment (hand carts, trucks) 		

ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION

Analysis Completed By: **Kym Edelman, CSP**

Reviewed on: _____

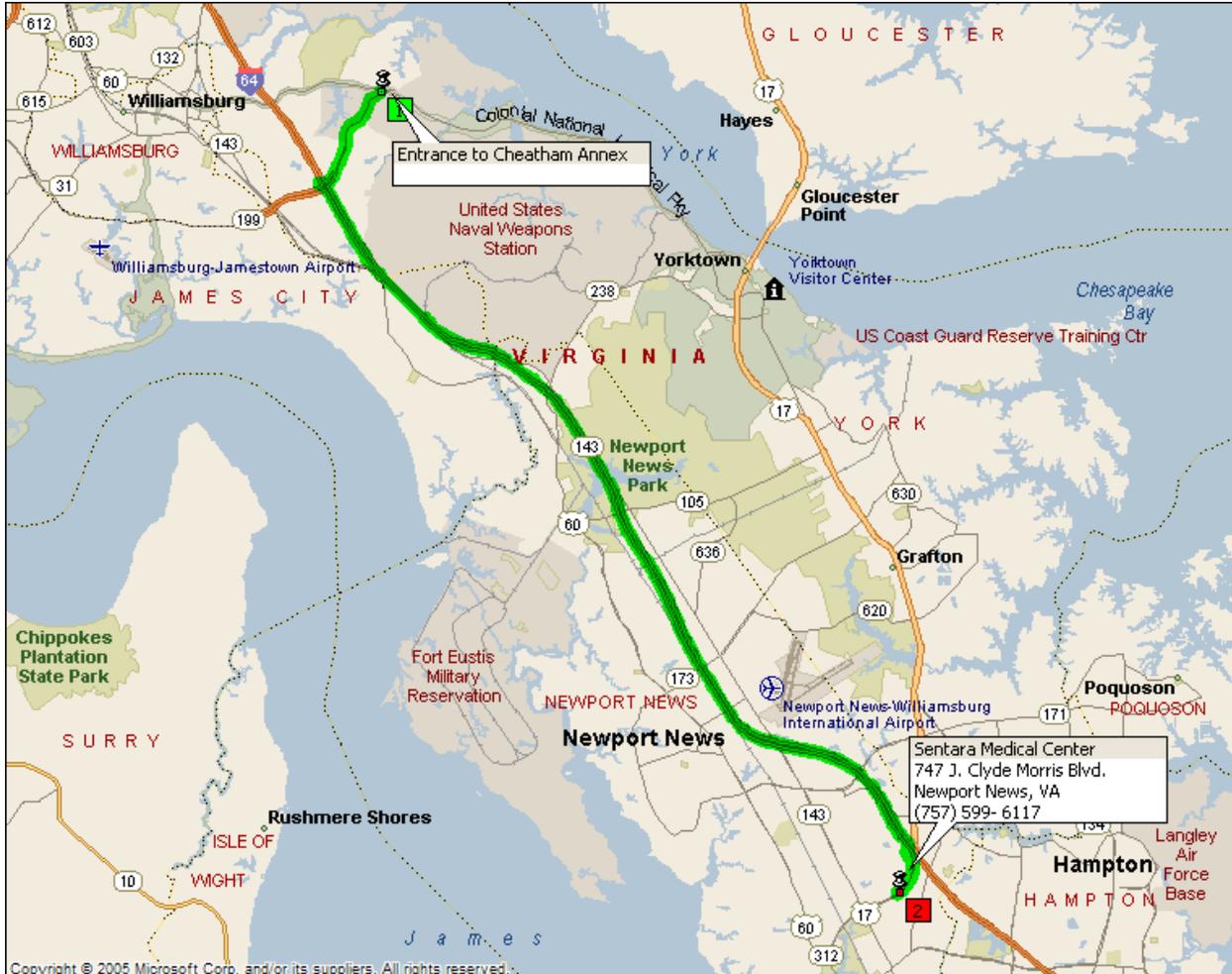
Date: **December 2008**

Reviewed by: _____

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment	Monitoring Devices
		to move large, awkward loads		
Site Restoration (continued)	High/Low Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat / Cold stress in accordance with Shaw Health and Safety Procedures HS400, HS401 • Provide fluids to prevent worker dehydration • Take adequate rest periods in a cool/warm shaded area • During rest breaks, replenish body fluids by drinking plenty of fluids (water and Gatorade type liquids). Do not drink caffeinated beverages • Remove PPE if possible during rest periods • Include plenty of salt in your food intake, however, do not take salt tablets 	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
EQUIPMENT TO BE USED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS	
<ul style="list-style-type: none"> • Bob Cat or Forklift for moving bulky loads • Grass Seed/Sod 		<ul style="list-style-type: none"> • Equipment inspections • Inspection of all emergency equipment (i.e.: first aid kits, fire extinguishers) 	<ul style="list-style-type: none"> • Review SSHSP • Review site-specific AHA with all task personnel 	

APPENDIX D
DIRECTIONS TO THE HEALTH RESOURCE CLINIC AND HOSPITAL

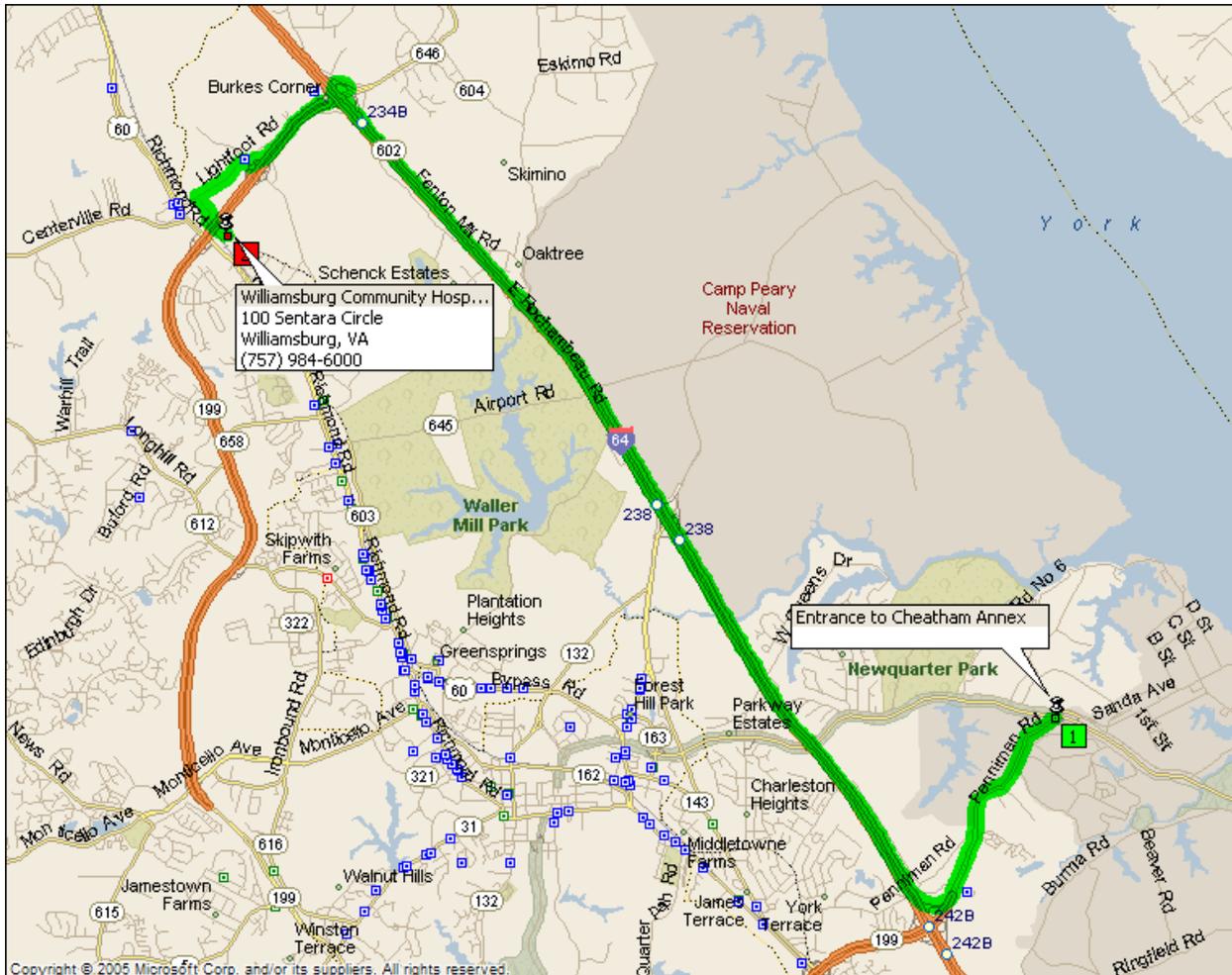
**Directions to Health Resource Clinic
 Sentara Medical Center
 747 J. Clyde Morris Blvd.
 Newport News, VA
 757-599-6117**



Summary: 21.8 miles (26 minutes)

Time	Mile	Instruction	For	Toward
9:00 AM	0.0	Depart near Queens Lake on Patrol Rd No 6 (South)	0.3 mi	
9:01 AM	0.3	Road name changes to D St	0.6 mi	
9:03 AM	0.9	Turn RIGHT (West) onto Sanda Ave	1.5 mi	
9:06 AM	2.4	Road name changes to Penniman Rd	1.2 mi	
9:08 AM	3.6	Bear RIGHT (South) onto SR-199	0.9 mi	
9:09 AM	4.5	Take Ramp (RIGHT) onto I-64	16.3 mi	I-64 / Newport News
9:24 AM	20.7	At exit 258A, take Ramp (RIGHT) onto US-17 [J Clyde Morris Blvd]	1.0 mi	US-17 / J Clyde Morris Boulevard
9:25 AM	21.8	Turn LEFT (South) onto Thimble Shoals Blvd, then immediately turn LEFT (East) onto US-17 [J Clyde Morris Blvd]	120 yds	
9:26 AM	21.8	Arrive 747 J Clyde Morris Blvd, Newport News, VA 23601		

Directions to Williamsburg Community Hospital
100 Sentara Circle
Williamsburg, Virginia 23188
757-984-6000



Summary: 12.2 miles (14 minutes)

Time	Mile	Instruction	For	Toward
9:00 AM	0.0	Depart near Queens Lake on Penniman Rd (South-West)	1.2 mi	
9:01 AM	1.2	Bear RIGHT (South) onto SR-199	0.6 mi	
9:02 AM	1.7	Take Ramp (RIGHT) onto I-64	8.2 mi	I-64 / Richmond
9:09 AM	10.0	At exit 234A, take Ramp (RIGHT) onto SR-646 [Newman Rd]	0.4 mi	VA-199 E / Lightfoot
9:10 AM	10.4	Road name changes to SR-199	0.6 mi	
9:11 AM	11.0	Turn RIGHT onto Ramp	0.2 mi	International Pkwy West / Lightfoot Rd
9:12 AM	11.2	Turn RIGHT (North-West) onto International Blvd, then immediately turn LEFT (South-West) onto Lightfoot Rd	0.5 mi	
9:13 AM	11.7	Turn LEFT (South-East) onto SR-603 [Mooretown Rd]	0.4 mi	
9:14 AM	12.2	Arrive near Lightfoot		

SUMMARY

Driving distance: 12.2 miles
 Trip duration: 14 minutes

APPENDIX E
HEALTH AND SAFETY PLAN
AMENDMENT DOCUMENTATION FORM

Amendment Documentation

Project Name:

Project No.

Amendment No.

Date:

The Amendment Addresses the Following Sections:

Task(s) Amendment Affects:

Reason For Amendment:

Amendment:

Completed by:

Approved by:

APPENDIX F

HURRICANE PREPAREDNESS PLAN



HURRICANE PREPAREDNESS PLAN

**SITE 11
HOT SPOT REMOVAL ACTION
NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA**

CONTRACT NO. N62470-02-D-3260

Prepared for:

**DEPARTMENT OF THE NAVY
NAVFAC MID-ATLANTIC
9742 Maryland Avenue
Norfolk, VA 23511**

Prepared by:

**SHAW ENVIRONMENTAL, INC.
500 East Main Street, Suite 1630
Norfolk, Virginia 23510**

**TASK ORDER 113
SHAW PROJECT NO. 128068**

FEBRUARY 2009

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ATTACHMENTS

ATTACHMENT A	Hurricane Preparedness Responsibility Checklists Hurricane Preparedness Checklist Condition V – Hurricane Preparedness Checklist Condition IV (Landfill within 72 hours) – Hurricane Preparedness Checklist Condition III (Landfill within 48 hours) – Hurricane Preparedness Checklist Condition II – Hurricane Preparedness Checklist Condition I – Hurricane Preparedness Checklist Resume Site Operations –Hurricane Preparedness Checklist
ATTACHMENT B	EMERGENCY PHONE NUMBERS
ATTACHMENT C	HURRICANE TRACKING MAP

1.0 INTRODUCTION

1.1 PURPOSE

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

1.2 SCOPE

This procedure is applicable to all contractor personnel, including Shaw's subcontractors, temporary construction facilities, and remediation equipment present at the NWS, Yorktown, Virginia sites.

1.3 DISCUSSION

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

The following table demonstrates that the accuracy of forecasting where a hurricane landfall will occur is very low more than 24 hours in advance of a storm.

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

2.0 DEFINITIONS

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

2.1 Conditions of Readiness (CORS)

Condition V - Destructive winds are possible at the NWS sites within 96 hours. Normal daily jobsite cleanup and good housekeeping practices.

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

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

Condition II - Destructive winds are possible at the NWS sites within 24 hours or a Small Area Storm is anticipated within 6 hours. Curtail or cease routine activities until securing operations are complete. Reinforce or remove form work and scaffolding. Secure machinery, tools, equipment and materials, or remove from job site. Expend every effort to clear all missile hazards and loose equipment from the jobsite. Contact client representative for weather and COR updates and completion of required actions.

Condition I - Destructive winds are possible at the NWS sites within 12 hours or a Small Area Storm is imminent within 1 hour. Perform and complete all remaining actions required for lower conditions of readiness. Secure the jobsite and leave the government premises.

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

Gale – Non-tropical windstorm with winds 33 to 55 knots.

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

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

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

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

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

Small Area Storms – Thunderstorms or tornadoes.

Small Area Storms Condition I - Destructive winds, heavy rain, lightening and hail are imminent within 1-hour.

Small Area Storms Condition II - Destructive winds, heavy rain, lightening and hail are expected within 6-hours.

Storm – Non-tropical windstorm with winds 33 to 55 knots.

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

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

Tornado – Violent rotating columns of air with winds 100 to 250 knots.

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

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

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

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

3.0 RESPONSIBILITIES

Project Manager – Skip Dunham

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

Site Superintendent – TBD

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

Site Safety Officer – TBD

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

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

4.0 EMERGENCY OPERATING PROCEDURES

4.1 Condition V - Early Preparedness

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

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

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

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

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

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

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

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

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

The SS/SSO will ensure that the following steps are taken:

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

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

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

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

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

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

4.4 Condition II - Destructive Winds are anticipated within 24 hours or a small area storm is anticipated within 6 hours.

Condition II begins when destructive winds are anticipated within 24 hours, a small area storm is anticipated in 6 hours, and/or as directed by the Navy. The PM and SS/SSO will determine when to demobilize from the site based upon weather conditions. During this phase:

The SS will:

- Secure machinery, tools, equipment and materials or remove them from the jobsite.
- Conduct a roll call of personnel on-site and inform the SSO
- Notify personnel, on leave, of schedule changes
- Personnel needing to leave the project to attend to personal matters will notify their SS immediately.
- Valuable records, files, and equipment will be boxed in preparation for movement to a safe location.
- Move large office equipment away from doors and windows
- Tape or board the windows in the office trailers

The SS/SO will ensure that the following step is taken:

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

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

4.5 Condition I - Destructive winds are anticipated within 12 hours or a Small Area Storm is imminent within 1 hour.

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

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

4.6 Resume Site Operations

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

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

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

5.0 DEBRIEFING

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

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

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

6.0 REFERENCES

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

- Disaster Planning Guide for Business and Industry, Federal Emergency Management Administration (FEMA).
- U.S. Department of Commerce; National Oceanic and Atmospheric Administration (NOAA)

ATTACHMENT A

HURRICANE PREPAREDNESS RESPONSIBILITY CHECKLISTS

HURRICANE PREPAREDNESS CHECKLIST

Condition V

Date/Time Entered Condition V: _____

Severe Weather/Tropical Storm: _____

Action Items:

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

Storm Location:

Date/Time: _____

Date/Time: _____

Location/Coordinates: _____

Location/Coordinates: _____

Date/Time: _____

Date/Time: _____

Location/Coordinates: _____

Location/Coordinates: _____

Condition V Action Items Complete: _____

Date: _____

HURRICANE PREPAREDNESS CHECKLIST

Condition IV (Landfall within 72 hours)

Date/Time Entered Condition IV: _____

Action Items:

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

The Project Foremen will ensure the following steps are taken:

- Secure all heavy equipment located at the site in accordance with manufacturer's specifications.
- All equipment fuel tanks will be filled.
- All subcontractors with equipment or supplies on-site will be notified to begin removal procedures
- Ensure all generators and lights are operational and make arrangements to secure additional ones if needed.

Condition IV Action Items Complete: _____

Date: _____

HURRICANE PREPAREDNESS CHECKLIST

Condition III (Landfall within 48 hours)

Date/Time Entered Condition III: _____

Action Items:

- Provide the status of the storm to site personnel on an hourly basis
- Remove all valuable records, files, and small equipment from the trailers
- Take actions to secure job-site necessary for Condition I that cannot be accomplished in 18 hours
- Recheck all items on checklist IV to ensure they are complete (ie.: gas tanks are still filled)

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

Condition III Action Items Complete: _____

Date: _____

HURRICANE PREPAREDNESS CHECKLIST

Condition II

Date/Time Entered Condition II: _____

Action Items:

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

Condition II Action Items Complete: _____

Date: _____

HURRICANE PREPAREDNESS CHECKLIST

Condition I

Date/Time Entered Condition I: _____

Action Items:

- Complete all action items for lower conditions of readiness
- Secure job-site access and evacuate to safe refuge

Condition I Action Items Complete: _____

Date: _____

HURRICANE PREPAREDNESS CHECKLIST

Resume Site Operations

Date/Time Resume Site Operations: _____

Action Items:

- Conduct a damage survey
- Notify all site personnel when to return to work
- Develop a prioritized recovery plan
- Inspect electrical equipment before re-energizing to detect and repair damage
- Inspect trailers for structural damage. Repair as needed.
- Provide bottled water for drinking until normal drinking water is deemed safe to drink
- Remove storm debris from site
- Notify client representative of the resumption of site activities

Resume Site Operations Action Items Complete: _____

Date: _____

ATTACHMENT B

EMERGENCY PHONE NUMBERS

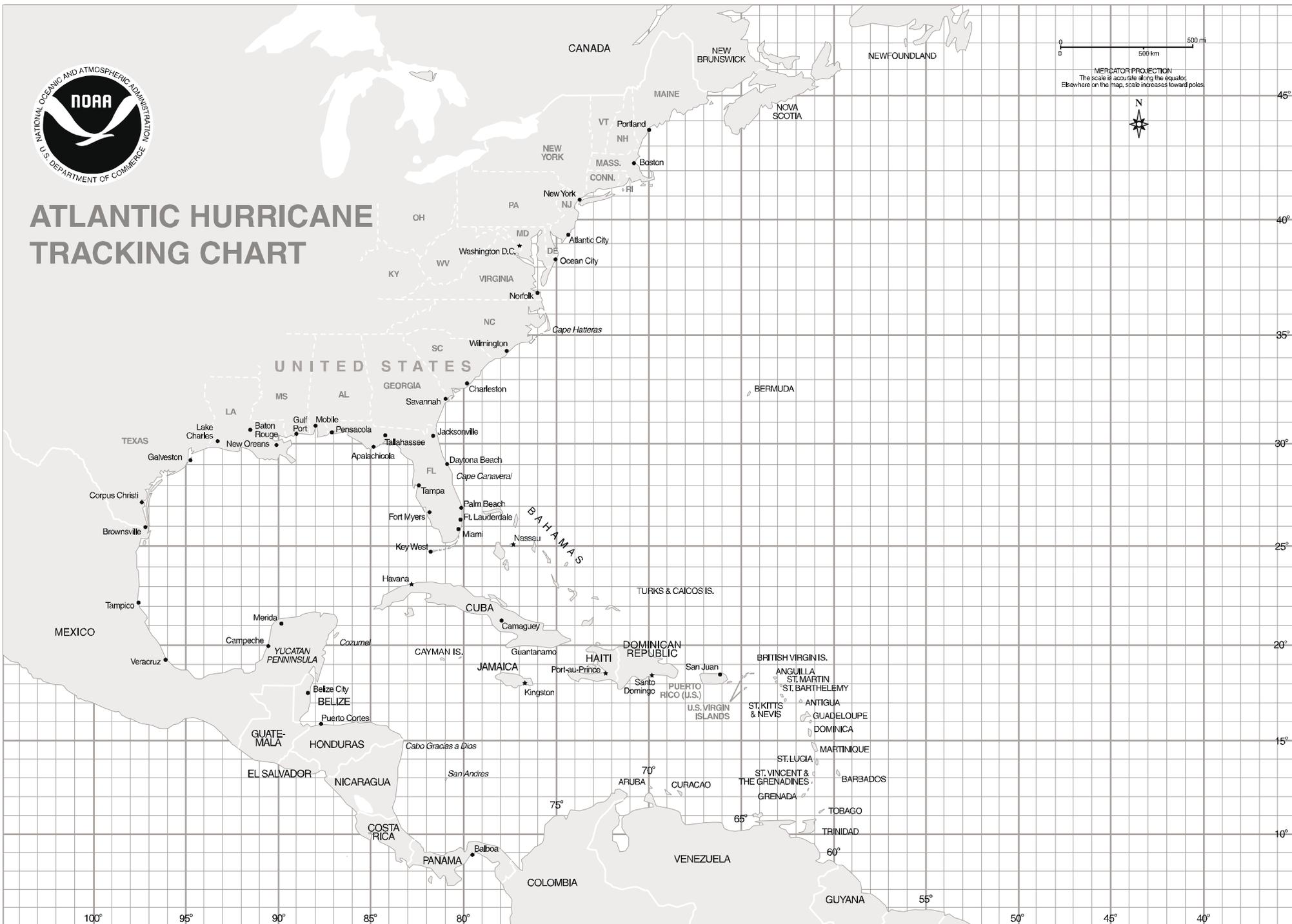
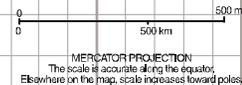
EMERGENCY TELEPHONE NUMBERS	
<u>Local Agencies</u> : On Base Emergencies	
Ambulance	
Fire	887-4676
Police	
Hospital: Mary Immaculate Hospital 2 Bernardine Drive Newport News, VA 23602	(757) 886-6000 (Emergency Room)
<u>Health Resources Clinic:</u> Sentara Medical Center 747 J. Clyde Morris Blvd. Newport News, Virginia	(757) 599-6117
Virginia Dept. of the Environment Regional Poison Control Center	(804) 367-0080 (800) 222-1222
<u>Federal Agencies</u>	
Agency for Toxic Substances and Disease Registry	(404)639-0615
EPA Region Branch Response Center	(215) 587-8800
National Response Center	(800) 424-8802
U.S. Coast Guard	(804) 484-8192
Public Works – Willie Wells	(757) 847-7952
RPM- Linda Cole	(757) 444-3826
COR- Zane Perry	(757)322-4777 (office) (757) 619-4611 (cell)
<u>SHAW E&I Personnel</u>	
Project Manager – Skip Dunham	(757)640-6921 (office)
Site Manager - TBD	
Alternate- TBD	
Program Safety Manager – Kym Edelman	(757) 435-5384 (cell)
Program CIH- David Mummert	(419)425-6129 (office)
SHAW E&I Help Desk (24 hour)	(866) 299-3445

ATTACHMENT C

HURRICANE TRACKING MAP



ATLANTIC HURRICANE TRACKING CHART



APPENDIX G

ACCIDENT PREVENTION PLAN



ACCIDENT PREVENTION PLAN

**SITE 11
HOT SPOT REMOVAL ACTION
NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA**

CONTRACT NO. N62470-02-D-3260

Prepared for:

**DEPARTMENT OF THE NAVY
NAVFAC MID-ATLANTIC
9742 Maryland Avenue
Norfolk, VA 23511**

Prepared by:

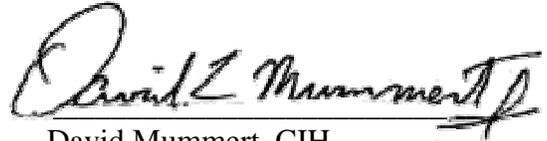
**SHAW ENVIRONMENTAL, INC.
500 East Main Street, Suite 1630
Norfolk, Virginia 23510**

**TASK ORDER 113
SHAW PROJECT NO. 128068**

FEBRUARY 2009

ACCIDENT PREVENTION PLAN SIGNATURE SHEET

Approved by:
Program Certified Industrial Hygienist (CIH)



David Mummert, CIH
(419) 425-6129 (office)

Approved by:
Project Manager



Skip Dunham
(757) 640-6921 (office)

Completed by:
Program Safety Manager



Kym Edelman, CSP
(757) 640-6950

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LIST OF ACRONYMS

AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
APP	Accident Prevention Plan
ASTM	American Society for Testing and Materials
CD	Compact Disc
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
EH&S	Environmental Health and Safety
EMR	Experience Modification Rate
HAZWOPER	Hazardous Waste Operations and Emergency Response
HPP	Hurricane Preparedness Plan
HS	Health and Safety
HSC	Health and Safety Coordinator
HSM	Health and Safety Manager
MIDLANT	Department of the Navy Mid-Atlantic
NIOSH	National Institute for Safety and Health
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
PM	Project Manager
Shaw	Shaw Environmental Inc.
SSHSP	Site Specific Health and Safety Plan
SS/SSO	Site Superintendent/Site Safety Officer
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard

1.0 BACKGROUND INFORMATION

The primary site tasks include the following:

- Clearing and Grubbing
- Excavation
- Pre and Post Removal Site Survey
- Site Restoration

Activity Hazard Analyses (AHA) have been prepared for the above activities and are included in **Appendix C** of the Site Specific Health and Safety Plan (SSHSP).

Shaw Environmental, Inc. (Shaw) Accident Experience

YEAR	Experience Modification Rate (EMR) (Interstate)	Occupational Safety and Health Administration (OSHA) Recordable Incident Rate
2007	0.61	0.82
2006	0.52	0.83
2005	0.49	1.03
2004	0.50	1.07

2.0 STATEMENT OF SAFETY AND HEALTH POLICY

Corporate Policy

Subject: Safety

Purpose and Summary

It is the policy of Shaw to provide a safe and healthful workplace for all employees, subcontractors, and consultants in compliance with governmental requirements. Additionally, the requirements of our clients shall take precedence provided that their requirements exceed those of Shaw and governmental regulations.

We believe in two fundamental principles of safety: all accidents, injuries and occupational illnesses are preventable; and if an operation cannot be done safely, we will not do it. To put these principles into practice, every associate will receive the appropriate training, equipment, and other resources necessary to complete assigned tasks in a safe and efficient manner.

Safety, industrial hygiene and loss prevention are the direct responsibility of all members of management, who must create an environment in which everyone shares a concern for their own safety and the safety of their associates. Safety shall take precedence over expediency or short cuts. It is a condition of employment that all employees work safely and follow established safety rules and procedures. No individual(s) may pose a direct threat to the health and safety of other individuals in the workplace.

Managers must conduct their businesses in compliance with governmental safety regulations and company procedures. All Shaw health and safety procedures shall be implemented for all Shaw employees on all projects where Shaw is the subcontractor, or a joint venture partner. If Shaw is the prime contractor, Shaw procedures shall be applied to all Shaw and subcontractor personnel.

The implementation of effective safety and health practices is a key measure of managerial performance. Management, with the assistance of the internal health and safety professional staff, will conduct audits to assess the effectiveness of the safety program(s) in place, and to identify areas for improvement. All deficiencies shall be corrected promptly.

All injuries, occupational illnesses, vehicle accidents, and incidents with potential for injury or loss will be investigated. Appropriate corrective measures will be taken to prevent recurrence, and to continually improve the safety of our workplace.

3.0 RESPONSIBILITIES AND LINES OF AUTHORITY

Safety responsibilities, accountability and lines of authority are discussed in Section 3.0 of the SSHSP. The Project Manager (PM), Site Superintendent/Site Safety Officer (SS/SSO), Health and Safety Coordinator (HSC), Program Certified Industrial Hygienist (CIH) and Program Health and Safety Manager (HSM) are responsible for formulating and enforcing health and safety requirements, and implementing the SSHSP.

4.0 SUBCONTRACTORS AND SUPPLIERS

Each subcontractor working on the project site will be required to adhere to the SSHSP and the requirements presented below.

4.1 SUBCONTRACTOR/SUPPLIER COORDINATION AND CONTROL

All subcontractors will be screened for safety performance and compliance with Federal Alcohol and Drug testing requirements prior to being issued any contract for site work. Subcontractors will comply with the requirements for site safety as outlined in Shaw's Health and Safety (HS) Procedure HS011 (**Appendix B** of the SSHSP). The SS/SSO will be responsible for the conduct and control of Shaw subcontractors.

4.2 SUBCONTRACTOR/SUPPLIER SAFETY RESPONSIBILITIES

All subcontractor employees are subject to the same training and medical surveillance requirements as Shaw personnel depending on job activity. All activities involving the potential for exposure to hazardous waste materials will require medical and training certification as mandated by 29 Code of Federal Regulations (CFR) 1910.120 and 29 CFR 1926.65. All subcontractor personnel will be required to sign in daily and be required to attend a daily meeting discussing operations and safety issues. All subcontractors involved in construction/remedial activities will complete a Subcontractor Pre-Job Safety Checklist prior to the start of work at the site. Subcontractors will submit AHAs for their work activities to the SS/SSO. The subcontractor reports directly to the PM. All incidents involving subcontractor employees shall be reported to the SS/SSO and a copy of the subcontractor's injury/illness report shall be submitted to the SS/SSO within 24 hours.

Subcontractors are required to read and sign the SSHSP and comply with all requirements of this Accident Prevention Plan (APP). Contractors not in compliance will be immediately dismissed from the site.

Suppliers delivering various materials to the project site or providing equipment/ equipment maintenance will comply with all Naval Facility rules and regulations. Supplier personnel will not be permitted into contaminated areas unless training and medical surveillance is in accordance with 29 CFR 1910.120/1926.65. Contractors will not ride on tractors, forklifts or similar vehicles unless specific seats are provided. They will follow facility hot work rules if hot work is required for vehicle or equipment maintenance. Trucks will be loaded and unloaded in a safe and effective manner and materials will be stored safely in designated locations only. Associated packaging will be properly disposed of and litter will not be permitted to be scattered or blown from truck beds. Operators of mobile equipment on site must observe all traffic rules such as speed limits and right-of-ways of pedestrians.

5.0 TRAINING

Outlines of the site safety orientation and training for site personnel, subcontractors and visitors are provided in Section 10.0 of the SSHSP.

5.1 MANDATORY TRAINING AND CERTIFICATIONS

Mandatory training and certifications are discussed in Section 10.0 of the SSHSP.

5.2 EMERGENCY RESPONSE TRAINING

All Shaw personnel who have completed the Shaw 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Training are qualified as emergency responders per 29 CFR 1910.120/1926.65 (e)(3)(iv). Site Specific Emergency Response Procedures will be reviewed with all site personnel as a part of site indoctrination.

5.3 SUPERINTENDENT AND EMPLOYEE SAFETY MEETINGS

The Shaw SS/SSO will conduct daily safety meetings at the start of each work shift for on-site personnel and will require subcontractors to follow similar meeting procedures or participate in the Shaw daily safety meetings. Daily safety meetings will comply with HS051 (**Appendix B** of the SSHSP).

6.0 HEALTH AND SAFETY INSPECTIONS

6.1 INSPECTIONS

The Shaw PM and SS/SSO are required to conduct bi-monthly inspections of the sites using the Project Safety Inspection Report. The SS/SSO is responsible for conducting and preparing reports of daily safety inspections of work processes, site conditions, and equipment conditions and submitting them to the HSM. The SS/SSO will discuss any necessary corrective actions with the SS/SSO and review new procedures. Copies of these reports are maintained on file at the project locations.

The Shaw HSM or HSC representative will periodically conduct site visits and perform Site Safety Assessments. These reports are kept on file at the Norfolk, Virginia, office and are tracked in a database for each Shaw PM and SS/SSO, including the number of action items noted during the visit and written confirmation of the corrective actions for each item. These responses are compiled and provided to program management for review.

6.2 EXTERNAL INSPECTIONS/CERTIFICATIONS

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

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

7.0 SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAMS, AND COMPLIANCE

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

7.1 SHAW SAFETY INCENTIVE PROGRAMS:

A copy of the Shaw Safety Incentive Award Program will be available at each project. The Shaw PM will develop a site-specific program for approval by the HSM and the Department of the Navy, Mid-Atlantic (MIDLANT) program Manager within 10 days of project mobilization.

7.2 SHAW EMPLOYEE SAFETY RESPONSIBILITY REQUIREMENTS

Each employee is responsible for personal safety as well as the safety of others in the area and is expected to participate fully in the ***Safety Improvement Process***, particularly the Safety Observation Program. The employee will use all equipment provided in a safe and responsible manner as directed by the SS/SSO. All Shaw personnel will follow the policies set forth in the Shaw Health and Safety Procedures HS001-999 (Available on Shawnet or compact disc [CD]). Site personnel concerned with any aspect of health and safety shall bring it to the attention of the SS/SSO. If not satisfied, they should contact the HSM. All project personnel have the authority to stop work if in their judgement serious injury could result from continued activity. The SS/SSO shall be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions up to and including termination. Shaw Employee Safety Responsibility is fully detailed in HS010 Employee Safety and Health Work Rules (**Appendix B** of the SSHSP).

7.3 MANAGERS AND SUPERINTENDENTS SAFETY ACCOUNTABILITY

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

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

Superintendents will:

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

8.0 ACCIDENT REPORTING

8.1 EXPOSURE DATA (MAN-HOURS WORKED)

The Shaw's Environmental Health and Safety (EH&S) Manager tracks and maintains incident records as to Federal reporting requirement. Incident rates are reported monthly to the Shaw's EH&S Manager. Incident Rates and Workers Compensation losses are tracked for each business line. MIDLANT program incident rates are reported monthly by the Program HSM.

8.2 ACCIDENT INVESTIGATIONS, REPORTS AND LOGS

The SS/SSO conducts accident/incident investigations. A report is completed by the SS/SSO and it must be submitted to the Shaw Baton Rouge, Louisiana Safety Department within 24 hours. All incident reporting forms are provided in HS020, and Management Safety reviews are provided in HS021 (**Appendix B** of SSHSP).

8.3 IMMEDIATE NOTIFICATION OF MAJOR INCIDENTS

Shaw will immediately notify the client of any major incident, including injury, fire, equipment/ property damage, and environmental incident. A full report will be provided within 24 hours. The following procedure will be followed in response to any major personal injury.

8.4 ACCIDENT 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 Superintendent will be summoned.

The work crew Superintendent will immediately make radio contact with the SS/SSO to alert a medical emergency situation. The work crew Superintendent will advise the following information:

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

9.0 MEDICAL SUPPORT

On-site Medical Support/Off-site Medical Arrangements will be outlined in Section 9.0 of the SSHSP.

10.0 PERSONAL PROTECTIVE EQUIPMENT

Protection levels provided in the SSHSP will be established for the site work activities based on the levels of site contaminants and the scope of work. Once on-site, results of air monitoring and visual inspection of the work activities may indicate the need for changes in these PPE level(s). Any significant change in the PPE level will be approved by the SS/SSO in consultation with the CIH and/or HSM. PPE selection criteria are outlined in HS600 and HS601 (**Appendix B** of the SSHSP).

All personnel using respiratory protection will be cleared by a physician for use of a respirator and will be fit-tested to assure they can achieve an acceptable fit. Physician clearance and results of fit testing will be documented as required by HS601 (**Appendix B** of the SSHSP).

11.0 PLANS REQUIRED BY THE SAFETY MANUAL

11.1 HAZARD COMMUNICATION PROGRAM

The Site-Specific Hazard Communication Program is included Section 4.2 of the SSHSP. Shaw Hazard Communication Program complies with 29 CFR 1926.59/1910.1200 and is outlined in HS060 (**Appendix B** of the SSHSP).

11.2 EMERGENCY RESPONSE PLANS

The Emergency Response and Contingency Plan is included in Section 9.0 of the SSHSP.

11.3 LAYOUT PLANS

Work zones are defined in Section 5.0 of the SSHSP.

11.4 RESPIRATORY PROTECTION PLAN

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

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

11.5 CONTINGENCY PLAN FOR SEVERE WEATHER

Contingency plans for severe weather are included in Section 9.0 of SSHSP. A Hurricane Preparedness Plan (HPP) is located in **Appendix F** of the SSHSP.

11.6 ALCOHOL AND DRUG ABUSE PREVENTION PLAN

Shaw substance abuse procedures are outlined in Shaw HS101 - Drug, and Alcohol Testing.

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

In addition to this APP, Shaw has prepared a SSHSP to meet the major requirements of United States Army Corps of Engineers (USACE) Manual 385-1-1. Additional procedures for major requirements are provided in the Shaw Health and Safety Procedures Manual HS001-999 (Available on Shownet or CD).

APPENDIX H
SAFETY PLAN ACKNOWLEDGEMENT

APPENDIX I
OSHA 300 LOG

Summary of Work-Related Injuries and Illnesses



All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	3	16	25
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
35	745
(K)	(L)

Injury and Illness Types

Total number of... (M)	(1) Injury	(2) Skin Disorder	(3) Respiratory Condition	(4) Poisoning	(5) Hearing Loss	(6) All Other Illnesses
	43	1	0	0	0	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 50 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name Shaw Environmental & Infrastructure, Inc.

Street 4171 Essen Lane

City Baton Rouge State LA Zip 70809

Industry description (e.g., Manufacture of motor truck trailers)
Special Trade Contractors

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

OR North American Industrial Classification (NAICS), if known (e.g., 336212)
2 3 8 9 9 0

Employment information

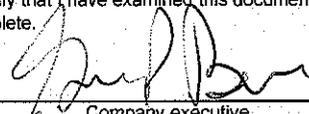
Annual average number of employees 5850

Total hours worked by all employees last year 11,510,915

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.



Company executive

President
Title

225-932-2500

Phone

January 28, 2009

Date

APPENDIX J
BLOOD BORNE PATHOGENS EXPOSURE CONTROL PLAN



BLOOD BORNE PATHOGENS EXPOSURE CONTROL PLAN

**SITE 11
HOT SPOT REMOVAL ACTION
NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA**

CONTRACT NO. N62470-02-D-3260

Prepared for:

**DEPARTMENT OF THE NAVY
NAVFAC MID-ATLANTIC
9742 Maryland Avenue
Norfolk, VA 23511**

Prepared by:

**SHAW ENVIRONMENTAL, INC.
500 East Main Street, Suite 1630
Norfolk, Virginia 23510**

**TASK ORDER 113
SHAW PROJECT NO. 128068**

FEBRUARY 2009

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1.0 BLOOD BORNE PATHOGEN EXPOSURE CONTROL PLAN

Blood-borne pathogens are microorganisms (i.e., bacteria, virus) sometimes present in blood and certain body fluids, which are capable of causing human disease or death. These pathogens can also be present on objects and surfaces that have had contact with infected blood or certain body fluids. Blood-borne pathogens are also capable of causing human disease or death to unprotected people who come into contact with infected blood or body fluids. Diseases caused by blood-borne pathogens include, but are not limited to, hepatitis A, hepatitis B, hepatitis C, malaria, acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases. The most significant of these and of greatest concern are hepatitis B and AIDS.

Hepatitis B is a serious disease caused by hepatitis B virus (HBV), which attacks the liver. The virus can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death. Exposure symptoms include fever, fatigue, nausea, vomiting, muscle aches, loss of appetite, and jaundice (yellowing of the eyes or skin). Hepatitis diagnosis is difficult because some symptoms are similar to the flu and may remain mild for an extended period of time. The HBV can remain infectious for up to 10-days, even in dried blood. Hepatitis B vaccine is available for all age groups to prevent hepatitis B virus infection.

Human immunodeficiency virus (HIV) is the virus that causes AIDS. People with HIV have what is called HIV infection. Some of these people will develop AIDS as a result of their HIV infection. Humans may be infected with HIV for many years without experiencing any symptoms. Upon development of AIDS, symptoms may include weight loss, skin lesions, dry cough, fever, fatigue, diarrhea, swelling of the lymph glands, and death. Presently, no cure exists for HIV or AIDS, and no vaccination is currently available.

A hazard exists for blood and other bodily fluids to be infected with dangerous, infectious pathogens. Employees could become infected if they are exposed to these blood-borne pathogens.

The purpose of this Blood-borne Pathogen Exposure Control Plan is to provide the information, procedures, and requirements necessary to prevent employee exposure to blood-borne pathogens.

1.1 Regulatory, Requirement, and Policy Compliance

This Blood-borne Pathogen Exposure Control Plan has been prepared in compliance with:

- 29 CFR 1910.1030, Blood-borne Pathogens
- Safety and Health Requirements Manual, EM 385-1-1 (USACE, 2003), Section A.03.06

- Shaw HS 512, Handling of Blood or Other Potentially Infectious Material.

1.2 Exposure Determination

Occupational Safety and Health Administration (OSHA) requires employers to perform an exposure determination, identifying employees who may incur occupational exposure to blood or other potentially infectious materials. The exposure determination is made without regard to the use of personal protective equipment. For exposure determination purposes, employees are considered to be exposed, even if they wear PPE.

Activities at this project do not present a high risk of employee exposure to blood or other body fluids. An exception to this would be under circumstances when personnel administer first aid care or CPR to injured workers and when personnel clean-up areas and equipment that may have come in contact with blood as a result of the incident. In these cases, there is reasonable potential for employee skin, eye, mucous membrane, or potential contact with blood or other bodily fluids.

OSHA requires a listing of job classifications with identification of tasks performed in which some employees may have potential for occupational exposure. This requirement is for employees to clearly understand the tasks that they may perform have a potential for occupational exposure to infectious materials. The job classifications and associated tasks with an exposure potential are as follows:

- Field Superintendent—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Site Safety Officer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.
- Laborer—Administer first aid or CPR; decontaminate or disinfect surfaces and articles that have contacted infectious materials, and prepare biohazard waste for temporary storage and subsequent disposal.

These employees have potential for exposure to blood-borne pathogens when administering first aid or CPR and when performing post-accident clean-up operations due to:

- Contact or absorption of blood or blood-contaminated objects through open or broken skin (i.e., cuts, scratches, rashes)
- Blood splashes to their eyes, nose, or mouth, or other mucous membranes
- Punctures through the skin with a contaminated sharp object (i.e., scissors)

Workers can reduce their risk of contacting blood-borne pathogens by implementing the recommended work practices (outlined in this plan) before, during, and after responding to emergency medical incidents primarily involving personal injuries.

1.3 Schedule of Implementation

The procedures in this Blood-borne Pathogen Exposure Control Plan are to be implemented immediately.

Implementation includes:

- Verifying personnel, who are available to voluntarily provide first aid care and CPR hold a valid training completion certificate from a reputable training provider (American Red Cross or American Heart Association).
- The SSO is responsible for verifying that an appropriate number of personnel have been trained in and hold valid certification to perform first aid and CPR.
- Verifying that personnel voluntarily providing first aid care, CPR, post-accident clean-up operations, and biohazard waste handling have received the specialized training meeting the requirements of 29 CFR 1910.1030, Blood-borne Pathogens; Safety and Health Requirements Manual, EM 385-1-1 (USACE, 2003), Section A.03.06; and Shaw HS512, Handling of Blood or Other Potentially Infectious Material. This training is required for applicable personnel prior to the commencement of work and at least annually thereafter. This training shall cover the following elements:
 - A copy of 29 CFR 1910.1030 and this procedure including an explanation of the contents
 - A general explanation of the epidemiology and symptoms of blood-borne diseases
 - An explanation of the modes of transmission of blood-borne pathogens
 - An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials
 - An explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and personal protective equipment
 - Information of the types, proper use, location, removal, handling, decontamination, and/or disposal of personal protective equipment
 - An explanation of the basis for selection of personal protective equipment
 - Information on the hepatitis B vaccine, including information on its efficacy, safety, and the benefits of being vaccinated

- Information on the appropriate actions to take and persons to contact in an emergency
- An explanation of the procedure to follow if an exposure incident occurs including the method of reporting the incident and the medical follow-up that will be made available
- Also information on the medical counseling that is provided for exposed individuals
- An explanation of required signs and labels

The SSO is responsible for verifying that this blood-borne pathogen training has occurred.

- Verifying that engineering controls are readily available at the project for use in an emergency. Engineering controls for this project include:
 - (1) Fluid control solidifier pack
 - (1) 8” Biohazard scoop
 - (1) Disposable gown with full sleeves
 - (2) Disposable shoe covers
 - (1) Disposable bonnet
 - (1) Eye shield with ear loop
 - (2) 15”x24” Biohazard bags, 5 gallon capacity
 - (2) Clear bags with twist ties
 - (3) Disposable clean-up towels
 - (2) Exam gloves
 - (3) Anitseptic cleansing wipes
 - (2) Germicidal wipes

The SSO is responsible for verifying that this inventory of engineering controls is readily available at the project site for emergency use.

Verifying that the appropriate PPE for use in an emergency is readily available at the project site. Personal protective equipment is necessary to prevent employee exposures

to infectious materials. The necessary PPE, which shall be maintained separately for use in an emergency include:

- (1) Disposable gown with full sleeves
- (2) Disposable shoe covers
- (1) Disposable bonnet
- (1) Eye shield with ear loop
- (2) Exam gloves

The SSO is responsible for verifying that the above inventory of PPE is readily available at the project site for emergency use.

1.4 Work Practice Controls

Work practice controls reduce the likelihood of exposure by altering the manner in which a task is performed. The work practice controls outlined in this section are applicable to the administration of first aid and the subsequent clean-up operations.

Work practice controls shall be instituted whenever there is potential for employee contact with blood and bodily fluid. Situational examples where these controls are to be implemented include, but are not limited to:

- The voluntary administration of first aid care, such as application of bandages to minor or major cuts and abrasions of another person. This care may allow for contact with sores, wounds, broken skin, blood, or other bodily fluids.
- The voluntary administration of first aid care, such as providing CPR.
- Clean-up activities involving handling soiled articles (e.g., gauze, bandages, compresses, etc.) and the decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, such as blood or other bodily fluids.
- Prepare biohazard waste for temporary storage and subsequent disposal.

Based upon professional judgment, an employee may choose to temporarily forego the use of PPE if the employee determines that the use of the PPE will further jeopardize his well being or that of the injured worker. This limited application must be carefully evaluated and considered by the employee. If this situation does occur, Shaw will investigate and document the circumstances in an effort to provide alternative means to avoid further occurrence.

The following are specific work practice controls that shall be implemented in the above noted situations or whenever an employee determines that the implementation of these work practices is prudent or necessary:

- The appropriate PPE shall be donned prior to engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids.
- Hands and face will be washed as soon as possible after engaging in any activities that have the potential for employee contact with potentially infectious materials, such as blood or other bodily fluids. If wash facilities are not readily available, individually packaged disinfectant towelettes may be used in the interim.
- Eating, drinking, or smoking is not allowed in any work area where a potential exists for occupational exposure to blood borne pathogens.
- Open wounds or cuts shall be promptly bandaged.
- Work surfaces and areas shall be cleaned/disinfected immediately after being contacted by potentially infectious materials. A 10% bleach solution (one part bleach added to nine parts water) shall be applied and allowed to have a contact time of 15-minutes. Non-disposable articles, equipment, or materials contaminated with potentially infectious materials shall be similarly cleaned/disinfected prior to reuse.
- All bins, pails, cans, and similar receptacles intended for reuse, which have become contaminated with blood or other potentially infectious materials shall be cleaned/disinfected immediately after use.
- Broken glassware, which may be contaminated, shall not be picked up directly by hand. Broken glass shall be picked-up using mechanical means, such as by using a whiskbroom and dustpan.
- All personal protective equipment shall be immediately removed upon leaving the potentially contaminated work area, or as soon as possible if visibly contaminated. The contaminated PPE shall be placed in a labeled “red-bag” and then placed in the 30-gallon container for temporary storage and subsequent disposal.
- Any clothing that has contacted blood or other potentially infectious fluids shall be removed as soon as possible.
- Any clothing that has contacted blood or infectious fluids shall be placed in a labeled “red-bag” and then placed in the 30-gallon container for temporary storage and subsequent disposal.

1.4.1 Universal Precautions

Universal precautions is a method of infection control, which operates on the assumption that all human blood and bodily fluids are to be treated as if they are known to be infectious for HIV, HBV, or other blood-borne pathogens. Universal precautions shall be observed to prevent

contact with blood or other potentially infectious materials. Universal precautions consist of the following practices:

- All workers shall routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other body fluids is anticipated. Gloves should be worn for touching blood and body fluids, mucous membranes, or non-intact skin and for handling items or surfaces contaminated with blood or body fluids. Masks and protective eye wear or face shields shall be worn during procedures that are likely to generate droplets of blood or other body fluids to prevent exposure of mucous membranes of the mouth, nose, and eyes. Protective suits shall be worn during procedures that are likely to generate splashes of blood or other body fluids.
- Hands and other skin surfaces shall be washed immediately and thoroughly if contaminated with blood or other body fluids. Hands shall be washed immediately after gloves are removed, using a disinfectant soap.
- CPR barriers or other ventilation devices should be available for use in areas in which the need for resuscitation is foreseeable.
- Workers who have exudative lesions or weeping dermatitis shall be excluded from handling potentially infectious materials until the condition resolves.
- Pregnant workers should be especially familiar with and strictly adhere to precautions to minimize the risk of transmission.

1.4.2 Personal Protective Equipment

The proper use of PPE is an effective work practice control. The following requirements for PPE are mandatory whenever there is potential for employee contact with blood and bodily fluid:

- Inspect PPE prior to use to verify it is in good working order and without defects.
- Blood or other potentially infectious materials.
- Disposable (single use) gloves, such as surgical or examination gloves, shall be replaced when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. Gloves should be changed as soon as possible after contact with blood or body fluids. After use, remove gloves from top to bottom inside out, not allowing unprotected skin to contact the exterior of the gloves. Hands and other skin surfaces shall be washed with disinfectant soap immediately after care has been rendered or clean up has been completed. Gloves reduce the incidence of blood contamination of hands, but they cannot prevent penetrating injuries caused by sharp objects. Do not reuse gloves once removed. A CPR barrier shall be used when administering CPR.
- Protection for the eyes, face, hands, body, feet, and against inhalation hazards shall be provided as appropriate for each job.

- Gloves shall be worn when employee has the potential for the hands to have direct skin contact with blood, other potentially infectious materials, mucous membranes, non-intact skin, and when handling items or surfaces soiled with
- Masks and eye protection or chin-length face shields shall be worn whenever splashes, spray, splatter, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.
- Fluid-resistant clothing (e.g. coated Tyvek suits) shall be worn if there is a potential for splashing or spraying of blood or potentially infectious materials. Coated Tyvek coveralls shall also be worn during clean-up activities involving decontamination or disinfecting of surfaces and articles that have contacted potentially infectious materials, and when preparing biohazard waste for temporary storage and subsequent disposal.
- Fluid-resistant clothing (e.g. coated Tyvek suits) shall be worn if there is a potential for clothing becoming soaked with blood or other potentially infectious materials.
- Fluid-proof coverings shall be worn if there is a potential for shoes or boots to contact blood or other potentially infectious materials.
- Disposable nitrile or vinyl gloves shall be worn for touching blood and body fluids requiring universal precautions, mucous membranes, or non-intact skin and for handling items or surfaces soiled with blood or body fluids to which universal precautions apply.

1.4.3 Waste Handling

All wastes generated as a result of administering emergency first aid care and the subsequent clean-up activities shall be placed in red-bags, labeled as a biohazard, and kept separately from other trash. Wastes used in medical emergency treatment (i.e., gloves, towels, gauze) shall also be bagged and stored in an identical manner. Red-bagged, biohazard waste shall be placed in the 30-gallon collection container, labeled, and secured for temporary storage and disposal. Additional containers shall be obtained as needed and containers shall not be overfilled.

1.5 Biohazard Waste Disposal

A Shaw Transportation and Disposal Coordinator shall be contacted to arrange for proper disposal of biohazard wastes. The waste shall remain secured on-site in labeled container(s) until disposal arrangements have been made at an approved disposal facility. Disposal of the infectious waste container(s) shall be in accordance with applicable local, state, and federal regulations.

1.6 Medical Requirements

Employees receive medical evaluations in accordance with Shaw Procedure HS100 *Medical Policies and Procedures*. The medical requirements of this exposure control plan include

provisions for vaccinations to all exposed employees as well as for post-exposure procedures and evaluation. All employees with potential for occupational exposure to blood-borne pathogens shall receive the hepatitis B vaccination and tetanus vaccination prior to workplace exposure, unless they read and sign the Hepatitis B and Tetanus Vaccination Declination Form (see attached).

1.6.1 Hepatitis B Vaccination

All potentially exposed employees will have made available to them at no cost a hepatitis B vaccination. Recombivax or Accelerated Recombivax vaccines shall be utilized. If the employee has previously received the hepatitis B vaccination and/or antibody testing reveals that the employee is immune, a new vaccination is not required. Employees may be subjected to occupational exposure immediately after receiving the first shot in the hepatitis B vaccination series. Antibody testing shall be performed 30-days after completing the hepatitis B vaccination series. Employees unable to develop immunity shall be precluded from further occupational exposure. If a physician recommends a booster dose(s), the doses shall be provided according to standard recommendations for medical practice. The employee will also receive training as to the vaccine's efficacy, safety, benefits, and consequences prior to administration. The vaccination series may also be initiated within 24-hours of an incident with exposure potential.

1.6.2 Tetanus Vaccination

All employees subject to this policy shall maintain current status documentation of tetanus vaccination (current status for tetanus vaccination is within 5 years.) All potentially exposed employees shall be offered a tetanus vaccination at no cost.

1.6.3 Post-Exposure Procedures and Evaluation

All exposure incidents shall be reported as required by Shaw HS020, Accident Prevention Program: Reporting, Investigation, and Review. The Corporate Medical Director shall be advised in addition to standard notification procedures.

Following a report of an exposure incident, each involved employee shall be offered a confidential medical evaluation and follow-up, which includes at least the following elements:

- Documentation of the route(s) of exposure
- HBV and HIV antibody status of the source patient(s) (if known), and how the exposure occurred.
- The medical confidentiality rights of the source patient shall be preserved at all times.
- If the source patient can be determined and permission is obtained, collection of and testing of the source patient's blood to determine the presence of HIV or HBV infection shall be conducted under the direction of the attending physician.

- Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HIV and/or HBV status. Actual core antibody and surface antigen testing of the blood or serum sample may be done at that time or at a later date if the employee so requests. If the test is deferred, arrangements shall be made through the attending physician to properly archive the specimen.
- Follow-up of the exposed employee including antibody and antigen testing, counseling, illness reporting, and safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice as defined by the Corporate Medical Director.

Where applicable laws require employee consent, documented consent shall be obtained prior to testing. If an employee refuses the blood test, documentation of the refusal will be made. Documentation of the test results shall be made available to the exposed employee(s). All test results shall be kept confidential.

1.6.4 Physician Information

The following information shall be provided to the evaluating physician:

- A copy of 29 CFR 1910.1030 and its appendices
- A description of the affected employee's duties as they relate to the employee's occupational exposure.

1.6.5 Physician Opinion

For each potentially exposed employee evaluation, the employee shall receive a copy of the evaluating physician's written opinion within 15 working days of the completion of the evaluation. The written opinion shall be limited to the following information:

- The physician's recommended limitations upon the employee's ability to receive hepatitis B vaccination.
- A statement that the employee has been informed of the results of the medical evaluation and that the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials, which require further evaluation or treatment.
- Specific findings or diagnoses, which are related to the employee's ability to receive HBV vaccination. Any other findings and diagnoses shall remain confidential.

1.7 Hazard Communication

There are regulatory requirements for labels, signs, and training. The provisions and exceptions for these are contained in the subsections below.

1.7.1 Warning Labels

Containers used for disposal of blood-contaminated supplies and waste will be labeled in accordance with the word "biohazard." The following symbol shall be an integral part of the label:



1.7.2 Warning Signs

There are no designated areas for medical treatment on-site, because first aid is provided on an emergency basis only; therefore, warning signs are not applicable. In cases of potential exposure, observers and nonessential personnel should be verbally warned to keep a safe distance from injured personnel.

1.7.3 Employee Training Program

All employees who are first aid/CPR trained and may provide assistance shall be trained in the requirements for voluntary providers as described in HS512, *Handling Blood and Other Potentially Infectious Materials* this SHERP and its addenda, and the general provisions of this procedure.

1.8 Recordkeeping

There are federal record-keeping requirements for training, medical, and incident reporting documentation. The provisions for keeping these records are contained in the subsections below.

1.8.1 Training Records

All employees covered under this exposure plan shall be trained as required. A record of the training shall be appropriately generated. The training record will contain the date of the training session(s), the contents or a summary of the training session(s), the names of persons conducting the training, and the names of all persons attending the training sessions.

The training records will be maintained by the Shaw Training Department for at least five (5) years from the training date.

1.8.2 Medical Records

Medical records necessary for Shaw employees will include documentation of HBV vaccination status, medical follow-up, post-exposure testing, and a medical professional's written evaluation.

The employee medical records will be forwarded to and maintained by Health Resources, 600 West Cumming Park, Suite 3400, Woburn, Massachusetts 01801-6350 for inclusion in the employee's medical file. Confidentiality of all medical records shall be maintained.

Shaw maintains employee medical records for the duration of the employee's employment plus 30 years thereafter. If, for whatever reason, Shaw no longer does business and no successor exists, Shaw will notify the director of NIOSH in writing three months prior to the disposal of records. If so directed, the records shall be transferred to the director of NIOSH.

1.8.3 Incident Recording

An incident that occurs as a result of rendering emergency medical care will be recorded on the OSHA 300 log as OSHA defines work-related injuries and illnesses. All injuries involving the release of blood or bodily fluids must be immediately reported to the Project CIH for proper reporting and follow-up.

1.9 Plan Review and Update

This Blood-borne Pathogen Exposure Control Plan shall be reviewed and updated on an annual basis.

2.0 HEPATITIS B AND TETANUS VACCINATION DECLINATION

Due to the potential for you to have occupational exposure to potentially infectious materials in your work, the company will provide and encourages you to accept, vaccination for Hepatitis B and Tetanus. Information to assist you in this decision is provided below.

2.1 Tetanus

- A bacterial disease causing muscle spasms, seizures, and "lockjaw".
- This single injection vaccination has few side effects.
- There is minimal loss in protection if the vaccination is given at the time of an exposure/injury rather than in advance.

2.2 Hepatitis B

- A viral infection of the liver.
- About 9,500 occupational cases occur annually, mostly in health care workers, with about 200 deaths.
- This three injection vaccination has few side effects.
- Vaccination is 90% effective for at least seven years when given prior to exposure.
- Vaccination is 70-88% effective when given within one week of exposure.
- Hepatitis B can survive in the environment for 24-48 hours after drying.
- Risk of infection from one cut or puncture wound from a contaminated object:
- Hepatitis B Virus 6-30%
- Human Immunodeficiency Virus (AIDS) 0.5%.

If you wish to talk to a company doctor before making your decision, please ask the Health and Safety Manager to make arrangements for you. *If you choose to decline vaccination at this time, you must print and sign your name, and date the bottom of this form.*

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B Virus (HBV) infection.

I have been given the opportunity to be vaccinated by hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive this vaccination series at no charge to me.

Name (print) _____

Signature _____

Date _____

APPENDIX K
ACCIDENT REPORTING FORMS

FEDERAL INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST

Program/Project Number: NAVFAC/128068

Project/Office/Facility Location: Cheatham Annex

Name	Phone Number(s)	Fax Number	E-mail
Shaw Notification Hotline/Helpdesk	1-866-299-3445	N/A	N/A
Health Resources <i>(must be notified before obtaining medical treatment)</i>	1-800-350-4511	1-800-853-2641	
Marcia Musgrave <i>(must be notified before obtaining medical treatment, drug screen authorization)</i>	419-425-6160	419-425-6039	Marcia.musgrave@shawgrp.com
Northeast Region/Zone 3 - Federal H&S Manager Dave Mummert	(419) 425-6129 (office) (419) 348-1544 (cell)	(419) 425-6039	david.mummert@shawgrp.com
Program HSM Kym Edelman *****	(757) 640-6950 (office) (757) 435-5384 (cell)	(757) 640-6201	Kym.edelman@shawgrp.com
Project Manager: Skip Dunham	(757) 640-6921	(757) 640-6201	skip.dunham@shawgrp.com
Program Manager Jim Dunn	(757) 640-6932 (office) (757) 373-9117 (cell)	(757) 640-6201	James.Dunn@shawgrp.com
Federal, Operations Vice-President Mike Fitzgerald	609 588 6380 (office) 732 927 0630 (cell)	609 588 6399	mike.fitzgerald@shawgrp.com
Worker's Comp Claims Manager Casey Parker	225-932-2763 (office) 225-405-1246 (cell)	225-987-3080	casey.parker@shawgrp.com
Federal Business Line H&S Director Mike Zustra	614-334-4819 (office)	614-834-4819	mike.zustra@shawgrp.com
Federal Business Line President Bill Winkler	225-987-7245 (office)	225-987-7248	william.winkler@shawgrp.com

Note: Incident reports going to Baton Rouge should be faxed to the Shaw Corporate Claims Department (225-932-2636) for distribution unless otherwise specified. **Notifications to Directors and above in the operations chain will be verbal and as soon as reasonably possible.**

Bold lettering denotes phone notifications that need to be made by the Project.

*** If you can not reach Joe Hoyt please contact Kym Edelman



Incident Reporting and Management Procedure - Federal

Action	Who? <i>When?</i>	Under what circumstances?	How?	Notes:
1. Notify Supervisor for all incidents (no matter how minor)	Injured person, first person recognizing incident, driver/passenger, or employee causing damage <i>Immediately</i>	All incidents no matter how minor	In person or by telephone	
2. For <i>life-threatening injuries/illnesses</i> - contact local emergency personnel For <i>non life-threatening injuries/illnesses</i> - transport injured person to doctor at an occupational medical facility For <i>vehicle accidents</i> – make scene safe, notify police, aid injured parties For <i>equipment/property damage</i> - make scene safe, prevent further damage or injuries	Site Supervisor <i>Immediately (concurrently with next step if injury or illness)</i> Site Supervisor <i>Immediately (concurrently with next step if injury or illness)</i> Driver/passenger <i>Immediately</i> Employee causing damage <i>Immediately</i>	In case of serious injury or illness requiring off-site medical care	Via ambulance Via vehicle	Site Supervisor or Site Safety Officer must immediately go to emergency care facility. Site Supervisor or Site Safety Officer must transport and stay with injured person until released from care
3. Notify Health Resources (for injuries/illnesses to Shaw employees only)	Site Supervisor <i>Immediately, prior to transporting the injured employee, unless injuries are life threatening</i>	<ul style="list-style-type: none"> ◆ Serious injury requiring off-site medical care ◆ If employee states that he/she has been exposed to any chemical or biological substance 	800-350-4511 Note: Outside Continental US call 781-935-8581	<ul style="list-style-type: none"> ◆ Not required for temporary agency and contract labor ◆ Provide name of injured employee, name and phone # of treating medical facility, description of the incident ◆ Health Resources will help with medical facility coordination and follow-up care
4. Notify Regional/Program H&S Manager	Site Supervisor <i>Immediately (concurrently with providing transportation to occupational medical facility or EMS transport to hospital)</i>	All incidents	See Federal Incident Notification and Communication Contact List (attached)	<ul style="list-style-type: none"> ◆ Contact should be made prior to sending the individual for medical care ◆ Regional/Program H&S Manager will notify Bob Brooks as appropriate

Incident Reporting and Management Procedure – Federal (continued)

Action	Who? <i>When?</i>	Under what circumstances?	How?	Notes:
5. Notify Shaw Notification Hotline/Help Desk	Site Supervisor <i>As soon as possible. Prior to sending an individual for medical treatment</i>	<ul style="list-style-type: none"> ◆ Illness and/or injury (doctors cases and above) ◆ Property damage (damage > \$2,500.00) ◆ Vehicle accidents (All) ◆ Criminal activity (i.e. bomb threat, theft) ◆ Natural disaster (all) ◆ Explosion and/or fires (damage > \$2,500.00 or result in injury) ◆ Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact) ◆ Regulatory agency visit ◆ Fatalities 	Shaw Notification Hotline/Help Desk Phone Number 866-299-3445 Note: Outside the Continental US call 225-215-5056	
6. Complete forms: <i>Injuries and illnesses</i> ◆ Authorization for Release of Protected Medical Information ◆ Authorization for Treatment of Occupational Injury/Illness ◆ Return-To-Work Examination Form <u>and</u> fax to Health Resources <u>and</u> fax to Loss Prevention Manager (Casey Parker)	Injured employee and medical facility personnel (Site Supervisor is responsible for verifying forms are completed) <i>Prior to leaving medical facility</i>	<ul style="list-style-type: none"> ◆ Serious injury requiring off-site medical care ◆ If employee states that he/she has been exposed to any chemical or biological substance 	Fax to Health Resources at 800-853-2641 Fax to Loss Prevention Manager (Casey Parker) at 225-987-3080)	Site Supervisor or Site Safety Officer must take these forms with him/her to occupational medical facility or hospital (Contained in HS 020)
7. Call Project Manager and notify of incident	Site Supervisor <i>As soon as reasonably possible</i>			Project Manager will report incident to upper level of Operations/Business Line Management <i>As soon as reasonably possible</i>

Incident Reporting and Management Procedure – Federal (continued)

Action	Who? <i>When?</i>	Under what circumstances?	How?	Notes:
8. Call back Regional/Program H&S Manager to report on status of <i>injured/ill employee</i>	Site Supervisor <i>Prior to employee leaving medical facility</i>	All injuries and illnesses requiring off-site medical care	See Federal Incident Notification and Communication Contact List (attached)	
9. Complete forms: <i>OSHA Recordable Cases</i> Supervisor’s Employee Injury/Illness Report Form Injured Employee Statement Witness Statement Form(s) <i>First Aid Cases</i> Supervisor’s Employee Injury/Illness Report Injured Employee Statement Witness Statement Form(s) Fax completed forms to Shaw Corporate Claims <u>and</u> Regional/Program H&S Manager <u>and</u> Health Resources.	◆ Site Supervisor ◆ Witnesses <i>As soon as possible – no later than 24 hours</i>	All injuries, illnesses, and first aide cases	Shaw Corporate Claims Department Fax (225-932-2636) Health Resources Fax 800-853-2641 See Federal Incident Notification and Communication Contact List (attached)	Site Supervisor should have these forms with him/her at all times (Contained in HS 020)
10. Complete forms: <i>Chargeable Vehicle Accidents</i> Vehicle Accident Report Witness Statement Form(s) Driving Record Certification (Procedure HS800) <i>Non-Chargeable Vehicle Accidents</i> Vehicle Accident Report Witness Statement Form(s) <i>Equipment, Property Damage and General Liability Incidents</i> Equipment, Property Damage and General Liability Loss Report Witness Statement Form(s) Fax completed forms to Shaw Corporate Claims <u>and</u> Regional/Program H&S Manager.	◆ Site Lead / Supervisor ◆ Witnesses <i>As soon as possible – no later than 24 hours</i>	All vehicle accidents and /or all property damage	Shaw Corporate Claims Department (225-932-2636) See Federal Incident Notification and Communication Contact List (attached)	Supervisor should have these forms with him/her at all times (Contained in HS 020)

Incident Reporting and Management Procedure – Federal (continued)

Action	Who? <i>When?</i>	Under what circumstances?	How?	Notes:
11. Complete forms: <i>OSHA Recordable Cases</i> Incident Investigation Report <i>First Aid Cases</i> Incident Investigation Report <i>Chargeable Vehicle Accidents</i> Incident Investigation Report <i>Non-Chargeable Vehicle Accidents</i> Incident Investigation Report <i>Equipment, Property Damage and General Liability Incidents</i> Incident Investigation Report <i>Near Miss</i> Incident Investigation Report Fax completed forms to Regional/Program H&S Manager	Site Supervisor <i>As soon as possible – no later than 72 hours of incident</i>		Shaw Corporate Claims Department (225-932-2636) See Federal Incident Notification and Communication Contact List (attached)	Supervisor should have these forms with him/her at all times (Contained in HS 020)
12. Perform "Accident Review Board" (ARB) and fax to Regional/Program H&S Manager.	Site Supervisor/Project Manager <i>Within 10 days of incident</i>	OSHA Recordable Cases Chargeable Vehicle Accidents		ARB must include: Regional Manager, Project Manager, Employee's Direct Supervisor, Regional/Program H&S Manager, and Employee(s) involved in the incident. Lost time injuries will require Bill Winkler and Bob Brooks.



Attachment 2

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT
FAX REPORT WITHIN 24 HOURS OF INCIDENT TO 225-932-2636.
Phone all injuries/ illnesses to Shaw Notification Hotline/Helpdesk
1-866-299-3445

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION

Employee's Social Security Number: Claim Number:
Employee's Name: Home Phone Number:
Home Address: Business Line Code:
Male Female Date of Birth: Hire Date:
Dependents: Dependents Under 18: Marital Status:
Occupation: Department Name:
State Hired: Currently Weekly Wage: Hourly Wage:
Hours/Days Worked Per Week: Days Per Week Hours Worked Per Day:
Employment Status: Employee Report No.: N/A Employee ID No.: N/A
Salaried Continued: Paid For Date of Injury: Education No. of Years:
Ever Injured on the Job: Supervisor Name & Phone:

EMPLOYER INFORMATION

Employer Name: The Shaw Group, Inc.
Work Location:
Contact Name: Troy Allen Telephone Number: (800)747-3322
Employer SIC: Employer Location Code:
Employer FED ID: Employer Code: N/A
Nature of Business:
Policy Number:

ACCIDENT INFORMATION

Date and Time of Injury:
Did the Accident Occur at the Work Location: If no, where did the accident occur? N/A
Accident Address:
Nature of Accident:
Give a Full Description of the Accident: (Be as Factually Complete As Possible)
Are Other WC Claims Involved? No Date and Time Reported to Employer:
Person Reported To:



WITNESS INFORMATION

Were There Any Witnesses?
If Yes, List Names and How to Contact Them:

INJURY INFORMATION

Which Part of the Body Was Injured? (e.g. Head, Neck, Arm Leg)
What Was the Nature of Injury? (e.g. Fracture, Sprain, Laceration)
Part of Body Location: (e.g. Left, Right, Upper, Lower)
Injury Description:

Source of Injury: | Is Employee Hospitalized?
Lost Time: | If Yes, What was First Full Day Out:
Date Last Day Worked: | Date Disability Began: N/A
Date Returned to Work: | Estimated Return Date: N/A

MEDICAL INFORMATION

ER Treated & Released: | Hospitalized: | Phy./Clinic:
Hospital - Name, Address, Phone Number: | Was Employee Transported via Ambulance: Yes No
N/A

Clinic - Name, Address, Phone Number:

ADDITIONAL COMMENTS & INFORMATION

REPORT PREPARED BY

Name: | Title:
Signature: | Phone:



ATTACHMENT 3
VEHICLE ACCIDENT REPORT
 Page 1 of 2

ACCIDENT DESCRIPTION

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ A.M. or P.M.
 LOCATION OF ACCIDENT (CITY, STATE) _____
 DESCRIPTION OF ACCIDENT _____

 WITNESS _____ PHONE NO. _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 POLICE OFFICER'S NAME AND BADGE # _____ DEPARTMENT _____

COMPANY VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 WORK PHONE NO. (____) _____ S.S. NO. _____ PROJECT NAME/NO. _____
 VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____
 STATE _____ VEHICLE OWNER: COMPANY LEASED/RENTED PRIVATE VEHICLE
 VEHICLE TYPE: COMMERCIAL MOTOR VEHICLE NON-COMMERCIAL
 IF NOT COMPANY-OWNED: OWNER _____ PHONE NO. (____) _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 VEHICLE DAMAGE _____
 NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____
 WERE HAZARDOUS MATERIALS RELEASED? NO YES IF YES, DESCRIBE MATERIALS _____

OTHER VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 PHONE NO. (____) _____ S.S. NO. _____
 OWNER'S NAME (CHECK IF SAME AS DRIVER) _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 INSURANCE COMPANY _____ POLICY NO. _____
 AGENT'S NAME _____ PHONE NO. (____) _____
 ADDRESS _____ CITY _____ STATE _____ ZIP _____
 VEHICLE YEAR _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____
 VEHICLE I.D. NO. _____
 VEHICLE DAMAGE _____
 PASSENGERS: NO YES INJURIES: NO YES (If Yes, list names and telephone numbers below)



Procedure No.
Revision No.
Date of Revision
Last Review Date
Page

HS020
5
07/16/03
07/16/03
13 of 24

VEHICLE ACCIDENT REPORT

Page 2 of 2

WEATHER: [] Clear [] Cloudy [] Fog [] Rain [] Sleet [] Snow Other _____
PAVEMENT: [] Asphalt [] Steel [] Concrete [] Wood [] Gravel/Dirt
[] Brick/Stone Other _____
CONDITION: [] Dry [] Wet [] Icy [] Pot Holes Other _____
TRAFFIC CONTROL: [] Traffic Light [] Stop Sign [] Railroad [] No Intersection [] No Control
ROADWAY: Number of Lanes Each Direction: _____ [] Residential [] Divided Highway [] Undivided Highway

Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.

SYMBOLS:

- Your Vehicle ①
- Other Vehicle(s) ② ③
- Pedestrian [pedestrian symbol]
- Stop Sign [stop sign symbol]
- Yield [yield sign symbol]
- Railroad [railroad symbol]

[Large empty box for drawing accident scene]

ADDITIONAL INFORMATION: _____

EMPLOYEE _____ (Print) _____ (Signature) _____ (Date)

SUPERVISOR _____ (Print) _____ (Signature) _____ (Date)

HEALTH & SAFETY REP. _____ (Print) _____ (Signature) _____ (Date)

ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPORT

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY.

REPORT ALL CHARGEABLE VEHICLE ACCIDENTS TO SHAW NOTIFICATION HOTLINE/HELPDESK
(PHONE: 1-866-299-3445)



ATTACHMENT 4

EQUIPMENT, PROPERTY DAMAGE AND GENERAL LIABILITY LOSS REPORT

This report is to be completed for all losses or damage to company property in excess of \$2,500.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION _____ PROJECT NO. _____ DATE _____

ADDRESS _____

HOW DID DAMAGE OR LOSS OCCUR: _____

DESCRIPTION AND VALUE (\$) OF DAMAGED/LOST/STOLEN PROPERTY: _____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (____) _____
 Address _____ City _____
 Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. (____) _____
 Address _____ City _____
 Employer and Address _____
 Description of Injury _____

WITNESSES:

1. Name _____ Home Phone (____) _____
 Home Address _____ City _____
 Employer and Address _____

2. Name _____ Home Phone (____) _____
 Home Address _____ City _____
 Employer and Address _____

WERE PICTURES TAKEN? YES NO
 WERE POLICE NOTIFIED? YES NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____ (Print) _____ (Signature) _____ (Date)

PROJECT/LOCATION MANAGER: : _____ (Print) _____ (Signature) _____ (Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY



ATTACHMENT 6a
Injured Employee Statement
MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Time your shift ends? Time _____ am pm

Name of Known Witnesses:

Name _____

Name _____

Name _____

Name _____

Your Immediate Supervisors Name _____

If not employed by Shaw E&I, enter name of company and phone number _____

Have you had a prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

Signature/Date

Print Name



ATTACHMENT 6b
Employee Witness Statement
MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Ends _____ am pm

Witness Information:

Name _____

Home Phone No. _____

Home Address _____

County _____ Zip _____

Witness' Supervisor Name _____

If not employed by Shaw E&I, enter name of company _____

Company Phone Number _____

Did You See the Incident/Accident? _____

How Far From You (approx., in feet) Did the Incident/Accident Occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

Witness Signature/Date

Print Name



ATTACHMENT 10

HELP DESK / HOTLINE NOTIFICATION GUIDELINES

Any incident, as defined in the bulleted items below, requires corporate notification **as soon as practical but not longer than one hour after occurrence**, via the Health and Safety Help Desk / Hotline. This requirement is a corporate wide directive and applies to all Shaw Group companies, not just Shaw E&I. As such, the responsibility for whom makes this notification has purposefully not been defined. This is due to the various types of projects in which The Shaw Group performs activities. Some projects may only consist of three technicians at a site; others may involve multiple levels of site management and consist of 200+ employees. Therefore, the intent is for the supervisory/management person to communicate the notification requirements to his/her employees and make the appropriate determination as to how the notification takes place.

Immediate Corporate Notification via Help Desk: [1-866-299-3445](tel:1-866-299-3445)

- Illness and/or injury (doctors cases and above);
- Property damage (dollar amount greater than \$2,500);
- Automobile accidents (All);
- Criminal activity (i.e. bomb threat, theft);
- Natural disaster (i.e. earthquakes, flood, storm damage, hurricanes);
- Explosion and/or fires (that results in property damage greater than \$2,500 or result in injury);
- Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact);
- Regulatory visit (i.e. OSHA, EPA, DEQ, MSHA, etc.);
- Fatalities

Note:

- Help Desk / Hotline notification is in addition to the requirement to inform Health Resources of all incidents requiring off-site medical attention by calling [1-800-350-4511](tel:1-800-350-4511). This call should be made **prior** to transporting the employee such that they can coordinate physicians' services prior to arrival of the employee to the medical facility.
- As stated above, the notification requirements are a corporate directive and apply to the entire Shaw Group. Accordingly, Shaw E&I managers/supervisors should use sound judgment as it pertains to the two bulleted items that have been highlighted above. Although they may not be desired events, some Environmental spills/releases that occur may not be an uncommon situation at a particular site. In addition, there may be projects in which the EPA or some other regulatory agency visits on some normal frequency. Events such as these, which would typically be unusual at a construction or fabrication site, are not so unusual to some of our environmental projects. As such, a notification to the helpdesk would not be required.

APPENDIX E

UFP SAMPLING AND ANALYSIS PLAN

INCLUDED ON CD ONLY

**SAMPLING AND ANALYSIS PLAN
FIELD SAMPLING AND QUALITY ASSURANCE PROJECT PLAN**

**REMOVAL ACTION AT SITE 11
NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA**

Prepared for:

DEPARTMENT OF THE NAVY
NAVFAC MIDLANT
9742 Maryland Avenue
Norfolk, Virginia 23511

Contract No. N62470-02-D-3260
Task Order No. 0113

Prepared by:

Shaw Environmental, Inc.
500 East Main Street, Suite 1630
Norfolk, VA 23510

June 10, 2008
Revision: October 2, 2008
Revision: November 25, 2008
Revision: February 5, 2009
Revision: February 10, 2009
Shaw Project No. 128068

Preface

Shaw Environmental, Inc., (Shaw), has been tasked to perform the soil removal activities at Site 11, Naval Weapons Station (WPNSTA) Yorktown, Cheatham Annex located in Williamsburg, Virginia. This Sampling and Analysis Plan (SAP) has been prepared in accordance with the Scope of Work (SOW) for Task Order No. 0113 (dated 20 July 2007) under the Department of the Navy, Naval Facilities Atlantic (NAVFAC MIDLANT) Contract Number N62470-02-D-3260. The overall objective of Task Order No. 0113 (TO 113) is to mitigate direct contact by human and ecological receptors with contaminated soil to a depth of 2 feet through removal and off-site disposal of contaminated soils from the Site 11, Bone Yard. This Sampling and Analysis Plan (SAP) is inclusive of a Field Sampling Plan and Quality Assurance Project Plan (QAPP) and will apply to all site and laboratory activities performed under the aforementioned contract in accordance with the removal actions at Site 11.

Included is the SAP which provides the guidelines for the systematic data collection and analysis associated with project. In accordance with the Uniform Federal Policy for Quality Assurance Project Plans (UFPQAPP, March 2005), this SAP includes 37 worksheets that detail various aspects of the environmental investigation process and establishes protocols to allow for comparability and defensibility of sampling and analytical data. This UFP-QAPP adheres to the program requirements of Chapter 25 of OPNAVINST 5090.1B, IR-CDQM and the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM), Version 3, January 2006.

Background

Site 11 encompasses an estimated 2.7-acre area located approximately 250 feet south of Antrim Road and the Public Works Department. Site 11 consists of an open, overgrown, grassy field surrounded by mixed-hardwood woodland. Old building foundations, concrete pads, and low retaining walls litter the site, both inside and outside of the wooded areas. Two creeks running eastward to Penniman Lake drain Site 11 and border the site to the north and south. Access to the site is from the north via a dirt road off of Antrim road. Site 11 was reportedly used between 1940 and 1978 to store containers of waste-oil and tar as well as asphalt and other scrap materials on the ground. Oil, asphalt, gasoline, and other unspecified materials have been identified in the disposal area.

Baker Environmental, Inc. prepared a remedial investigation (RI) report including baseline human health risk assessment and screening-level ecological risk assessment (ERA) including Step 3a refinement in April 2007. Prior to finalizing the RI report, the results were presented to the Partnering Team at the March 2007 meeting. At that meeting, the Navy recommended that prior to proceeding to Step 3b of the baseline ERA, a hot spot removal action would be initiated to remove hot spots. As described in the EE/CA there are four soil focus areas which are associated with sampling locations 11SS01, 11SS13, 11SS16, and 11SS17.

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APPENDIX C Accutest Quality System Manual	ON CD
APPENDIX D Accutest Standard Operating Procedures	ON CD
APPENDIX E Accutest Laboratories NELAC Certifications and Navy Validation Letter	ON CD
APPENDIX F Executed Signature Pages	ON CD

SAP Worksheet #1 -- Title and Approval Page

FINAL SAMPLING AND ANALYSIS PLAN (FIELD SAMPLING AND QUALITY ASSURANCE PROJECT PLAN)

Prepared: 10 June 2008
Revised: 02 October 2008
Revised: 25 November 2008
Revised: 05 February 2009
Revised: 10 February 2009

REMOVAL ACTION AT SITE 11 NAVAL WEAPONS STATION YORKTOWN CHEATHAM ANNEX WILLIAMSBURG, VIRGINIA

Prepared for:

DEPARTMENT OF THE NAVY
NAVFAC Mid-Atlantic
9742 Maryland Avenue
Norfolk, Virginia 23511

Prepared by:
Natasha Kelley Sullivan
Shaw Environmental, Inc.
500 East Main Street, Suite 1630
Norfolk, VA 23510
Telephone: (410)529-7598

Prepared under:
Contract No. N62470-02-D-3260
Task Order No. 0113

Review Signature: _____

Ernie Duke, Shaw Environmental QCM Signature
Printed Name/Title/Date

Approval Signature: _____

NAVFAC QAO / Chemist Signature
Printed Name/Title/Date

Other Approval Signature: _____

Christopher Murray / MIDLANT RPM Signature
Printed Name/Title/Date

Note: Individual executed signatures will be provided
on separate sheets in SAP Appendix F.

SAP Worksheet #2-- SAP Identifying Information

Site Number/Code: Site 11, Naval Weapons Station Yorktown, Williamsburg, VA

Operable Unit: N/A

Contractor Name: Shaw Environmental, Inc.

Contract Number: N62470-02-D-3260

Contract Title: Remediation Services

Work Assignment Number: Contract Task Order No. 0113

1. This SAP was prepared in accordance with the requirements of the *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) (U.S. EPA 2005)*.

2. Identify regulatory program: Yorktown Naval Weapons Station maintains a Cooperative Agreement with the Virginia Department of Environmental Quality to provide regulatory and technical oversight for the Environmental Restoration Program.

3. This SAP is a project-specific SAP.

4. List dates of scoping sessions that were held:

Scoping Session Date

Reference Document

09APR08 – 10APR08 Partnering Meeting EE/CA Presentation See SAP Worksheet #9

06FEB09 – CAX Partnering Team Conference Call Response to Comments Discussion See SAP Worksheet #9

5. List dates and titles of SAP documents written for previous site work, that relevant to current investigation:

Title	Received Date
n/a	n/a
_____	_____
_____	_____

6. List organizational partners (stakeholders) and connection with lead organization: U.S Navy (NAVFAC Atlantic); Virginia Department of Environmental Quality; U.S. EPA

7. Lead organization: U.S Navy (NAVFAC Atlantic);

8. If any required SAP elements and required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion below:

Worksheet #22 is not applicable to this project because no equipment is necessary for sampling that requires calibration, maintenance, testing or inspection.

UFP-SAP Worksheet #	Required Information	Crosswalk to Related Information
A. Project Management		
<i>Documentation</i>		
1	Title and Approval Page	
2	Table of Contents SAP Identifying Information	
3	Distribution List	
4	Project Personnel Sign-Off Sheet	
<i>Project Organization</i>		
5	Project Organizational Chart	
6	Communication Pathways	
7	Personnel Responsibilities and Qualifications	
8	Special Training Requirements Table	
<i>Project Planning / Project Definition</i>		
9	Project Planning/Problem Definition (including Data Needs tables) Project Scoping session Participants Sheet	
10	Problem Definition, Site History, and Background Site Maps (historical and present)	
11	Site – Specific Project Quality Objectives	
12	Measurement Performance Criteria	
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	
14	Summary of Project Tasks	
15	Reference Limits and Evaluation Table	
16	Project Schedule / Timeline Table	
B. Measurement Data Acquisition		
<i>Sampling Tasks</i>		
17	Sampling Design and Rationale	
18	Sampling Locations and Methods/SOP Requirements Table Sample Location Map(s)	
19	Analytical Methods/SOP Requirements Table	
20	Field Quality Control Sample Summary Table	
21	Project Sampling SOP References Table Sampling SOPs	
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	
<i>Analytical Tasks</i>		
23	Analytical SOPs Analytical SOP References Table	
24	Analytical Instrument Calibration Table	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures	
<i>Sample Collection</i>		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody Form and Seal	

UFP-SAP Worksheet #	Required Information	Crosswalk to Related Information
<i>Quality Control Samples</i>		
28	QC Samples Table Screening / Confirmatory Analysis Decision Tree	
<i>Data Management Tasks</i>		
29	Project Documents and Records Table	
30	Analytical Services Table Analytical and Data Management SOPs	
C. Assessment Oversight		
31	Planned Assessments Table Audit Checklists	
32	Assessment Findings and Corrective Action Responses Tables	
33	QA Management Reports Table	
D. Data Review		
34	Verification (Step I) Process Table	
35	Validation (Steps IIa and IIb) Process Table	
36	Validation (Steps IIa and IIb) Summary Table	
37	Usability Assessment	

SAP Worksheet #3 Distribution List

Name of SAP Recipients	Title / Role	Organization	Telephone Number	Fax Number	E-mail Address
Christopher Murray	Navy RPM	U.S. Navy	(757) 444-3811	(757) 444-5822	Christopher.r.Murray@navy.mil
William Wells	FEAD	U.S. Navy	(757) 847-7952	(757) 887-4200	william.wellsjr@navy.mil
Ed Corl	NAVSEA Laboratory Quality and Accreditation Officer	U.S. Navy	(757) 396-7956		william.corl@navy.mil
Sherri Eng	NAVFAC Atlantic Technical Support	U.S. Navy	(757) 322-4366		sherri.eng@navy.mil
Skip Dunham	Project Manager	Shaw Environmental, Inc.	(757) 640-6921	(757) 640-6201	Skip_Dunham@Shawgrp.com
Dennis Kelley	Project Superintendent	Shaw Environmental, Inc.	(757) 888-0727	(757) 888-2105	Dennis.Kelley@Shawgrp.com
Brooke Mourain	Staff Engineer	Shaw Environmental, Inc.	(757) 640-6944	(757) 640-6201	Brooke.Mourain@Shawgrp.com
Bonnie Roberts	QC Representative	Shaw Environmental, Inc.	(757) 640-6947	(757) 640-6201	Bonnie.Roberts@Shawgrp.com
Natasha Sullivan	Program Chemist	Shaw Environmental, Inc.	(410) 529-7598	(410) 529-7599	Natasha.Sullivan@Shawgrp.com
Ernie Duke	Quality Assurance Manager	Shaw Environmental, Inc.	(412) 601-1086		Ernie.Duke@Shawgrp.com
Eric Malarek	Project Data Validator	Shaw Environmental, Inc.	(410) 612-6322	(410) 612-6351	Erik.Malarek@Shawgrp.com
Susanne Haug	EPA RPM	U.S. EPA Region 3	(215) 814-3394	(215) 814-3001	Haug.Susanne@epa.gov
Wade Smith	DEQ Project Manager	Virginia DEQ	(804) 698-4125	(804) 698-4234	wmsmith@deq.virginia.gov
William Friedmann	Navy Clean Project Manager	CH2M Hill	(757) 671-6223	(757) 497-6885	William.Friedmann@CH2M.com
Harry Behzadi	Laboratory Manager	Accutest Orlando	(407) 425-6700	(407) 425-0707	Harryb@accutest.com
Heather Wandrey	Laboratory Project Manager	Accutest Orlando	(401) 425-6700	(407) 425-0707	Heatherw@accutest.com
Svetlana Izosimova	Laboratory QAO	Accutest Orlando	(407) 425-6700	(407) 425-0707	SvetlanI@accutest.com

SAP Worksheet #4 -- Project Personnel Sign-Off Sheet

Organization: Shaw Environmental, Inc.

Project Personnel	Title / Role	Telephone Number	Signature / Email receipt ¹	SAP Section (s) Reviewed	Date SAP Read
Skip Dunham	Project Manager	(757) 640-6921			
Ernie Duke	Quality Assurance Manager	(412) 601-1086			
Dennis Kelley	Project Superintendent	(757) 888-0727			
Brooke Mourain	Staff Engineer	(757) 640-6944			
Bonnie Roberts	QC Representative	(757) 640-6947			
Natasha Sullivan	Program Chemist	(410) 529-7598			

Organization: Navy / Virginia DEQ / U.S. EPA / CH2M Hill

Project Personnel	Title / Role	Telephone Number	Signature / Email receipt ¹	SAP Section (s) Reviewed	Date SAP Read
Christopher Murray	Remedial Project Manager	(757) 444-3811			
William Wells	FEAD	(757) 847-7952			
Ed Corl	NAVSEA Laboratory Quality and Accreditation Officer	(757) 396-7956			
Sherri Eng	NAVFAC Atlantic Chemist	(757) 322-4366			
Susanne Haug	EPA RPM	(215) 814-3394			
Wade Smith	Virginia DEQ Project Manager	(804) 698-4125			
William Friedmann	Navy Clean Project Manager	(757) 671-6223			

¹ Individual executed signatures will be provided on separate sheets in SAP Appendix F.

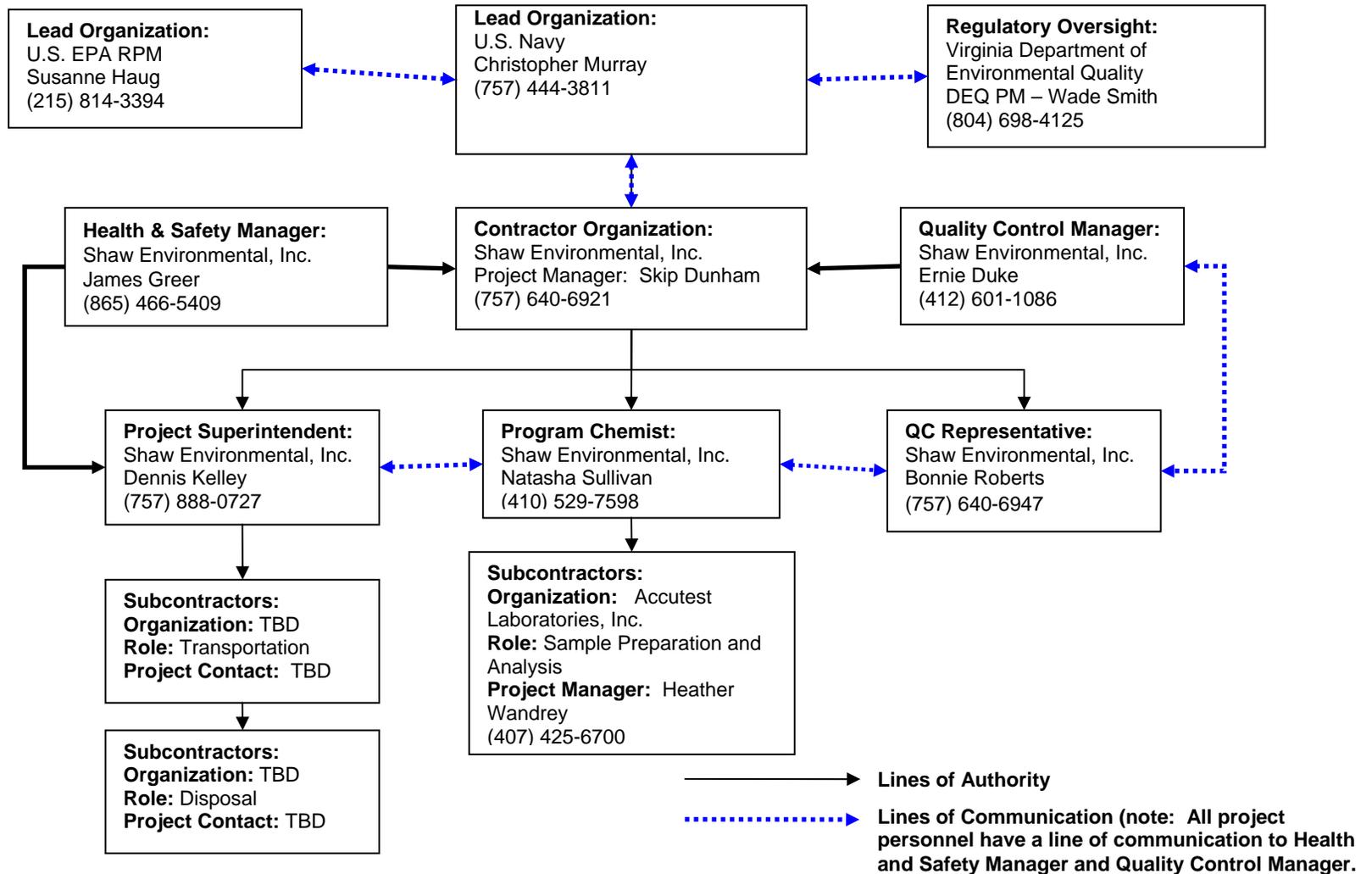
SAP Worksheet #4 -- Project Personnel Sign-Off Sheet – (continued)

Organization: Accutest Laboratories - Orlando

Project Personnel	Title / Role	Telephone Number	Signature / Email receipt ¹	SAP Section (s) Reviewed	Date SAP Read
Harry Behzadi	Laboratory Manager	(407) 425-6700			
Heather Wandrey	Laboratory Project Manager	(407) 425-6700			
Svetlana Izosimova	Laboratory QA Officer	(407) 425-6700			

¹ Individual executed signatures will be provided on separate sheets in SAP Appendix F.

SAP Worksheet #5 Project Organizational Chart



SAP Worksheet #6 Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number and /or email	Procedure (timing, pathways, etc.)
Point of Contact with Virginia DEQ Project Manager	Remedial Project Manager (RPM)	Christopher Murray	(757) 444-3811 Christopher.r.Murray@navy.mil	All Materials and information pertaining to the project will be forwarded to Wade Smith by the Remedial Project Manger (RPM) following review.
Manage all project phases	Contractor Project Manager	Skip Dunham	(757) 640-6921 Skip.Dunham@Shawgrp.com	Issues are to be reported to the RPM immediately and followed up in writing within 2 business days.
SAP Changes in the field	Project Superintendent	Dennis Kelley	(757) 888-0727 Dennis.Kelley@Shawgrp.com	Notify the Shaw PM by phone and e-mail of changes to the SAP made in the field and the reasons within 24 hours. Changes will be documented in a technical directive.
Daily Field Progress Reports	Project Superintendent	Dennis Kelley	(757) 888-0727 Dennis.Kelley@Shawgrp.com	Project Superintendent will provide daily reports to Project Manager fax, phone, or e-mail.
Reporting Lab Data Quality Issues	Laboratory Quality Assurance Officer	Svetlana Izosimova	(407) 425-6700 SvetlanI@accutest.com	All QA/QC issues with laboratory analyses will be reported to Project Chemist within 2 business days.
Reporting Quality System Issues	Program QC Manager	Ernie Duke	(412) 601-1086 Ernie.Duke@Shawgrp.com	Periodic Quality System reviews are conducted once per quarter. Any issues discovered during these review processes are reported to the program and the Project Manager immediately and in writing within 2 business days.
Field Corrective Actions	QC Representative	Bonnie Roberts	(757) 640-6947 Bonnie.Roberts@Shawgrp.com	The need for corrective action for field issues will be reported by the QC Representative and documented in a technical directive within 2 business days.
Lab Analytical Corrective Actions	Program Chemist	Natasha Sullivan	(410) 529-7598 Natasha.Sullivan@Shawgrp.com	Will determine the need for corrective actions for analytical issues. The corrective actions will be reported to the Project Manager within 2 business days.

SAP Worksheet #6
Communication Pathways (Continued)

Communication Drivers	Responsible Affiliation	Name	Phone Number and /or email	Procedure (timing, pathways, etc.)
Release of Analytical Data	Program Chemist	Natasha Sullivan	(410) 529.7598 Natasha.Sullivan@Shawgrp.com	No analytical data will be released until verification is completed. Data will be verified by the Program Chemist within one business day of receipt from the laboratory.
SAP Amendments	Program Chemist	Natasha Sullivan	(410) 529.7598 Natasha.Sullivan@Shawgrp.com	Any major changes to the SAP must be approved by the Project Manager before the changes can be forwarded to the Navy organizational partners for approval. The proposed changes will be forwarded to the Navy organizational partners within 5 days of proposal. Major changes to the SAP will not be implemented unless approved by the Navy organizational partners.

SAP Worksheet #7 -- Personnel Responsibilities and Qualifications Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Christopher Murray	Remedial Project Manager	U.S. Navy	Oversees the project and serves as the liaison between the Navy and U.S. EPA and Virginia DEQ.	B.S. Environmental Science M.E. Environmental Engineering Professional Engineer, 10 years experience
William Wells	FEAD	Navy Public Works Department (PWD) Yorktown	Oversees construction activities in the field and responds to RPM.	B.S. Civil Engineering, 31 years experience
Skip Dunham	Project Manager	Shaw Environmental, Inc.	Manages project and coordinates between Navy and Shaw Environmental, Inc.	B.S. Mechanical Engineering, Professional Engineer, Missouri. Over 17 yrs experience.
Dennis Kelley	Project Superintendent	Shaw Environmental, Inc.	Responsible of supervising all field activities and supervises field sampling.	Over 27 years of construction professional experience. Experience in procurement of equipment and materials, project health and safety compliance, budgeting, scheduling, and client liaison.
Ernie Duke	Program QC Manager	Shaw Environmental, Inc	Oversees the project Quality Systems.	B.S. Geology, P.G. 34 years experience.
Bonnie Roberts	QC Representative	Shaw Environmental, Inc.	QA oversight on the project.	B.S. Environmental Science , 5 years experience
Natasha Sullivan	Program Chemist	Shaw Environmental, Inc.	Serves as liaison between Shaw Environmental and laboratory.	17 years of experience.
James Greer	Health & Safety Manager	Shaw Environmental, Inc.	Oversees the H&S for field activities.	17 years of experience.

SAP Worksheet #7 -- Personnel Responsibilities and Qualifications Table (continued)

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Harry Behzadi	Laboratory Manager	Accutest Orlando	Manages the generation of analytical data	Ph.D. Chemistry, 24 years of experience
Heather Wandrey	Laboratory Project Manager	Accutest Orlando	Serves as Laboratory Project Manager and laboratory liaison with Shaw.	B.A. Environmental Studies, 12 years experience
Svetlana Izosimova	Laboratory QA Officer	Accutest Orlando	Performs lab QA oversight	M.S. Chemical Engineering Ph.D. Colloid Chemistry, 16 years experience

SAP Worksheet #8 -- Special Personnel Training Requirements Table

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel / Groups Receiving Training	Personnel Titles / Organizational Affiliation	Location of Training Records / Certificates ¹
Site Superintendent	<ul style="list-style-type: none"> • 40-Hour Hazardous Waste Site Worker • 24-Hour Initial On-Site Field Experience • 8-Hour Hazardous Waste Site Supervisor Training • 10-hour OSHA Construction Site Worker Safety Training 	Varies ²	Varies ²	All	Dennis Kelly Skip Dunham/ Shaw Environmental	Certificates available upon request and documentation files are maintained on site.
Field Technicians and Equipment Operators	<ul style="list-style-type: none"> • 40-Hour Hazardous Waste Site Worker • 24-Hour Initial On-Site Field Experience 	Varies ²	Varies ²	All	Field Technicians, all levels; Equipment Operators, all levels	Shaw Environmental: Certificates available upon request. Certification files are maintained on site.
Any personnel working in the exclusion area or are of contamination on the project site	<ul style="list-style-type: none"> • 40-Hour Hazardous Waste Site Worker • 24-Hour Initial On-Site Field Experience 	Varies ²	Varies ²	All	Varies by Trade	Shaw Environmental: Certificates available upon request. Certification files are maintained on site.

¹ Training records and/or certificates are available at the Shaw Construction Trailer at Naval Weapons Station Yorktown, Virginia.

² The training provider and date of the training may/will vary from person to person but is indicated on the individual's certificate.

SAP Worksheet #9 -- Project Scoping Session Participants Sheet

Project Name: Naval Weapons Station Yorktown Removal Actions Projected Date(s) of Sampling: _____TBD_____	Site Name: Site 11 Site Location: Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia
Project Manager: Skip Dunham	

Date of Session: (see below)
Scoping Session Purpose: (see below)

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Linda Cole	Navy RPM	U.S. Navy	(757) 444-3826	Linda.Cole@navy.mil	Navy RPM
Skip Dunham	Project Manager	Shaw Environmental	(757) 640-6921	Skip.Dunham@Shawgrp.com	Project Manager
Dennis Kelley	Project Superintendent	Shaw Environmental	(757) 888-0727	Dennis.Kelley@Shawgrp.com	Project Superintendent
Adair Franklin	Project Superintendent	Shaw Environmental	(757) 888-0727	James.Franklin@Shawgrp.com	Project Superintendent
Brooke Mourain	Project Engineer	Shaw Environmental	(757) 640-6944	Brooke.Mourain@Shawgrp.com	Project Engineer
Adam Forshey	Project Engineer	Shaw Environmental	(757) 640-6943	Adam.Forshey@Shawgrp.com	Project Engineer
Kym Edelman	Health and Safety Manger	Shaw Environmental	(757) 640-6950	Kym.Edelman@Shawgrp.com	Health and Safety

The formal scoping for these removal actions was developed prior to the implementation of the UFP-QAPP. The Naval Weapon Station Yorktown Team developed the:

- April 9-10, 2008: The Engineering Evaluation/Cost Analysis (EE/CA) for Soil Removal Action slide show presentation (prepared and presented by CH2M Hill) was presented at the Partnering Meeting on the aforementioned dates. Site history, sampling guidelines, and PRGs were discussed and demonstrated. Attendance sheets and copies of the slide show presentation can be made available upon request to CH2M Hill.

SAP Worksheet #9 -- Project Scoping Session Participants Sheet
 (Continued)

Project Name: Naval Weapons Station Yorktown Removal Actions Projected Date(s) of Sampling: _____TBD_____	Site Name: Site 11 Site Location: Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia
Project Manager: Skip Dunham	

Date of Session: February 6, 2009
Scoping Session Purpose: Team Consensus on Work Plan and Response to Comments (RTCs) via Conference Call.

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Christopher Murray	Navy RPM	U.S. Navy	(757) 444-38	Christopher.r.Murray@navy.mil	Navy RPM
Susanne Haug	EPA Manager	U.S. EPA Region 3	(215)814-3394	Haug.Susaanne@epa.gov	EPA Manager
Peter Knight	EPA BTAG	EPA BTAG			
Wade Smith	VDEQ Project Manager	Virginia DEQ	(804) 698-4125	wmsmith@deq.virginia.gov	VDEQ Manager
Donna Caldwell	NAVFAC Atlantic	NAVFAC		Donna.Caldwell@navy.mil	
Skip Dunham	Project Manager	Shaw Environmental	(757) 640-6921	Skip.Dunham@shawgrp.com	Project Manager
Bonnie Roberts	Field Scientist	Shaw Environmental	(757) 640-6947	Bonnie.Roberts@shawgrp.com	Field Scientist
Marlene Ivester		CH2M Hill	(757) 873-1442	Marlene.Ivester@CH2M.com	
Jim Gravette		CH2M Hill	(757) 873-1442	Jim.Gravette@CH2M.com	
Bill Kappleman		CH2M Hill	(757) 873-1442	William.Kappleman@CH2M.com	
Stephanie Sawyer		CH2M Hill	(757) 873-1442	Stephanie.Sawyer@CH2M.com	

The Naval Weapon Station Yorktown Team reached the following consensus to the VDEQ, EPA and BTAG comments on the Workplan and UFP SAP:

- VDEQ's Comment #9. The Navy clarified that all four areas will be excavated to a depth of three feet. Workplan Section 3.4.1 and UFP SAP Worksheet 10 text has been revised.
- EPA BTAG Comment #1. No resolution. Resolution of this comment will not hold up the proposed field work since the work plan was written for Areas 1 through 4. Therefore, the Team agreed that the work at Areas 1 to 4 could continue.
- EPA BTAG Comment #2. The team agreed that the clean fill will be sampled for the analytes in accordance with the SAP. The analytical results will be compared to the Site 11 established PRGs or background concentrations to determine if the fill used as backfill can be used at Site 11. If the analyzed constituents, detailed in the SAP, are equal to or below the PRGs or the CAX background levels, the fill can be used at Site 11. This agreement is specific to Site 11. Shaw is waiting to receive direction from the partnering team concerning the background levels that are to be used to evaluate clean fill as of 10 February 2009. Results will be submitted to the partnering team for discussion, review, and approval. Shaw will only compare the fill material results to the CAX Site 11 PRGs. Fill will not be placed without prior written approval from the partnering team.
- EPA BTAG Comment #3. Regarding Section 5.4 of the WP which addresses "protection of natural resources". Since there are no requirements at Site 11 for the protection of natural resources, the team agreed to change this section to state that there are no known special protection requirements for natural resources.
- EPA BTAG Comment #5. EPA BTAG is concerned that the proposed sampling in Areas 1, 3, and 4 are not adequate. For Area 1, upon further explanation of the sample locations and their ID's it was agreed that BTAG had misread the sample ID and the comment was no longer valid. For Areas 3 and 4, Jim Gravette explained that no additional samples could be collected due to the site topography. The proposed sample locations are the only place where samples can be collected. Shaw will add language to the work plan to explain the topography around Areas 3 and 4 and rationale for not sampling the northern side of the depressions. In addition, the team agreed that the sampling plan for Areas 3 and 4 would follow the Workplan as proposed, and based on those sampling results, the Team will determine if any additional sampling is needed.

A more detailed description of the discussions held during this conference call are included in the meeting minutes and will be included in the final workplan.

SAP Worksheet #10 -- Problem Definition

The problem to be addressed by the project:

This task primarily focuses on the remediation efforts at Site 11 (Bone Yard). Site 11 encompasses an estimated 2.7-acre area located approximately 250 feet south of Antrim Road and the Public Works Department. Site 11 consists of an open, overgrown, grassy field surrounded by mixed-hardwood woodland. Old building foundations, concrete pads, and low retaining walls litter the site, both inside and outside of the wooded areas. Two creeks running eastward to Penniman Lake drain Site 11 and border the site to the north and south. Access to the site is from the north via a dirt road off Antrim road. Site 11 was reportedly used between 1940 and 1978 to store containers of waste-oil and tar as well as asphalt and other scrap materials on the ground. Oil, asphalt, gasoline, and other unspecified materials have been identified in the disposal area.

Baker Environmental, Inc. prepared a remedial investigation (RI) report including baseline human health risk assessment and screening-level ecological risk assessment (ERA) including Step 3a refinement in April 2007. Prior to finalizing the RI report, the results were presented to the Partnering Team at the March 2007 meeting. At that meeting, the Navy recommended that prior to proceeding to Step 3b of the baseline ERA, a hot spot removal action would be initiated to remove hot spots. As described in the EE/CA there are four soil focus areas which are associated with sampling locations 11SS01, 11SS13, 11SS16, and 11SS17.

The human health risk assessment concluded there were no potential unacceptable risks to current on-site workers or trespassers or to future construction workers or adult residents from exposure to soils. Furthermore, while potential unacceptable risk was identified for future child residents, mainly due to ingestion of iron, that risk is considered manageable since that average iron concentration across the site is less than background and the USEPA Region 3 residential soil screening level.

The ERA indicated that PAHs, pesticides, and inorganics contributed to a potential unacceptable ecological risk in soil. The soils that pose a potential ecological risk are isolated to four areas. While this assessment identified two other soil sample locations that were recommended for further evaluation (RI sample locations 11SS24 and 11SS12), these locations will not be included in this action. RI sample location 11SS24, where mercury was detected at 0.17 L ppm, will not be included because this concentration is below background (0.24 ppm). RI sample location 11SS12, where lead was detected at 385 ppm, will not be included because both the maximum concentration of lead in surrounding soils (58.6 ppm at RI sample location 11SS13) and average residual concentrations of lead across the site without addressing sample location 11SS12 (42 ppm) are below the ecological screening criteria of 120 ppm.

The environmental questions being asked:

Will the proposed excavation areas and depths be sufficient to mitigate the risks to ecological receptors?
What will the final disposal volume be?

Observations from any site reconnaissance reports:

The area includes significant tree and shrub growth; approximately 2 acres of the four areas will be cleared and grubbed. The establishment of a lay down pad and construction of a decontamination pad will be conducted at the site. The contamination and the areas of contamination have been thoroughly investigated.

SAP Worksheet #10 -- Problem Definition (Continued)

A synopsis of secondary data or information from site reports:

Site 11
A comprehensive environmental investigation was conducted by the Navy Clean Contractor (Baker Environmental, Inc.) and CH2M Hill to determine the contaminants of concern and Preliminary Remediation Goals. The basis for the Preliminary Remediation Goals (PRGs) for Site 11 were established from the Final Remedial Investigation, Site 11- Bone Yard, Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia, (Baker Environmental, April 2007) and Engineering Evaluation/Cost Analysis (EE/CA) Site 11 (Bone Yard), Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia (CH2MHill, April 2008). The current PRGs are as follows and are based upon a dry weight basis:

- Copper 70 mg/kg Ecological
- Lead 120 mg/kg Ecological
- Mercury 0.24 mg/kg Background
- Selenium 1.8 mg/kg Ecological
- Zinc 120 mg/kg Ecological
- Iron 46,400 Background
- 4,4'-DDD 100 µg/kg Ecological
- 4,4'-DDE 100 µg/kg Ecological
- PAHs 18,000 µg/kg Ecological

The possible classes of contaminants and the affected matrices:

Site 11 was primarily used to store containers of waste-oil and tar as well as other debris such as asphalt and other scrap materials from 1940 to 1978. The main contaminants of concern at Site 11 are select PAHs and metals, and pesticides. Previous site investigations indicate that soil, and ground water at this site is affected. However, the primary purpose of this project is to mitigate the unacceptable risks to ecological receptors from direct contact with contaminated soil through removal and disposal of debris and contaminated soil. Groundwater contamination is not being addressed during these removal actions.

The rationale for inclusion of chemical and nonchemical analyses:

Pre-Excavation confirmation soil samples will be collected from the proposed lateral extent of excavations areas to verify that for the constituents of concern will be removed equal to or below the Preliminary Remediation Goals when excavation is complete.

Confirmation soil samples will only be collected from the bottoms of excavations area to verify that for the constituents of concern have been removed equal to or below the Preliminary Remediation Goals.

Soil samples will be collected in-situ to characterize the soil for disposal.

Off-Base Fill Material will be sampled prior to placement to verify the material is acceptable for placement.

Site 11 - Groundwater samples were previously evaluated during the RI/FS; and it was determined that the groundwater does not pose unacceptable risk to human health and the environment.

The removal actions at Site 11 will not contact groundwater within the limits of removal, and no public water systems are affected by the remedial action. It is unlikely that these sites will be developed for residential use or that the shallow groundwater will be used as a potable water supply. Groundwater remediation is not being addressed in this removal action.

SAP Worksheet #10 -- Problem Definition (Continued)

Depths of Excavations:

It is anticipated that Area 1 will be excavated to a depth of 3 feet below ground surface (bgs), Area 2 will be excavated to 3 foot bgs, and Areas 3 and 4 will be excavated to a depth of 3 feet bgs. These excavation depths were developed by the partnering team and are based upon the previous analytical data used to develop the EE/CA.

Project decision conditions (If..., then... @ statements):

Confirmation Soil Samples Site 11 (see worksheet 19 for analytical methods)

Pre-Excavation Soil Samples

The EE/CA has established that the existing data is sufficient to delineate the excavation areas and only samples as defined on Figure 3 and as described below are required.

Prior to the excavation soil samples will be collected from:

Area 1: Collect grab co-located surface (0-6 inches) and subsurface soil (2-3 ft bgs) samples at the three locations shown on Figure 3 to delineate the western portion of Area 1. Samples will be analyzed for total PAHs, 4,4-DDD, 4,4-DDE, copper, lead, mercury, and zinc.

Area 2: Collect grab surface soil (0-6 inches) and subsurface soil (2-3 ft bgs) at the four locations shown on Figure 3 to delineate all four corners of the Area 2 excavation area. Samples will only be analyzed for zinc.

Area 3: Collect one grab surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression shown on Figure 3. The lateral extent of contamination is constrained by the limits of the manmade pit. Samples will be analyzed for 4,4-DDD, 4,4-DDE, copper, iron, lead, mercury, selenium, and zinc.

Area 4: Collect one grab surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression shown on Figure 3. The lateral extent of contamination is constrained by the limits of the manmade pit. Samples will be analyzed for 4,4-DDD, 4,4-DDE, copper, lead, mercury, selenium, and zinc.

IF the concentrations are equal, to or below the Preliminary Remediation Goals (PRGs) for the Contaminants of Concern (COCs) **THEN** the boundaries of the excavation have been established and excavation can begin. Pre-Excavation soil samples at Areas 1 and 2 below PRGs will serve as confirmation wall samples, no additional wall samples will be required. At Areas 3 and 4 the lateral extent of contamination is constrained by the limits of the pit, no additional confirmation wall samples will be required.

IF the concentrations exceed the Preliminary Remediation Goals (PRGs) for the Contaminants of Concern (COCs) **THEN** the boundaries for contamination have not been located and additional samples may be required to determine those boundaries. With approval and direction from the Navy RPM additional samples will be collected at intervals of 5 feet laterally (Areas 1,2,3, and 4) from the initial sampling point until clean margins are established.

SAP Worksheet #10 -- Problem Definition (Continued)

Soil Samples Bottom of the Excavation (All Areas)

Following the excavation confirmation soil samples will be collected. Confirmation samples will be analyzed for the same parameters listed for the pre-excavation soil samples. The frequency of the confirmation soil samples will consist of one 5-point composite soil sample from the bottom of the excavation per 500 square feet. The results from the laboratory will be an average concentration of 5 point field composited and homogenized sample, and will be compared to the Preliminary Remediation Goals.

IF the concentrations are equal to or below the Preliminary Remediation Goals **THEN** no further excavation is required. Backfilling and restoration may begin.

IF the concentrations exceed the Preliminary Remediation Goals **THEN** additional 1-2 feet of material will be excavated from the bottom. The newly excavated area will be **ONLY** be sampled for those constituents of concern that exceeded the Preliminary Remediation Goals in the prior sampling and those results compared to the Preliminary Remediation Goals. After two iterations of the above process, **IF** the constituents' concentrations still exceed the soil remediation goals, **THEN** excavation activities will halt and NAVFAC personnel will be notified for evaluation and decision as to how to proceed. The decision (if warranted), will be documented and detailed in the Closeout Report. **IF** the concentrations are equal to or below the Preliminary Remediation Goals **THEN** no further excavation is required. Backfilling and restoration may begin.

Should groundwater be encountered during excavation it will be allowed to flow into an adjacent grid that has been excavated to an acceptable level. If the groundwater is so prevalent that it will not adequately flow into the adjacent grid to allow for excavation, the Navy will be contacted for guidance/assistance on a move forward strategy.

Excavation may be stopped at anytime at the discretion of the Navy RPM.

SAP Worksheet #10 -- Problem Definition (Continued)

Waste Disposal Profile Soil Samples (see worksheet 19 for analytical methods)

Site 11 – Approximately 2,000 cubic yards of contaminated soil and 100 cubic yards of concrete and debris will be excavated and disposed of at an approved off-site disposal facility.

Soil samples will be collected in-situ from the areas to be excavated to characterize the material for disposal. The areas of proposed excavation will be laid out in to grids. Areas 1, 2, 3, and 4 where the depth of the excavation will 3 feet (bgs) the grids will be approximately 65 feet by 65 feet. The purpose of the five point composite is to characterize the soil to be excavated by collecting a sample that would represent the average concentration of the soil to be disposed. Discrete sample points from varying depths will be used to create the five-point composite sample, not to exceed the depth of the bottom of the excavation. Manual excavation will be used to collect these individual sample aliquots before compositing.

Waste Characterization samples will be collected as follows:

One five-point composite sample will be collected in-situ per Area and per approximately 500 cubic yards of soil:

Area 1 – two five point composite samples to be collected.

Area 2, 3, and 4 – one five point composite sample is to be collected per each area.

Composite soil samples will be collected in-situ from the each Area and analyzed for full toxicity characteristic leaching procedure (TCLP) parameters as listed in **Worksheet 19** *minus TCLP Mercury and or TCLP Lead*, polychlorinated biphenyls (PCBs), Resource Conservation and Recovery Act (RCRA) characteristics and total petroleum hydrocarbons (TPH) to characterize the material for disposal. The analytical data will be compared to TCLP Maximum Contaminant Concentrations (40 CFR 261 6/96), PCB limits and TPH limits to determine if the concentrations exceed the regulatory requirements for land disposal. The rationale for separate sampling and analysis of TCLP Mercury and TCLP Lead, to characterize for material disposal, is described below.

Upon review of the 1999, 2000 and 2002 RI data, it was determined that Mercury in Areas 3 and 4 and Lead in all Areas is elevated from a potential RCRA characterization perspective. The following sampling scenario was developed to further delineate any potential TCLP Mercury and or TCLP Lead exceedance.

Area 1 - Collect **ten grab samples**, using the locations selected for the five point composite sample. Analyze for TCLP Lead. Results will be evaluated against the TCLP Maximum Contaminant Concentration (40 CFR 261 6/96). For TCLP Lead, if the results exceed 5.0 mg/l further division of the grids may be conducted and additional TCLP Lead samples may be taken to further delineate the grids.

Area 2 - Collect **three grab samples**, using the locations selected for the five point composite sample. Analyze for TCLP Lead. Results will be evaluated against the TCLP Maximum Contaminant Concentration (40 CFR 261 6/96). For TCLP Lead, if the results exceed 5.0 mg/l further division of the grids may be conducted and additional TCLP Lead samples may be taken to further delineate the grids.

Area 3 and 4 - Collect **three grab samples**, using the locations selected for the five point composite sample. Analyze for TCLP Lead and TCLP Mercury. Results will be evaluated against the TCLP Maximum Contaminant Concentration (40 CFR 261 6/96). If the results exceed 5.0 mg/l for TCLP Lead or 0.2 mg/l for TCLP Mercury further division of the grids may be conducted and additional TCLP Lead and or TCLP Mercury samples may be taken to further delineate the grids.

SAP Worksheet #10 -- Problem Definition (Continued)

Waste Disposal Profile Soil Samples (see worksheet 19 for analytical methods) -continued

IF the TCLP concentrations **EXCEED** the TCLP Maximum Contaminant Concentrations and or 50 milligrams per kilograms (mg/kg) of total PCBs **THEN** the soil is classified as a hazardous material and it must be stabilized or transported to a permitted hazardous waste facility. The project team may decide that additional splitting and analysis of the grids may be performed to further delineate the exceedances. **IF** it is decided that additional delineation is required **THEN** the grids will be divided in half and grab samples will be collected for the constituent/s that exceeded at a frequency of one grab sample per ~100 cubic yards of material; a minimum of three grab samples will be collected. If after further splitting of the grids and subsequent analysis the soil has concentrations that **EXCEED** the TCLP Maximum Contaminant Concentrations **THEN** the Navy RPM will be notified and the project team will discuss whether further splitting of the grids and additional sample analysis is required. **IF** the project team decides that further splitting of the grids is not required then the soil will be classified as a hazardous material, and it must be transported to a permitted hazardous waste facility. **IF** it is decided by the project team to split the grids again **THEN** process as described above will be repeated.

IF the TPH concentrations exceed 3,000 mg/kg **THEN** the waste be classified as a hazardous material, and it must be transported to a permitted hazardous waste facility.

IF the TCLP concentrations **DO NOT** exceed TCLP, PCBs, RCRA characteristics and TPH maximum contaminant concentrations and are equal to or less than 50 mg/kg of Total PCBs or 3,000 mg/kg of TPH **THEN** the material is not hazardous and can be excavated and transported to a permitted non-hazardous landfill.

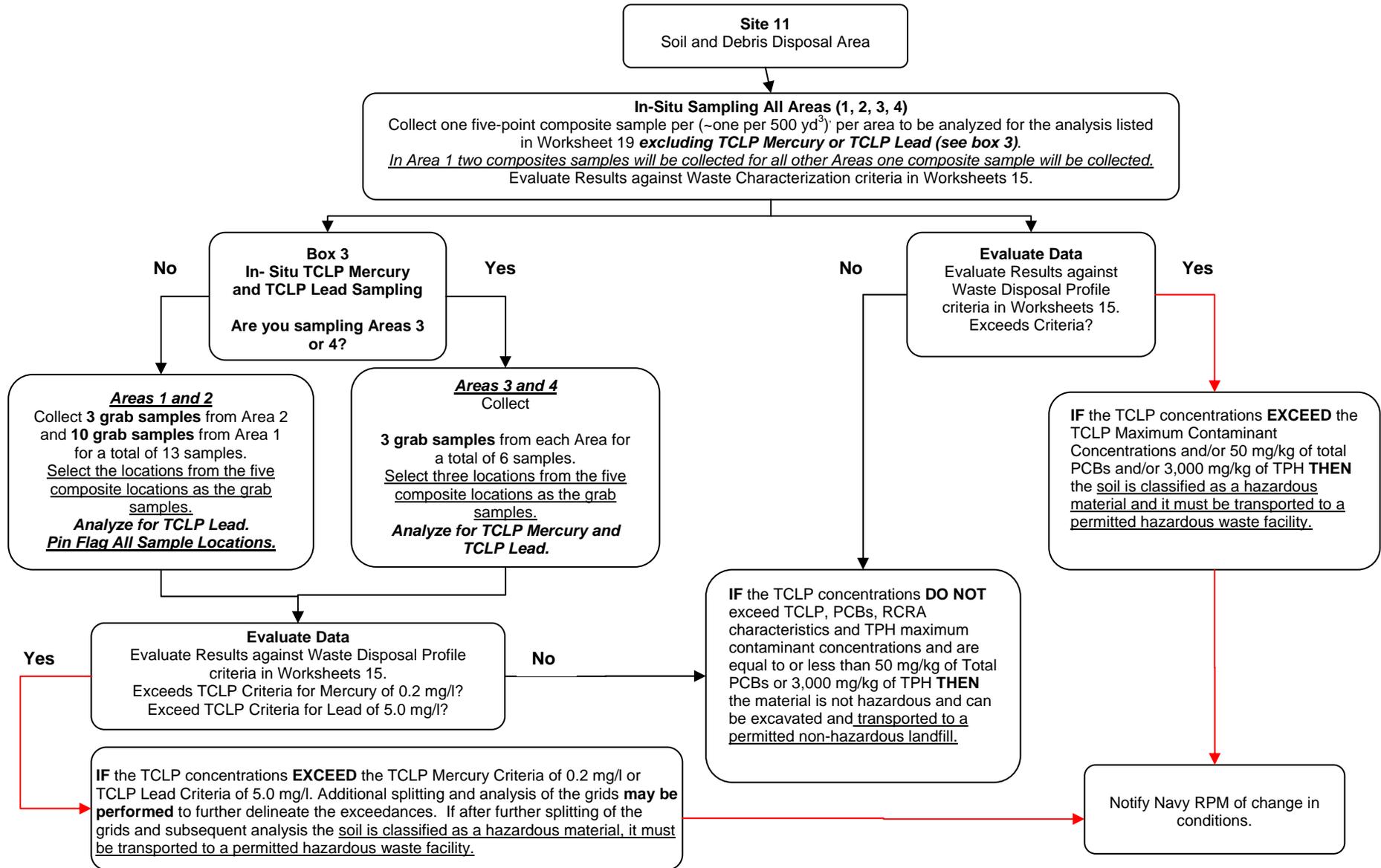
Fill Material Characterization Soil Samples (see worksheet 19 for analytical methods)

For fill material (material brought on site to restore site grading), one five point composite soil sample per 1,000 cubic yards will be collected from each type of fill material (i.e. topsoil, clay, sand) for each material source. Fill material samples will be analyzed for the clean fill requirements as listed in **Worksheet 19**.

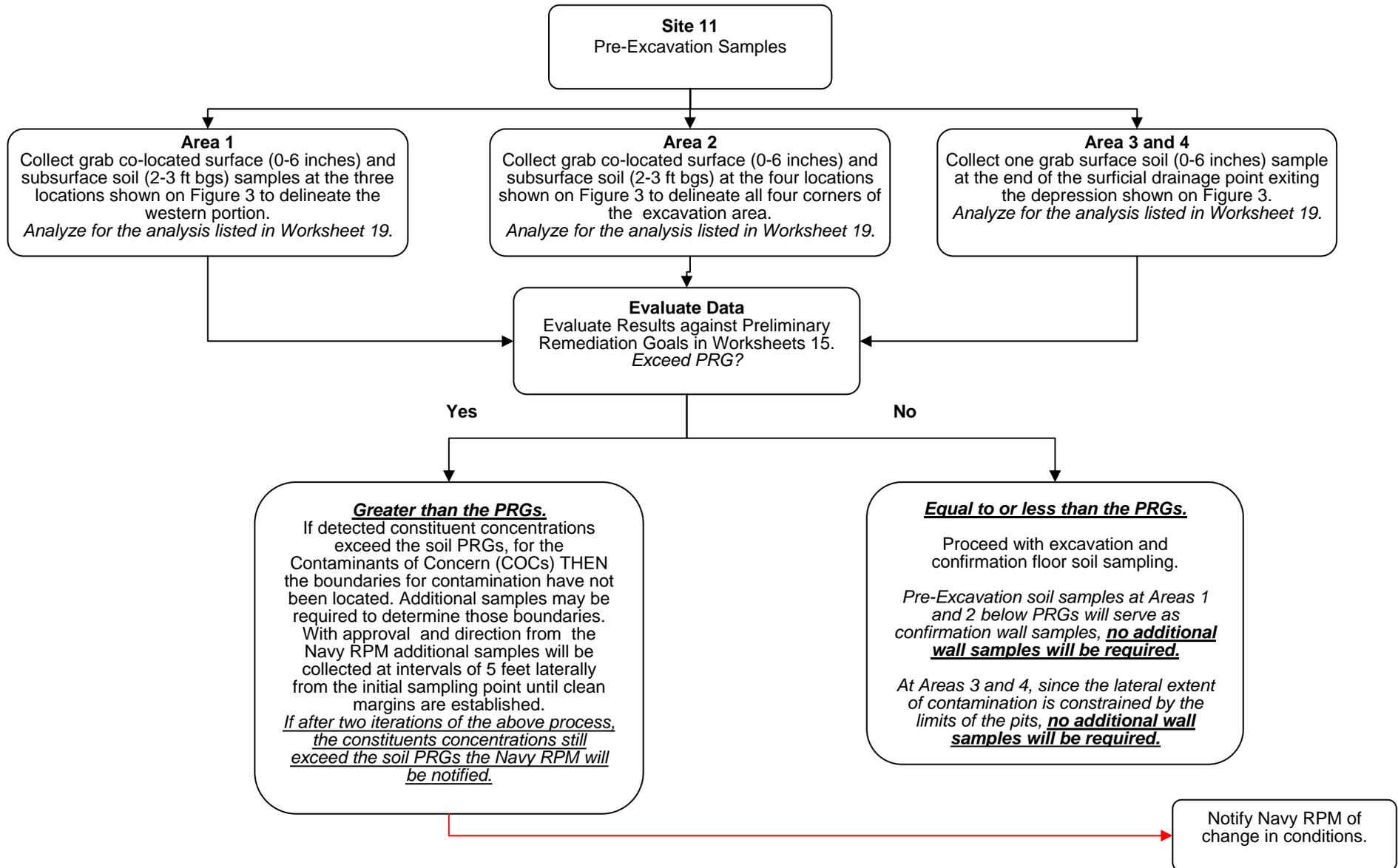
IF the concentrations are equal to or less than the PRGs listed in **Worksheet 15** for Copper, Lead, Mercury, Selenium, Zinc, Total PAHs, 4,4'-DDD, and 4,4'-DDE, **THEN** the material maybe considered acceptable for use. The results will then be submitted to the partnering team for discussion and review of the additional analysis, additional analysis may be compared to site specific background levels for some or all of the analytes. Fill will not be placed without written approval from the partnering team.

IF the concentrations exceed the PRGs for constituents of concern **THEN** the material is rejected and will not be used at the site. When any material is rejected, another source of material will be located. The new source of material will be sampled. All results of these samples shall be evaluated by the partnering team and approved by the Navy prior to placement.

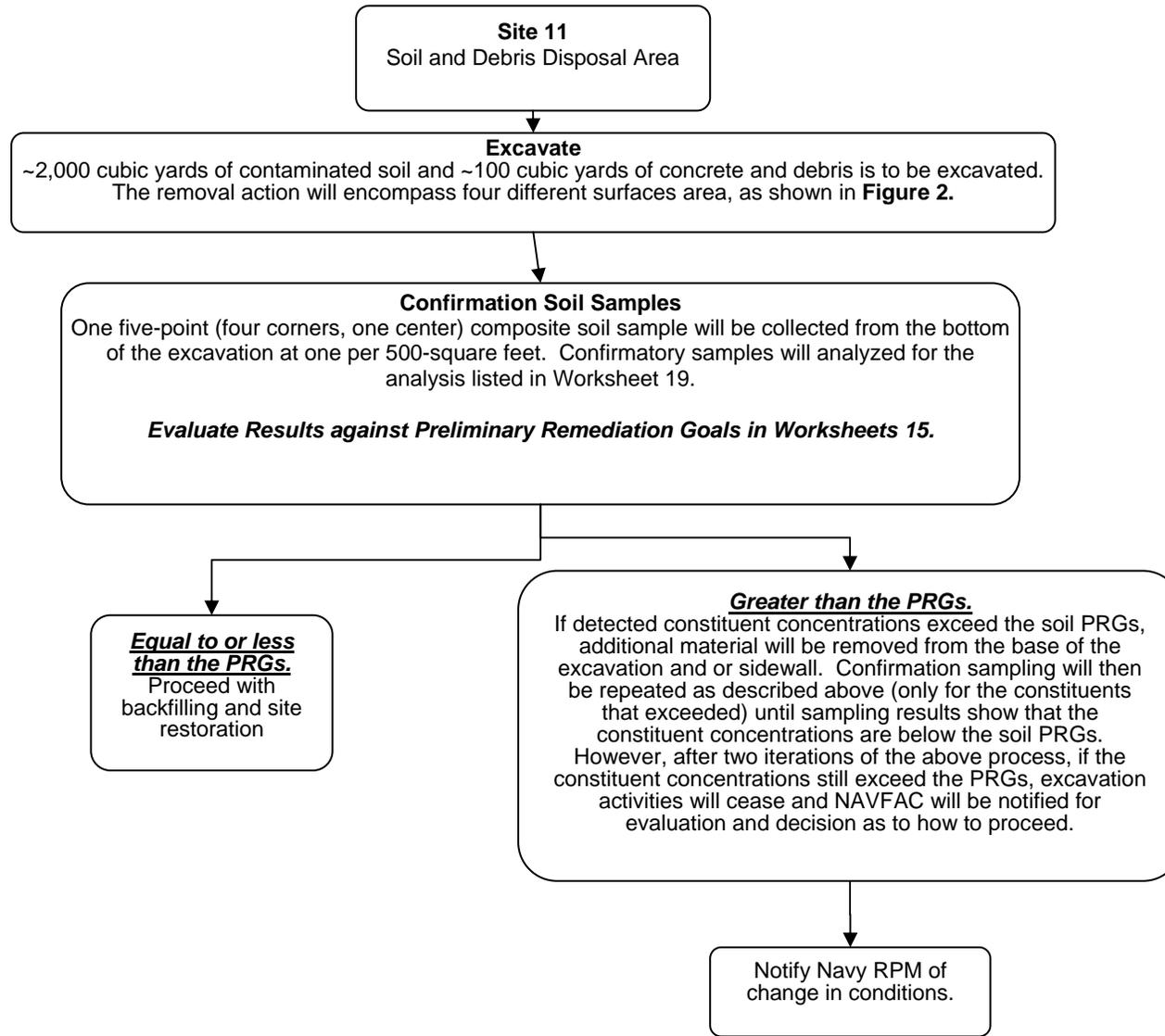
SAP Worksheet #10 -- Problem Definition (Continued) Waste Disposal Profile Samples Flowchart – Site 11



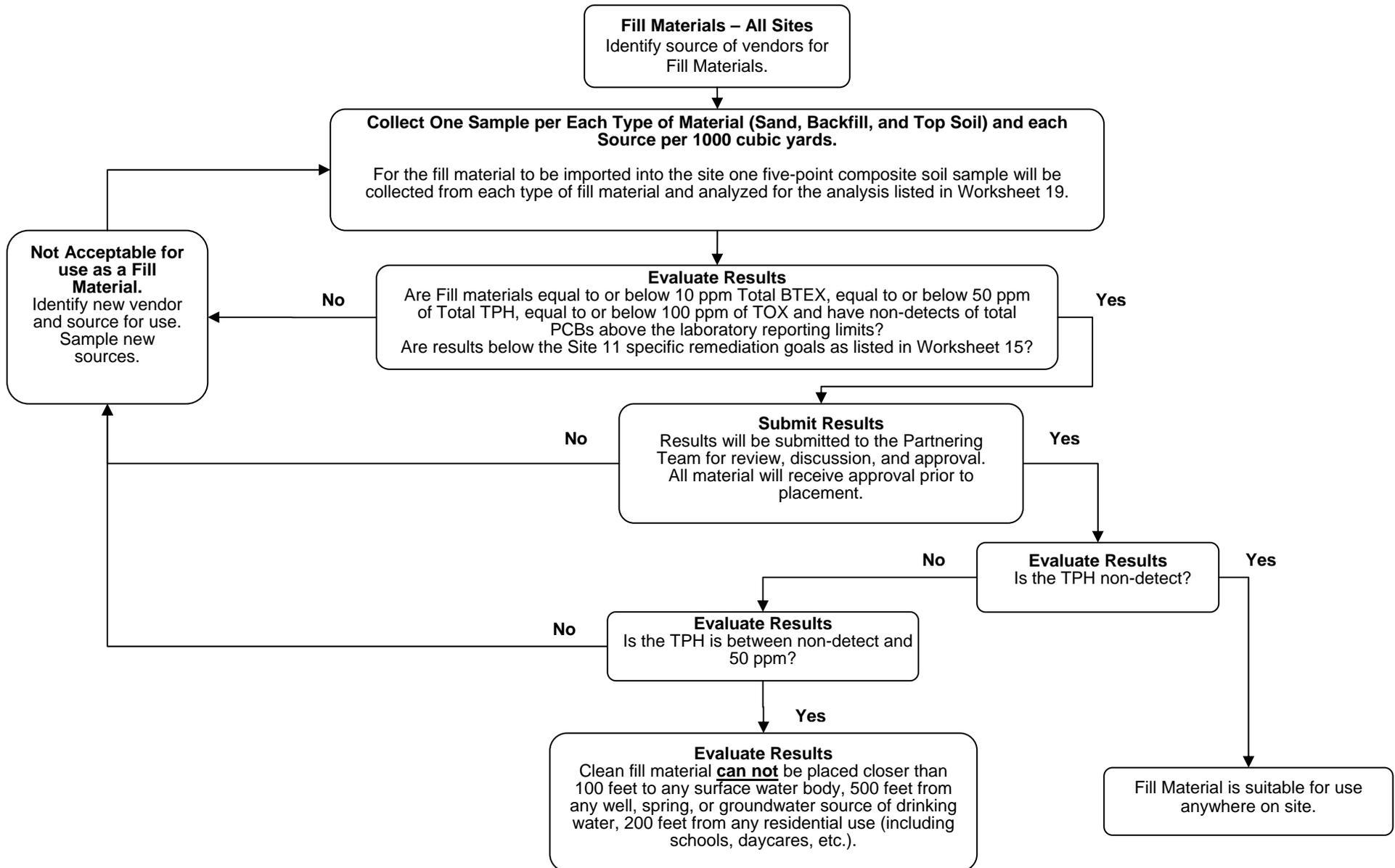
SAP Worksheet #10 -- Problem Definition (Continued) Pre-Excavation Samples – Site 11



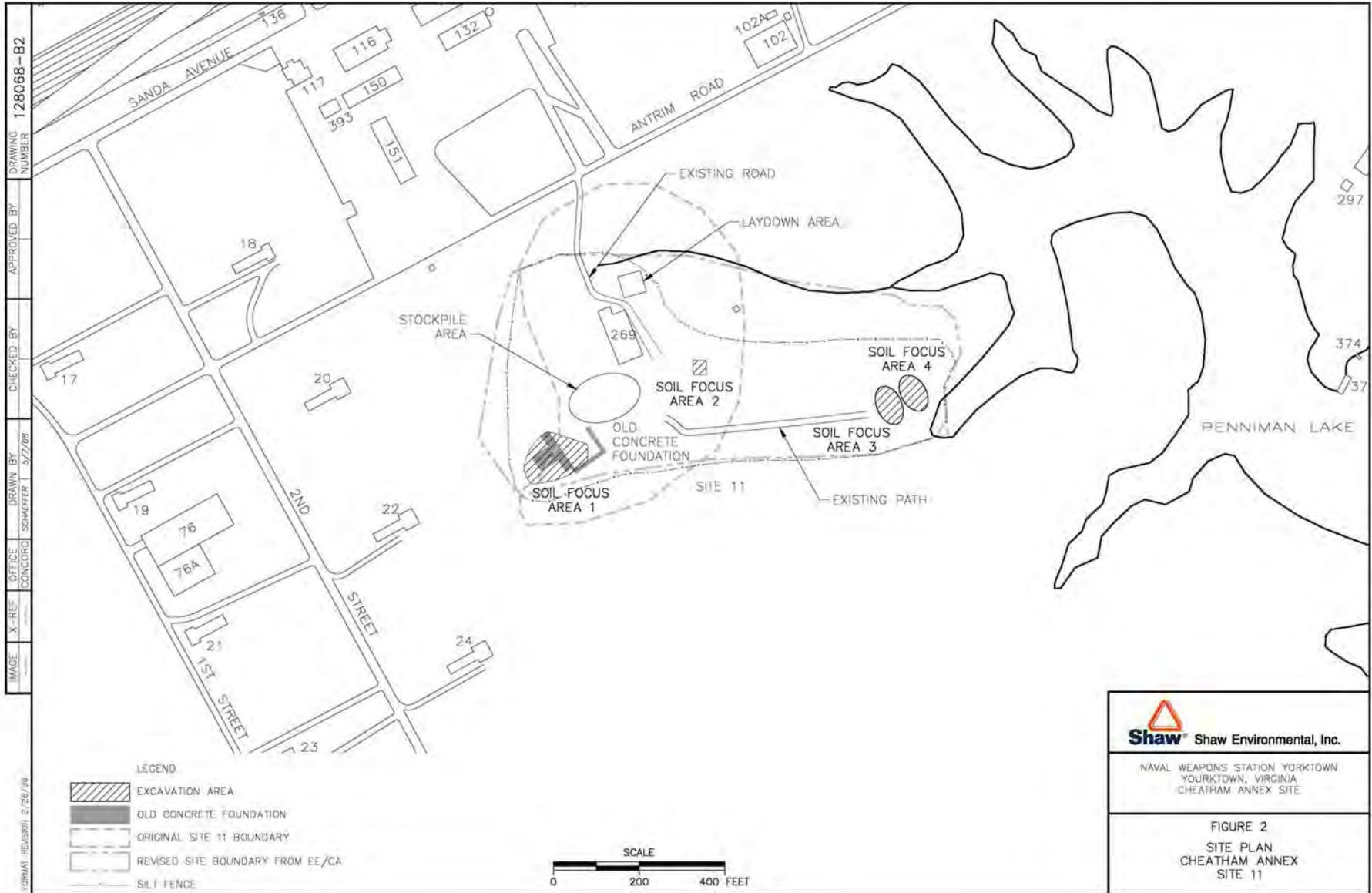
SAP Worksheet #10 -- Problem Definition (Continued) Confirmation Samples Flowchart – Site 11 FLOOR SAMPLES



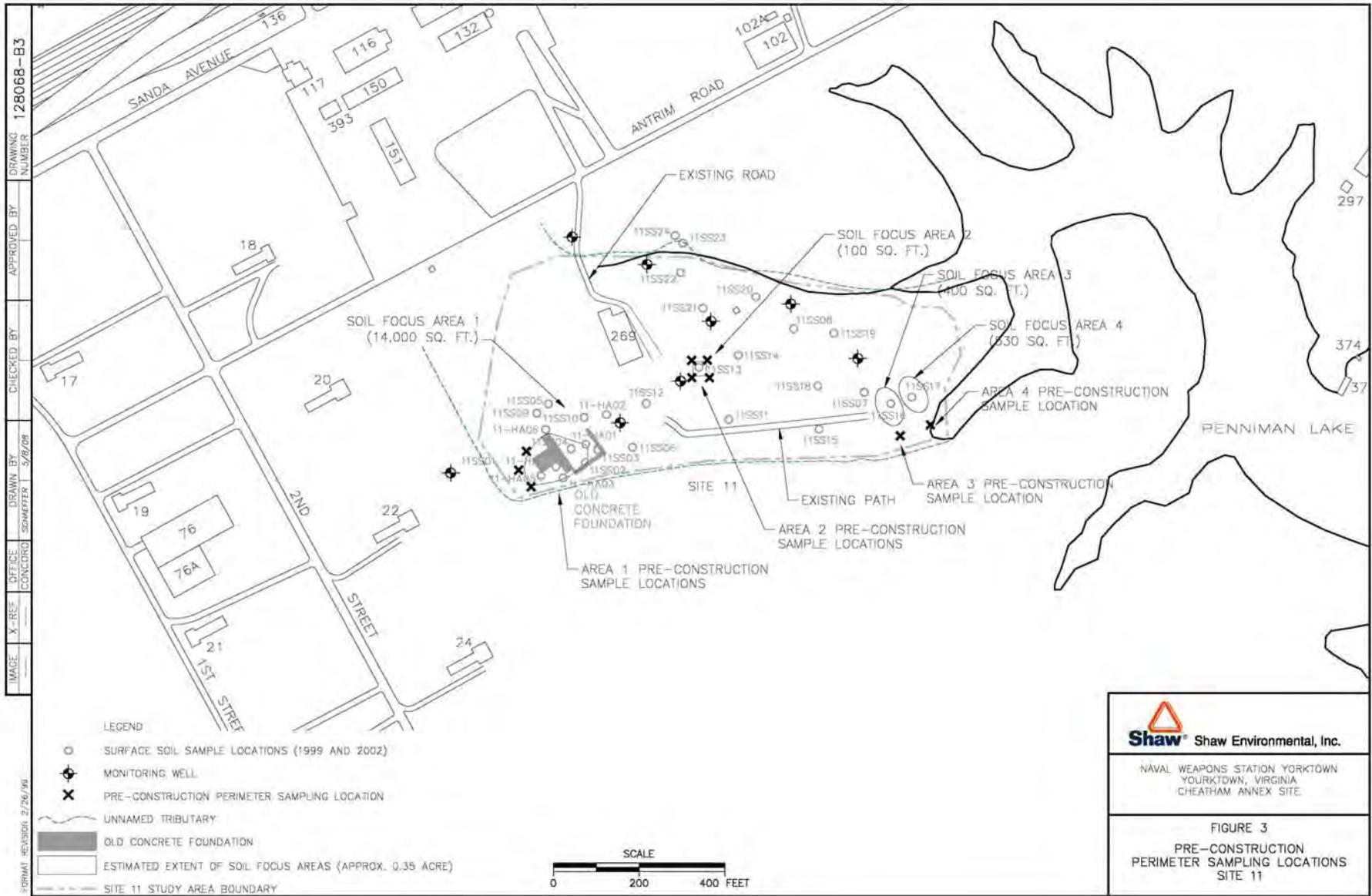
SAP Worksheet #10 -- Problem Definition (Continued) Fill Material Samples Flowchart – All Sites



SAP Worksheet #10 -- Problem Definition (Continued)



SAP Worksheet #10 -- Problem Definition (Continued)



SAP Worksheet #11-- Project Quality Objectives/Systematic Planning Process Statements

Who will use the data?

Confirmation Samples:

The data will be used by the Navy (and its contractors) and other stakeholders to delineate the excavation limits and to verify that all impacted soil and debris have been removed.

Waste Disposal Profile Samples:

Shaw E & I will use the sample results from the disposal characterization of the impacted soil to ensure proper disposal to an approved off-site facility.

Fill Material Characterization Samples (If Fill Material is Required):

The data will be used by the Navy and Shaw E & I to ensure placement of appropriate fill materials prior to importation onto Site 11, WPNSTA Yorktown, Cheatham Annex.

What will the data be used for?

Confirmation Samples:

Shaw E & I will use the confirmation analyses to verify that the impacted soil from the additional excavation areas has achieved all of the Preliminary Remediation Goals. Following the removal of the impacted soil, Shaw will conduct a site survey and determine if there are excavation areas outside of the original excavation boundaries. The results will be evaluated against the specific project action goals listed in Worksheet 15 to ensure that the remediation goals have been met.

Waste Disposal Profile Samples:

Shaw E & I will use the sample results to determine the appropriate disposal facility for approximately 2,000 cubic yards of in-situ impacted debris and soil which will be analyzed for Full TCLP, PCBs, RCRA characteristics (including Total Cyanide and Total Sulfide, Corrosivity, Ignitability) and TPH (diesel range organics [DRO], oil range organics [ORO], and gasoline range organics [GRO]) by SW-846 methodology see worksheet 19 for specific methods. These results will be evaluated against the TCLP Maximum Contaminant Concentrations (40 CFR 261.6/96) RCRA limits and the limits of 50 mg/kg of Total PCBs or 3,000 mg/kg of TPH as part of the waste profiling to ensure proper disposal to an approved off-site facility prior to being direct loaded into dump trucks for disposal at a Navy approved disposal facility.

Fill Material Characterization Samples (If Fill Material is Required):

Shaw E & I will use the results of the replacement fill material analyses which will be analyzed in accordance with the analysis in worksheet 19. All results of these samples shall be approved by the Navy prior to placement and documented in the Closeout Report.

SAP Worksheet #11-- Project Quality Objectives/Systematic Planning Process Statements (continued)

What types of data are needed (matrix, target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques)?

The site sampling at this site will include the following:

- Standard Operating Procedures for sample collection, handling, sample preparation, and analytical methods.

For sample collection and handling, refer to Worksheet 21 for field sampling SOPs.

All sample analysis will be performed by an off-site Laboratory (Accutest). Refer to Worksheet 19 for sample types, matrices, analytical groups and methods, and laboratory SOPs.

How "good" do the data need to be in order to support the environmental decision?

Confirmation Sampling

To confirm the analytical results meet the remedial goals (PRGs) the concentrations must be equal to or less than the goals to support ecological evaluation. The data will be of the quantity and quality necessary to provide technically sound and defensible assessments of potential risks to ecological receptors posed by the contaminants identified. For high level decisions, the laboratory methods will meet CERCLA, USEPA Region III and Navy guidance. Data from confirmatory samples will be validated.

Waste Disposal Profile

The data will need to be of sufficient quantity and quality to adequately characterize the impacted soil material in-situ (waste profiling) to ensure proper disposal to a Navy approved off-site facility prior to being direct loaded from the site. The laboratory methods will meet CERCLA, USEPA Region III and Navy guidance. Since this data is for waste profiling only, the data will not be subjected to data validation.

Clean Fill Requirements

To confirm that the analytical results of the fill materials meet the site specific PRGs and are appropriate for placement. The laboratory methods will meet CERCLA, USEPA Region III and Navy guidance. Data from the fill material samples will be validated.

How much data are needed (number of samples for each analytical group, matrix, and concentration)?

Confirmation Samples:

Pre-Excavation Samples:

Area 1: Collect grab co-located surface (0-6 inches) and subsurface soils (2-3 ft bgs) samples at the three locations shown on Figure 3 to delineate the western portion of Area 1. Samples will be analyzed for total PAHs, 4,4-DDD, 4,4-DDE, copper, lead, mercury, and zinc.

Area 2: Collect grab co-located surface (0-6 inches) and subsurface soils (2-3 ft bgs) at the four locations shown on Figure 3 to delineate all four corners of the Area 2 excavation area. Samples will only be analyzed for zinc.

Area 3: Collect one grab surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression shown on Figure 3. The lateral extent of contamination is constrained by the limits of the pit. Samples will be analyzed for 4,4-DDD, 4,4-DDE, copper, iron, lead, mercury, selenium, and zinc.

Area 4: Collect one grab surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression shown on Figure 3. The lateral extent of contamination is constrained by the limits of the pit. Samples will be analyzed for 4,4-DDD, 4,4-DDE, copper, lead, mercury, selenium, and zinc.

Floor of Excavations All Four Areas Site 11: One five-point composite (four corners and one center) soil sample per 500 square feet.

SAP Worksheet #11-- Project Quality Objectives/Systematic Planning Process Statements (continued)

Waste Disposal Profile Samples: One five-point composite soil sample collected in-situ from soil to be excavated as follows:

Site 11 – Approximately 2,000 cubic yards of contaminated soil will be excavated and stockpiled. Approximately one five-point composite sample will be collected per 500 cubic yards of material from the proposed excavation Areas and analyzed per the analysis listed in worksheet 19.

Area 1 – two five point composite samples to be collected.
Area 2, 3, and 4 – one five point composite sample is to be collected per each area.

In addition, at Areas 1,2,3,4 each and individual grab samples will be collected and analyzed for TCLP Mercury and or TCLP Lead.
Area 1 – 10 grab samples for TCLP Lead.
Area 2- 3 grab samples for TCLP Lead.
Area 3 and 4 – 3 grab samples for TCLP Lead and TCLP Mercury.

Fill Material: One five-point composite soil sample per 1,000 cubic yards of material per each source for each fill type.

Refer to Worksheet 19 for sample types, matrices, analytical groups and methods, and laboratory SOPs for each of the type of sampling at Sites 11.

Where, when, and how should the data be collected/generated?

Pre-excavation soil samples will be collected prior to any excavation activities to determine the boundaries of the excavation.

Confirmation floor soil samples will be collected following the excavation activities prior to backfilling. At Site 11 there will be one five-point composite soil sample per 500 square feet of the floor.

Waste Disposal Profile sampling will be taken as a composite from the soil to be excavated.

Fill material sampling will occur per 1,000 cubic yards of material for each source and type of material prior to placement.

SAP Worksheet #11-- Project Quality Objectives/Systematic Planning Process Statements (continued)

Who will collect and generate the data?

On site Shaw E & I personnel will collect the samples and Accutest Laboratories, Inc. will analyze the samples as per the methods contained in Worksheet 19 for the appropriate sample type.

How will the data be reported?

To ensure the integrity of sample analytical data from the time of collection in the field to the tabulation of results, data documentation protocols will be implemented as outlined in the Shaw field collection and the analytical laboratory SOPs. This will include providing sample labels, chains-of-custody records, and field information forms to document field data; and for comparing laboratory analysis reports with tabular displays and graphic displays to evaluate the accuracy of the data transfer. A report will be prepared summarizing the data collection and the analytical results for each sampling event.

The data will be distributed to the Shaw project manager and NAVY RPM.

How will the data be archived?

Upon completion of all field activities, Shaw will prepare a closeout report documenting site activities and reporting all data. The analytical reports will be included in the final closeout report. All analytical reports and closeout reports will be stored on the Shaw server in PDF format for a period of seven years. The server is backed up automatically and archived on tape daily in accordance with federal regulations.

SAP Worksheet #12.1 -- Measurement Performance Criteria Table

Matrix	Solid, Field and Rinse Blanks				
Analytical Group	ICP Metals				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011 Decontamination of Contact sampling Equipment, 9/08/06, SOP EI-FS014	SW-846 6010/ LAB SOP#MET100	Field Representativeness (Absence of interference/ contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.2 for ICP metals Aqueous	Field Blank/ Equipment Blank	S + A
		Field Precision	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for ICP metals Solids	Field Duplicate	S + A
		Laboratory Representativeness (Absence of interference/ contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for ICP metals Solids Worksheet 15.2 for ICP metals Aqueous Worksheet 15.19 for ICP TAL metals Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for ICP metals Solids Worksheet 15.2 for ICP metals Aqueous Worksheet 15.19 for ICP TAL metals Solids %Recovery = (Calculated Value/True Value) *100%	Laboratory Control Sample	A

SAP Worksheet #12.1 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/2006, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011 Decontamination of Contact sampling Equipment, 9/08/06, SOP EI-FS014	SW-846 6010/ LAB SOP#MET100	Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for ICP metals Solids Worksheet 15.2 for ICP metals Aqueous Worksheet 15.19 for ICP TAL metals Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Matrix Spike	A
		Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for ICP metals Solids Worksheet 15.2 for ICP metals Aqueous Worksheet 15.19 for ICP TAL metals Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} (\%) = [(XA - XB) / XM] * 100$ Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, $(XA + XB) / 2$	Matrix Spike Duplicate or Sample Duplicate	A
		Accuracy	<u>ICS-A</u> : Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes) <u>ICS-AB</u> : Within $\pm 20\%$ of expected value	Interference check solutions (ICS)	A
		Precision (field samples)	Five-fold dilution must agree within $\pm 10\%$ of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.	Serial Dilution Test	S + A
		Completeness	QC acceptance criteria: $\geq 95\%$ for ICP metals Solids $\geq 95\%$ for ICP metals Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data}) / (\text{Total Number of Requested Analyses})$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.2 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	TCLP Volatiles (VOCs)				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 8260/ LAB SOP#MS005	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. For the common laboratory contaminants 2-butanone, all analytes <RL. Project QLs for all target compounds are specified in: Worksheet 15.7 for TCLP VOCs Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.7 for TCLP VOCs Solids $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Laboratory Control Sample	A
		Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.7 for TCLP VOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Surrogate Spike	A
		Accuracy (Instrument sensitivity control)	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within -50% to +100% of ICAL midpoint standard	Internal Standards	A
		Completeness	QC acceptance criteria: $\geq 95\%$ for TCLP VOCs Solids $\geq 95\%$ for TCLP VOCs Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data}) / (\text{Total Number of Requested Analyses})$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.3 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	TCLP Semivolatiles (SVOCs)				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 8270/ LAB SOP#MS006	Laboratory Representativeness (Absence of interference/contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.8 for TCLP SVOCs Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.8 for TCLP SVOCs Solids $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Laboratory Control Sample	A
		Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.8 for TCLP SVOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Surrogate Spike	A
		Accuracy (Instrument sensitivity control)	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within -50% to +100% of ICAL midpoint standard	Internal Standards	A
		Completeness	QC acceptance criteria: $\geq 95\%$ for TCLP SVOCs Solids $\geq 95\%$ for TCLP SVOCs Aqueous $\% \text{ Analytical Completeness} = 100 * (\text{Number of Useable Data}) / (\text{Total Number of Requested Analyses})$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.4 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	TCLP Pesticides				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 8081/ LAB SOP#GC015	Laboratory Representativeness (Absence of interference/contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.9 for TCLP pesticides Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.9 for TCLP pesticides Solids $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Laboratory Control Sample	A
		Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.9 for TCLP pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Surrogate Spike	A
		Completeness	QC acceptance criteria: ≥95% for TCLP pesticides Solids ≥95% for TCLP pesticides Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data}) / (\text{Total Number of Requested Analyses})$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.5 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	TCLP Herbicides				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 8151/ LAB SOP# GC031	Laboratory Representativeness (Absence of interference/contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.10 for TCLP herbicides Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.10 for TCLP herbicides Solids $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Laboratory Control Sample	A
		Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.10 for TCLP herbicides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Surrogate Spike	A
		Completeness	QC acceptance criteria: ≥95% for TCLP herbicide Solids ≥95% for TCLP herbicide Aqueous $\% \text{ Analytical Completeness} = 100 * (\text{Number of Useable Data}) / (\text{Total Number of Requested Analyses})$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.6 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	TCLP ICP Metals				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 6010B/ LAB SOP# Met 100, Met 103	Laboratory Representativeness (Absence of interference/contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.11 for TCLP ICP metals Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.11 for TCLP ICP metals Solids %Recovery = (Calculated Value/True Value) *100%	Laboratory Control Sample	A
		Accuracy	ICS-A: Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within ± 20% of expected value	Interference check solutions (ICS)	A
		Precision (field samples)	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.	Serial Dilution Test	S + A
		Completeness	QC acceptance criteria: ≥95% for TCLP ICP metals Solids ≥95% for TCLP ICP metals Aqueous % Analytical Completeness = 100 * (Number of Useable Data) / (Total Number of Requested Analyses)	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.7 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	TCLP Mercury				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 7470, SOP#MET106	Laboratory Representativeness (Absence of interference/contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.11 for TCLP mercury Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.11 for TCLP mercury Solids %Recovery = (Calculated Value/True Value) *100%	Laboratory Control Sample	A
		Accuracy	<u>ICS-A</u> : Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes) <u>ICS-AB</u> : Within ± 20% of expected value	Interference check solutions (ICS)	A
		Precision (field samples)	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >25x MDL for CVAA.	Serial Dilution Test	S + A
		Completeness	QC acceptance criteria: ≥95% for TCLP mercury Solids ≥95% for TCLP mercury Aqueous % Analytical Completeness = 100 * (Number of Useable Data) / (Total Number of Requested Analyses)	Analytical Sample Completeness (Usability)	A

¹Reference number from QAPP Worksheet #21 (see Section 3.1.2).

²Reference number from QAPP Worksheet #23 (see Section 3.2).

SAP Worksheet #12.8 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	Total Cyanide				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 9010/9012 LAB SOP#GN113, 115	Laboratory Representativeness (Absence of interference/contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.12 for total cyanide Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for total cyanide Solids $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Laboratory Control Sample	A
		Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for total cyanide Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Matrix Spike	A

SAP Worksheet #12.8 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 9010/9012 LAB SOP#GN113, 115	Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for total cyanide Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} (\%) = [(XA - XB) / XM] * 100$ Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, $(XA + XB) / 2$	Matrix Spike Duplicate or Sample Duplicate	A
		Completeness	QC acceptance criteria: ≥95% for total cyanide Solids ≥95% for total cyanide Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data}) / (\text{Total Number of Requested Analyses})$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.9 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	Total Sulfide				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	EPA SM19 4500S=2/ LAB SOP#GN140	Laboratory Representativeness (Absence of interference/contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.14 for total sulfide Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for total sulfide Solids $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Laboratory Control Sample	A
		Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for total sulfide Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Matrix Spike	A

SAP Worksheet #12.9 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	EPA SM19 4500S=2/ LAB SOP#GN140	Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for total sulfide Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} (\%) = [(XA - XB) / XM] * 100$ Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, $(XA + XB) / 2$	Matrix Spike Duplicate or Sample Duplicate	A
		Completeness	QC acceptance criteria: ≥95% for sulfide Solids ≥95% for sulfide Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data}) / (\text{Total Number of Requested Analyses})$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.10 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	Flash Point (Ignitability)				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A), or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 1010/ LAB SOP#GN121	Laboratory Accuracy	p-Xylene, second source flash point of p-Xylene is 77 ± 4.3°F	Second Source Standard	A
		Completeness	QC acceptance criteria: ≥95% for ignitability Solids ≥95% for ignitability Aqueous % Analytical Completeness = 100 * (Number of Useable Data) / (Total Number of Requested Analyses)	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.11 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	Corrosivity as pH				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 9045/ LAB SOP#GN179	Laboratory Accuracy	Percent recoveries for continuing calibration must be within ± 0.05 units of standard true value for pH.	Daily continuing calibration verification	A
		Laboratory Precision	% QC acceptance criteria for all target compounds as: %RPD \leq 10% RPD = (Difference between S and SD) * 100 / (Average of S and SD)	Sample Duplicate	A
		Completeness	QC acceptance criteria: $\geq 95\%$ for corrosivity as pH Solids $\geq 95\%$ for corrosivity as pH Aqueous % Analytical Completeness = 100 * (Number of Useable Data) / (Total Number of Requested Analyses)	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.12 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	PCBs				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 8082/ LAB SOP#GC014	Laboratory Representativeness (Absence of interference/contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.13 for PCBs Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.13 for PCBs Solids $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Laboratory Control Sample	A
		Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.13 for PCBs Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Matrix Spike	A
		Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.13 for PCBs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} (\%) = [(XA - XB) / XM] * 100$ Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, $(XA + XB) / 2$	Matrix Spike Duplicate or Sample Duplicate	A

SAP Worksheet #12.12 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 8082/ LAB SOP#GC014	Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.13 for PCBs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value/True Value) *100%	Surrogate Spike	A
		Completeness	QC acceptance criteria: ≥95% for PCBs Solids ≥95% for PCBs Aqueous % Analytical Completeness = 100 * (Number of Useable Data) / (Total Number of Requested Analyses)	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.13 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	Total Petroleum Hydrocarbons DRO/ORO				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 8015/ LAB SOP#GC011	Laboratory Representativeness (Absence of interference/contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.14 for TPH DRO/ORO Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for TPH DRO/ORO Solids $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Laboratory Control Sample	A
		Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for TPH DRO/ORO Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Matrix Spike	A
		Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for TPH DRO/ORO Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} (\%) = [(XA - XB) / XM] * 100$ Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, $(XA + XB) / 2$	Matrix Spike Duplicate or Sample Duplicate	A

SAP Worksheet #12.13 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 8015/ LAB SOP#GC011	Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for TPH DRO/ORO Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Surrogate Spike	A
		Completeness	QC acceptance criteria: ≥95% for TPH DRO/ORO Solids ≥95% for TPH DRO/ORO Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data} / (\text{Total Number of Requested Analyses}))$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.14 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	Total Petroleum Hydrocarbons GRO				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sampling for VOCs in soil – Sealed-Cap (EnCore®) Sampler SOP TS-FS-104 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101	SW-846 8015/ LAB SOP#GC010	Laboratory Representativeness (Absence of interference/contamination)	<1/2 Lab Reporting Limit Project QLs for all target compounds are specified in: Worksheet 15.15 for TPH GRO Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids %Recovery = (Calculated Value/True Value) *100%	Laboratory Control Sample	A
		Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. %Recovery = (Calculated Value - Sample Value/True Value) *100%	Matrix Spike	A
		Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/ XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	Matrix Spike Duplicate or Sample Duplicate	A

SAP Worksheet #12.14 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sampling for VOCs in soil – Sealed-Cap (EnCore®) Sampler SOP TS-FS-104 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101	SW-846 8015/ LAB SOP#GC010	Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Surrogate Spike	A
		Completeness	QC acceptance criteria: ≥95% for TPH GRO Solids ≥95% for TPH GRO Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data} / (\text{Total Number of Requested Analyses}))$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.15 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	Total Organic Halides (TOX)				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 9020/ LAB SOP#EGN219-03	Laboratory Representativeness (Absence of interference/contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.20 for TOX Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.20 for TOX Solids $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Laboratory Control Sample	A
		Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.20 for TOX Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Matrix Spike	A

SAP Worksheet #12.15 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 9020/ LAB SOP#EGN219-03	Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.20 for TOX Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} (\%) = [(XA - XB) / XM] * 100$ Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, $(XA + XB) / 2$	Matrix Spike Duplicate or Sample Duplicate	A
		Completeness	QC acceptance criteria: ≥95% for sulfide Solids ≥95% for sulfide Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data}) / (\text{Total Number of Requested Analyses})$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.16 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	TCL VOCs				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sampling for VOCs in soil – Sealed-Cap (EnCore®) Sampler SOP TS-FS-104 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101	SW-846 8260/ LAB SOP#MS005	Field Representativeness (Absence of interference/ contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. For the common laboratory contaminants methylene chloride, acetone, and 2-butanone, all analytes <RL.	Trip Blank	S + A
		Laboratory Representativeness (Absence of interference/ contamination)	All Target Compounds <1/2 RL. For the common laboratory contaminants methylene chloride, acetone, and 2-butanone, all analytes <RL. Project QLs for all target compounds are specified in: Worksheet 15.16 for TCL VOCs Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids %Recovery = (Calculated Value/True Value) *100%	Laboratory Control Sample	A
		Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. %Recovery = (Calculated Value - Sample Value/True Value) *100%	Matrix Spike	A

SAP Worksheet #12.16 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sampling for VOCs in soil – Sealed-Cap (EnCore®) Sampler SOP TS-FS-104 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101	SW-846 8260/ LAB SOP#MS005	Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value – Sample Value/True Value) *100% RPD (%) = [(XA-XB)/ XM] * 100 Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, (XA + XB)/2	Matrix Spike Duplicate or Sample Duplicate	A
		Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value/True Value) *100%	Surrogate Spike	A
		Accuracy (Instrument sensitivity control)	Retention time ±30 seconds from retention time of the midpoint standard in the ICAL EICP area within -50% to +100% of ICAL midpoint standard	Internal Standards	A
		Completeness	QC acceptance criteria: ≥95% for VOCs Solids ≥95% for VOCs Aqueous % Analytical Completeness = 100 * (Number of Useable Data) / (Total Number of Requested Analyses)	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.17 -- Measurement Performance Criteria Table

Matrix	Solid, Field and Rinse Blanks				
Analytical Group	TCL SVOCs and PAHs				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011 Decontamination of Contact sampling Equipment, 9/08/06, SOP EI-FS014	SW-846 8270C/ LAB SOP#MS006	Field Representativeness (Absence of interference/ contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. For the common laboratory contaminants phthalate esters, all analytes <RL. Project QLs for all target compounds are specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous	Field Blank/ Equipment Blank	S + A
		Field Precision	QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids	Field Duplicate	S + A
		Laboratory Representativeness (Absence of interference/ contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. For the common laboratory contaminants phthalate esters, all analytes <RL. Project QLs for all target compounds are specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids	Method Blank	A

SAP Worksheet #12.17 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011 Decontamination of Contact sampling Equipment, 9/08/06, SOP EI-FS014	SW-846 8270C/ LAB SOP#MS006	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Laboratory Control Sample	A
		Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Matrix Spike	A
		Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} (\%) = [(XA - XB) / XM] * 100$ Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, $(XA + XB) / 2$	Matrix Spike Duplicate or Sample Duplicate	A

SAP Worksheet #12.17 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011 Decontamination of Contact sampling Equipment, 9/08/06, SOP EI-FS014	SW-846 8270C/ LAB SOP#MS006	Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Surrogate Spike	A
		Accuracy (Instrument sensitivity control)	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within -50% to +100% of ICAL midpoint standard	Internal Standards	A
		Completeness	QC acceptance criteria: $\geq 95\%$ for SVOCs Solids $\geq 95\%$ for SVOCs Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data} / (\text{Total Number of Requested Analyses}))$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.18 -- Measurement Performance Criteria Table

Matrix	Solid				
Analytical Group	Pesticides				
Sampling Procedure¹	Analytical Method/SOP²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011	SW-846 8081/ LAB SOP#GC015	Field Representativeness (Absence of interference/ contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. For the common laboratory contaminants phthalate esters, all analytes <RL. Project QLs for all target compounds are specified in: Worksheet 15.5 for Pesticides Solids Worksheet 15.6 for Pesticides Aqueous Worksheet 15.18 for Pesticides Solids	Field Blank/ Equipment Blank	S + A
		Field Precision	QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for Pesticides Solids Worksheet 15.6 for Pesticides Aqueous Worksheet 15.18 for Pesticides Solids	Field Duplicate	S + A
		Laboratory Representativeness (Absence of interference/ contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.22 for pesticides Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.22 for pesticides Solids %Recovery = (Calculated Value/True Value) *100%	Laboratory Control Sample	A
		Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.22 for pesticides Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. %Recovery = (Calculated Value - Sample Value/True Value) *100%	Matrix Spike	A

SAP Worksheet #12.18 -- Measurement Performance Criteria Table
 (Continued)

		Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sampling Procedure ¹	Analytical Method/SOP ²	Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.22 for pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} (\%) = [(XA - XB) / XM] * 100$ Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, $(XA + XB) / 2$	Matrix Spike Duplicate or Sample Duplicate	A
		Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.22 for pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Surrogate Spike	A
		Completeness	QC acceptance criteria: ≥95% for pesticides Solids ≥95% for pesticides Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data}) / (\text{Total Number of Requested Analyses})$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #12.19 -- Measurement Performance Criteria Table

Matrix	Solid, Field and Rinse Blanks				
Analytical Group	Mercury				
Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011 Decontamination of Contact sampling Equipment, 9/08/06, SOP EI-FS014	SW-846 7471 and 7470/ LAB SOP# MET105/106	Field Representativeness (Absence of interference/ contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.2 for mercury Aqueous	Field Blank/ Equipment Blank	S + A
		Field Precision	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids	Field Duplicate	S + A
		Laboratory Representativeness (Absence of interference/ contamination)	The blank results are evaluated for the analytes of concern to ascertain the efficiency of decontamination and assess the potential for cross-contamination. All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids	Method Blank	A
		Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids %Recovery = (Calculated Value/True Value) *100%	Laboratory Control Sample	A

SAP Worksheet #12.19 -- Measurement Performance Criteria Table
 (Continued)

Sampling Procedure ¹	Analytical Method/SOP ²	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and / or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Sample Homogenization, 9/08/06, SOP EI-FS010 Trowel/Spoon Surface Soil Sampling, 09/11/06, SOP EI-FS101 Compositing, 9/08/06, SOP EI-FS011 Decontamination of Contact sampling Equipment, 9/08/06, SOP EI-FS014	SW-846 7471 and 7470/ LAB SOP# MET105/106	Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Matrix Spike	A
		Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} (\%) = [(XA - XB) / XM] * 100$ Where: XA and XB are the concentration in the MS and MSD, and XM is the average value of the concentrations in the MS and MSD, $(XA + XB) / 2$	Matrix Spike Duplicate or Sample Duplicate	A
		Precision (field samples)	Five-fold dilution must agree within $\pm 10\%$ of the original determination. Only applicable for samples with concentrations $>25x$ MDL for CVAA.	Serial Dilution Test	S + A
		Completeness	QC acceptance criteria: $\geq 95\%$ for mercury Solids $\geq 95\%$ for mercury Aqueous $\% \text{Analytical Completeness} = 100 * (\text{Number of Useable Data}) / (\text{Total Number of Requested Analyses})$	Analytical Sample Completeness (Usability)	A

¹Reference number from SAP Worksheet #21.

²Reference number from SAP Worksheet #23. Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #13 Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (originating organization, report title and date)	Data Generator(s) (originating organization, data types, data generation / collection dates)	How Data Will Be Used	Limitations on Data Use
Background Site Data	Baker Environmental, Inc./Final Remedial Investigation, Site 11 Bone Yard, Naval Weapons Station Yorktown, Williamsburg, Virginia/April 2007	Baker Environmental, Inc. historic data from previous site studies, 1999-2002	Baker Environmental, Inc. historic data from previous site studies, 1999-2002	The data collected is the basis for the Preliminary Remediation Goals (PRGs). Detections below the established Preliminary Remediation Goals will not be considered contamination requiring remediation.
	CH2M Hill/Engineering Evaluation/Cost Analysis (EE/CA) Site 11 (Bone Yard), Naval Weapons Station Yorktown, Williamsburg, Virginia/April 2008			

SAP Worksheet #14.1 -- Summary of Project Tasks - Confirmation Samples

Sampling Tasks:

1. Confirmatory soil samples will be collected at Site 11, see worksheet 19 for specific analysis.
Pre-Excavation Samples:
Area 1: Collect grab co-located surface (0-6 inches) and subsurface soils (2-3 ft bgs) samples from three locations to delineate the western portion of Area 1.
Area 2: Collect grab Collect grab co-located surface (0-6 inches) and subsurface soils (2-3 ft bgs) samples from four locations to delineate all four corners of the Area 2 excavation area.
Area 3: Collect one grab surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression.
Area 4: Collect one grab surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression.
Confirmation Floor Samples: One five-point (four corners, one center) composite soil sample will be collected from the floor of the excavation at one per 500-square feet.
2. Soil confirmation samples will be collected using a stainless steel trowel, a split-spoon sampler, or hand auger. See Worksheet 18 for field SOP and sampling techniques.
3. All soil/debris sampling equipment that may come into contact with samples or sampling surfaces will be constructed of stainless steel, borosilicate glass, or Teflon™.
4. All equipment used for collection, transfer, and homogenization will be properly decontaminated before collecting samples and between sampling locations.
5. After the sample is collected, the soil/samples will be homogenized as thoroughly as possible in a stainless-steel bowl.
6. Samples collected for chemical analysis will be placed in the appropriate sample containers, labeled with proper identification, and packed in a cooler with ice pending shipment to the laboratory. See Worksheet 19 for sample containers requirements.
7. To maintain integrity, samples collected in the field must be placed in a dedicated sample ice chest, on ice, and chilled to $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ from the time of collection until receipt by the laboratory for analysis
8. All soil samples will be visually classified and documented on a sample collection log. The Site Supervisor will choose the method for sampling, such as split-spoon sampler or auger.
9. The following procedure is applicable to sub-samples to be combined for compositing:
Don a fresh pair of sample gloves. For the remaining analysis place the sample, or subsamples to be composited into a stainless steel bowl. The sample is then thoroughly homogenized using a stainless steel spoon. If the sample aliquot is too large to reasonably homogenize in the stainless steel bowl, the sample should be carefully divided into quarters and then each of these quarters further divided into quarters. One of each of the second set of quarters is then recombined into the mixing bowl and then homogenized. The sample is then placed into the appropriate containers as described in Worksheet 19, taking care to minimize headspace as much as possible, and then labeled and stored in a cooler at $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$.
10. All sample documentation and chain of custody procedures outlined in Worksheet 27 should then be followed. After proper documentation has been performed, sample packaging and shipping as outlined in Worksheet 27 of this document should be completed.

Analysis Tasks:

1. For Site 11 Accutest Laboratories will process, prepare, and analyze soil samples for Copper, Iron, Lead, Zinc, Selenium, Mercury, Total PAHs, 4,4'-DDD and 4,4'-DDE as part of the confirmation sampling to delineate areas of contamination for excavation. See Worksheet 19 for analytical method requirements for each Area.

Quality Control Tasks:

1. Implement SOPs as defined in Worksheet 18 for field sampling procedures, follow guidelines as described in Worksheet 26 and 27 for sample custody procedures, packaging and transporting of samples.
2. Laboratory to follow preparation and analysis methods as described in Worksheets 15 and 19. Laboratory quality control samples and procedures as defined in Worksheet 28.
3. Field duplicate samples will be collected at a rate of 1 per 10 field samples. Equipment and field blank samples will be collected one per day of field sampling or one per twenty analytical samples.

Secondary Data:

1. See Worksheet 13.

SAP Worksheet #14.1 -- Summary of Project Tasks - Confirmation Samples (Continued)

Data Management Tasks:

1. Analytical data will be placed in an excel spreadsheet with the site remediation goals, analytical reports will be received in PDF format.

Documentation and Records:

1. All samples collected will have sample locations document in field log books. Chains-of-Custody records, air bills and laboratory sample logs will be retained for each sample and will become a part of the analytical PDF data report.
2. Analytical laboratory reports will be stored on the Shaw server.
3. Copy of the finalized SAP will be retained in the Shaw and Accutest central file area and at the site trailer for review.

Assessment / Audit Tasks:

1. Sampling SOPs and Safety will be reviewed prior to start up of sampling.
2. QC Meetings will be conducted throughout the project at a minimum monthly and if necessary more frequently.

Data Review Tasks:

1. The Shaw Chemist will verify that data has been received for all samples submitted to the laboratory. An evaluation of this data will be performed to determine whether the laboratory met the QC requirements for the analytical as stated in the analytical methods and laboratory SOPs.
2. Analytical results will be compared to site specific remediation goals for confirmation samples. Should any results exceed these limits the process shall be followed as outlined in Worksheet 10.
3. Data Verification will be performed on all samples by qualified Shaw personnel. Data verification that sample analysis was performed as stated in the SAP and per the laboratory SOPs. Data Validation will be performed using USEPA Region III modifications to the National Functional Guidelines for Data Review on all confirmation samples below the Site specific PRGs.

SAP Worksheet #14.2 -- Summary of Project Tasks – Waste Disposal Profile Samples

Sampling Tasks:

1. One five-point composite sample of the in-situ soil to be excavated will be collected for disposal characterization analysis as follows:
Site 11 – Approximately 2,000 cubic yards of material will be excavated and stockpiled. One in-situ five-point composite sample from each of the four Area at an approximate frequency of one per 500 cubic yards will be collected from the proposed excavation area one per 500 cubic yards and analyzed per the analysis listed in worksheet 19.
In addition, at Area 1, ten individual grab samples will be collected and analyzed for TCLP Lead. At Area 2, three grab samples will be collected and analyzed for TCLP Lead. At Areas 3 and 4, three grab samples will be collected and analyzed for TCLP Lead and TCLP Mercury.
2. Soil/disposal samples will be collected using a stainless steel trowel, a split- spoon sampler, or hand auger. See Worksheet 18 for field SOP and sampling techniques.
3. All soil/debris sampling equipment that may come into contact with samples or sampling surfaces will be constructed of stainless steel, borosilicate glass, or Teflon™.
4. All equipment used for collection, transfer, and homogenization will be properly decontaminated before collecting samples and between sampling locations.
5. After the sample is collected, the soil/samples will be homogenized as thoroughly as possible in a stainless-steel bowl.
6. Samples collected for chemical analysis will be placed in the appropriate sample containers, labeled with proper identification, and packed in a cooler with ice pending shipment to the laboratory. See Worksheet 19 for sample containers requirements.
7. To maintain integrity, samples collected in the field must be placed in a dedicated sample ice chest, on ice, and chilled to $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ from the time of collection until receipt by the laboratory for analysis.
8. All waste soil samples will be visually classified and documented on a sample collection log. The Site Supervisor will choose the method for sampling, such as split-spoon sampler or auger.
9. The following procedure is applicable to both discreet samples and sub-samples to be combined for compositing:
Don a fresh pair of sample gloves. For GRO analysis in soil, a grab sample will be collected directly from the sampling point using an Encore™ sampler or its equivalent and will not be homogenized prior to sampling. For the remaining analysis place the sample, or subsamples to be composited into a stainless steel bowl. The sample is then thoroughly homogenized using a stainless steel spoon. If the sample aliquot is too large to reasonably homogenize in the stainless steel bowl, the sample should be carefully divided into quarters and then each of these quarters further divided into quarters. One of each of the second set of quarters is then recombined into the mixing bowl and then homogenized. The sample is then placed into the appropriate container(s) as described in Worksheet 19, taking care to minimize headspace as much as possible, and then labeled and stored in a cooler at $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$.
10. All sample documentation and chain of custody procedures outlined in Worksheet 27 should then be followed. After proper documentation has been performed, sample packaging and shipping as outlined in Worksheet 27 of this document should be completed.

Analysis Tasks:

1. Accutest Laboratories will process, prepare, and analyze soil and sediment samples for Full TCLP including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOC), herbicides, pesticides and metals, total PCBs, Reactivity (Total Cyanide and Total Sulfide), Corrosivity, and Ignitability and total petroleum hydrocarbons (DRO/ORO and GRO) as part of the waste profiling to ensure proper disposal to an approved off-site facility. See Worksheet 19 for analytical method requirements.

Quality Control Tasks:

1. Implement SOPs as defined in Worksheet 18 for field sampling procedures, follow guidelines as described in Worksheet 26 and 27 for sample custody procedures, packaging and transporting of samples.
2. Laboratory to follow preparation and analysis methods as described in Worksheets 15 and 19, as well as, laboratory quality control samples and procedures as defined in Worksheet 28.
3. No field duplicate samples or equipment blank samples are required for waste disposal samples.

Data Management Tasks:

1. Analytical data will be placed in an excel spreadsheet. Laboratory Analytical Reports will be received in PDF format.

SAP Worksheet #14.2 -- Summary of Project Tasks – Waste *Disposal Profile Samples* (Continued)

Documentation and Records:

1. All samples collected will have sample locations documented in field log books. Chain-of-Custody records, air bills and laboratory sample logs will be retained for each sample and will become a part of the analytical PDF data report.
2. Analytical laboratory reports will be stored on the Shaw server.
3. Copy of the finalized SAP will be retained in the Shaw and Accutest central file area and at the site trailer for review.

Assessment / Audit Tasks:

1. Sampling SOPs and Safety will be reviewed prior to start up of sampling.

Data Review Tasks:

1. The Shaw Chemist will verify that data has been received for all samples submitted to the laboratory. An evaluation of this data will be performed to determine whether the laboratory met the QC requirements for the analytical as stated in the analytical methods and laboratory SOPs.
2. Data Verification will be performed on all samples by qualified Shaw personnel. Data verification that sample analysis was performed as stated in the SAP and per the laboratory SOPs.
3. Analytical results will be compared to TCLP Maximum Contaminant Concentrations (40 CFR 261 6/96), RCRA, PCB, and TPH limits for the landfill. For disposal samples if any results exceed these limits the process will follow the IF/THEN process described in Worksheet 10.

SAP Worksheet #14.3 -- Summary of Project Tasks – *Fill Materials*

Sampling Tasks:

1. Back fill and top soil samples one five point composite will be collected per source, fill type, and 1,000 cubic yards of material prior to placement.
2. Soil samples will be collected using a stainless steel trowel, a split-spoon sampler, or hand auger. See worksheet 18 for field SOP and sampling techniques.
3. All soil sampling equipment that may come into contact with samples or sampling surfaces will be constructed of stainless steel, borosilicate glass, or Teflon™.
4. All equipment used for collection, transfer, and homogenization will be properly decontaminated before collecting samples and between sampling locations.
5. After the sample is collected, the soil/samples will be homogenized as thoroughly as possible in a stainless-steel bowl.
6. Samples collected for chemical analysis will be placed in the appropriate sample containers, labeled with proper identification, and packed in a cooler with ice pending shipment to the laboratory. See Worksheet 19 for sample containers requirements.
7. To maintain integrity, samples collected in the field must be placed in a dedicated sample ice chest, on ice, and chilled to $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ from the time of collection until receipt by the laboratory for analysis
8. All waste soil samples will be visually classified and documented on a sample collection log. The Site Supervisor will choose the method for sampling, such as split-spoon sampler or auger.
9. The following procedure is applicable to sub-samples to be combined for compositing:
Don a fresh pair of sample gloves. For the GRO analysis in soil, a grab sample will be collected directly from the sampling point using an Encore™ sampler or its equivalent and not homogenized prior to sampling. For the remaining analysis place the sample, or subsamples to be composited into a stainless steel bowl. The sample is then thoroughly homogenized using a stainless steel spoon. If the sample aliquot is too large to reasonably homogenize in the stainless steel bowl, the sample should be carefully divided into quarters and then each of these quarters further divided into quarters. One of each of the second set of quarters is then recombined into the mixing bowl and then homogenized. The sample is then placed into the appropriate containers as described in worksheet 19, taking care to minimize headspace as much as possible, and then labeled and stored in a cooler at $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$.
10. All sample documentation and chain of custody procedures outlined in worksheet 27 should then be followed. After proper documentation has been performed, sample packaging and shipping as outlined in worksheet 27 of this document should be completed.

Analysis Tasks:

1. Accutest Laboratories will process, prepare, and analyze backfill and top soil samples for analyzed for site specific PRGs and Target Compound List (TCL) VOCs, TCL SVOCs, TCL pesticides, PCBs, TAL Metals, Total Cyanide, TOX, and total petroleum hydrocarbons (DRO and GRO) as part of the evaluation of fill materials for placement at the site. See worksheet 19 for analytical method requirements.

Quality Control Tasks:

1. Implement SOPs as defined in worksheet 18 for field sampling procedures, follow guidelines as described in worksheet 26 and 27 for sample custody procedures, packaging and transporting of samples.
2. Laboratory to follow preparation and analysis methods as described in worksheets 15 and 19. Laboratory quality control samples and procedures as defined in worksheet 28.
3. No field duplicate samples or equipment blank samples are required for fill material samples.

Secondary Data:

1. None.

Data Management Tasks:

1. Analytical data will be placed in an excel spreadsheet with the site remediation goals, analytical reports will be received in PDF format.

SAP Worksheet #14.3 -- Summary of Project Tasks – *Fill Materials* (Continued)

Documentation and Records:

1. All samples collected will have sample locations documented in field log books. Chain-of-Custody records, airbills and laboratory sample logs will be retained for each sample and will become a part of the analytical PDF data report.
2. Analytical laboratory reports will be stored on the Shaw server.
3. Copy of the finalized SAP will be retained in the Shaw and Accutest central file area and at the site trailer for review.

Assessment / Audit Tasks:

1. Sampling SOPs and Safety will be reviewed prior to start up of sampling.

Data Review Tasks:

1. The Shaw Chemist will verify that data has been received for all samples submitted to the laboratory. An evaluation of this data will be performed to determine whether the laboratory met the QC requirements for the analytical as stated in the analytical methods and laboratory SOPs.
2. Analytical results will be compared to site specific PRGs as listed in Worksheet 1. If any results exceed these limits, the Shaw Project Manager will be notified. Alternative sources of material will be identified in the event of an exceedance. The results will then be submitted to the partnering team for discussion and review of the additional analysis, additional analysis may be compared to site specific background levels for some or all of the analytes. Fill will not be placed without written approval from the partnering team.
3. Data Verification will be performed on all samples by qualified Shaw personnel. Data verification that sample analysis was performed as stated in the SAP and per the laboratory SOPs. Data Validation will be performed using USEPA Region III modifications to the National Functional Guidelines for Data Review on all fill material samples.

**SAP Worksheet #15.1 -- Reference Limits and Evaluation Table
 SITE 11 Confirmation Samples**

Matrix: Soil

Analytical Group: Inorganic Metals - SW-846 3050B/6010B/7471A

Analyte	CAS Number	Project Action Limit ¹ (mg/kg) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (mg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (mg/kg)	QLs (mg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Copper ⁴	7440-50-8	70	1.25	Ecological	0.10	1.25	80-120	80-120	20	NA	50
Iron ⁸	7439-89-6	46,400	5.0	Ecological	1.3	5.0	80-120	80-120	20	NA	60
Lead ⁵	7439-92-1	120	5	Ecological	0.22	5	80-120	80-120	20	NA	50
Mercury ⁶	7439-97-6	0.24	0.083	Background	0.012	0.083	80-120	80-120	20	NA	50
Selenium ⁷	7782-49-2	1.8	5.0	Ecological	0.15	5.0	80-120	80-120	20	NA	50
Zinc ⁴	7440-66-6	120	1.0	Ecological	0.19	1.0	80-120	80-120	20	NA	50

NA = Not Applicable.

¹Project action limits are based upon dry weight basis. The project quantitation limit goals are based upon a wet weight basis. Following the receipt of the analytical results for the final confirmation soil sample for a site, the project team will review the data to ensure that the sampling and data meets the DQOs.

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are used per DoD QSM.

⁴Basis for this PRG is the Ecological Soil Screening Concentration (EPA Ecological Soil Screening Level, 2007).

⁵Basis for this PRG is the Ecological Soil Screening Concentration (EPA Ecological Soil Screening Level, 2005).

⁶Basis for this PRG is the maximum detected background concentration of mercury measured at Yorktown and neighboring Cheatham Annex (Baker 1995, Baker 2002b).

⁷Basis for this PRG is the Ecological Soil Screening Concentration (EPA Region 3 Biological Technical Assistance Group, 1995).

⁸Basis for this PRG is the Background Soil Concentration (Yorktown anthropogenic maximum surface soil background value previously used in the CAX Site 11 Baseline Ecological Risk Assessment).

SAP Worksheet #15.2 -- Reference Limits and Evaluation Table
SITE 11- Confirmation Samples

Matrix: Field and Equipment Blanks
 Analytical Group: Inorganic Metals - SW-846 3010A/6010B/7470A

Analyte	CAS Number	Project Action Limit (µg/L) Equal to or Less Than	Project Quantitation Limit Goal (µg/L)	Project Action Limit Reference	Achievable Laboratory Limits ¹		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/L)	QLs (µg/L)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Copper	7440-50-8	Not Required ³	25	Not Required ³	0.9	25	80-120	80-120	20	NA	50
Iron	7439-89-6	Not Required ³	300	Not Required ³	15	300	80-120	80-120	20	NA	50
Lead	7439-92-1	Not Required ³	5.0	Not Required ³	1.7	5.0	80-120	80-120	20	NA	50
Mercury	7439-97-6	Not Required ³	1.0	Not Required ³	0.11	1.0	80-120	80-120	20	NA	50
Selenium	7782-49-2	Not Required ³	10	Not Required ³	2.0	10	80-120	80-120	20	NA	50
Zinc	7440-66-6	Not Required ³	20	Not Required ³	5.0	20	80-120	80-120	20	NA	50

NA = Not Applicable.

¹Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* Following the receipt of the analytical results for the final confirmation soil sample for a site, the project team will review the data to ensure that the sampling and data meets the DQOs.

²The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories* (DoD QSM), Version 3, January 2006.

³Project action limits are not required since the purpose of these blanks is to assess the adequacy of the decontamination process, and provide information about contaminants that may have been introduced during sample collection, storage, and or transport. Blanks will be evaluated during the data review and verification process.

SAP Worksheet #15.3 Reference Limits and Evaluation Table
SITE 11 - Confirmation Samples

Matrix: Soil

Analytical Group: Total PAHs Organic - SW-846 3550B/8270C

Analyte	CAS Number	Project Action Limit ¹ (µg/kg) Equal to or Less Than	Project Quantitation Limit Goal ¹ (µg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/kg)	QLs (µg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Acenaphthene	83-32-9	Total PAHs 18,000 Total PAHs will be a summation of all PAHs. ⁵	170	Ecological ⁴	33	170	45-110	45-110	30	NA	50
Acenaphthylene	208-96-8		170		33	170	45-105	45-105	30	NA	50
Anthracene	120-12-7		170		33	170	55-105	55-105	30	NA	50
Benzo(a)anthracene	56-55-3		170		33	170	50-110	50-110	30	NA	50
Benzo(a)pyrene	50-32-8		170		33	170	50-110	50-110	30	NA	50
Benzo(b)fluoranthene	205-99-2		170		33	170	45-115	45-115	30	NA	50
Benzo(g,h,i)perylene	191-24-2		170		67	170	40-125	40-125	30	NA	50
Benzo(k)fluoranthene	207-08-9		170		33	170	45-125	45-125	30	NA	50
Chrysene	218-01-9		170		33	170	55-110	55-110	30	NA	50
Dibenzo(a,h)anthracene	53-70-3		170		67	170	40-125	40-125	30	NA	50
Fluoranthene	206-44-0		170		33	170	55-115	55-115	30	NA	50
Fluorene	86-73-7		170		33	170	50-110	50-110	30	NA	50
Indeno(1,2,3-cd)pyrene	193-39-5		170		67	170	40-120	40-120	30	NA	50
1-Methylhaphthalene	90-12-0		170		33	170	45-105	45-105	30	NA	50
2-Methylnaphthalene	91-57-6		170		33	170	45-105	45-105	30	NA	50
Naphthalene	91-20-3		170		33	170	40-105	40-105	30	NA	50
Phenanthrene	85-01-8		170		33	170	50-110	50-110	30	NA	50
Pyrene	129-00-0		170		67	170	45-125	45-125	30	NA	50
Nitrobenzene-d5	4165-60-0	NA	NA	NA	NA	NA	NA	NA	NA	35-100	NA
2-Fluorobiphenyl	321-60-8	NA	NA	NA	NA	NA	NA	NA	NA	45-105	NA
Terphenyl-d14	1718-51-0	NA	NA	NA	NA	NA	NA	NA	NA	30-125	NA

NA = Not Applicable.

¹Project action limits are based upon dry weight basis. The project quantitation limit goals are based upon a wet weight basis. Following the receipt of the analytical results for the final confirmation soil sample for a site, the project team will review the data to ensure that the sampling and data meets the DQOs.

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

⁴Basis for this PRG is the Ecological Soil Screening Concentration (EPA Ecological Soil Screening Level, 2007).

⁵Total PAHs will be a straight summation of all detected PAHs, for any non-detect analytes one-half the laboratory quantitation limit will be used as the value in the summation.

SAP Worksheet #15.4 Reference Limits and Evaluation Table
SITE 11 – Field and Equipment Blanks

Matrix: Field and Equipment Blanks
 Analytical Group: Total PAHs Organic - SW-846 3510C/8270C

Analyte	CAS Number	Project Action Limit (µg/l) Equal to or Less Than	Project Quantitation Limit Goal (µg/l)	Project Action Limit Reference	Achievable Laboratory Limits ¹		Precision and Accuracy Method Performance Criteria ²				
					MDLs (µg/l)	QLs (µg/l)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Acenaphthene	83-32-9	Not Required ³	5.0	Not Required ³	1.0	5.0	45-110	45-100	30	NA	50
Acenaphthylene	208-96-8	Not Required ³	5.0	Not Required ³	1.0	5.0	50-105	50-105	30	NA	50
Anthracene	120-12-7	Not Required ³	5.0	Not Required ³	1.0	5.0	55-110	55-110	30	NA	50
Benzo(a)anthracene	56-55-3	Not Required ³	5.0	Not Required ³	1.0	5.0	55-110	55-110	30	NA	50
Benzo(a)pyrene	50-32-8	Not Required ³	5.0	Not Required ³	1.0	5.0	55-110	55-110	30	NA	50
Benzo(b)fluoranthene	205-99-2	Not Required ³	5.0	Not Required ³	1.0	5.0	45-120	45-120	30	NA	50
Benzo(g,h,i)perylene	191-24-2	Not Required ³	5.0	Not Required ³	2.0	5.0	40-125	40-125	30	NA	50
Benzo(k)fluoranthene	207-08-9	Not Required ³	5.0	Not Required ³	1.0	5.0	45-125	45-125	30	NA	50
Chrysene	218-01-9	Not Required ³	5.0	Not Required ³	1.0	5.0	55-110	55-110	30	NA	50
Dibenzo(a,h)anthracene	53-70-3	Not Required ³	5.0	Not Required ³	2.0	5.0	40-125	40-125	30	NA	50
Fluoranthene	206-44-0	Not Required ³	5.0	Not Required ³	1.0	5.0	55-110	55-110	30	NA	50
Fluorene	86-73-7	Not Required ³	5.0	Not Required ³	1.0	5.0	50-110	50-110	30	NA	50
Indeno(1,2,3-cd)pyrene	193-39-5	Not Required ³	5.0	Not Required ³	2.0	5.0	45-125	45-125	30	NA	50
1-Methylhaphthalene	90-12-0	Not Required ³	5.0	Not Required ³	1.0	5.0	45-105	45-105	30	NA	50
2-Methylnaphthalene	91-57-6	Not Required ³	5.0	Not Required ³	1.0	5.0	45-105	45-105	30	NA	50
Naphthalene	91-20-3	Not Required ³	5.0	Not Required ³	1.0	5.0	40-100	40-100	30	NA	50
Phenanthrene	85-01-8	Not Required ³	5.0	Not Required ³	1.0	5.0	50-115	50-115	30	NA	50
Pyrene	129-00-0	Not Required ³	5.0	Not Required ³	1.0	5.0	50-130	50-130	30	NA	50
Nitrobenzene-d5	4165-60-0	NA	NA	NA	NA	NA	NA	NA	NA	40-110	NA
2-Fluorobiphenyl	321-60-8	NA	NA	NA	NA	NA	NA	NA	NA	50-110	NA
Terphenyl-d14	1718-51-0	NA	NA	NA	NA	NA	NA	NA	NA	50-135	NA

NA = Not Applicable.

¹Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis. Following the receipt of the analytical results for the final confirmation soil samples for a site, the project team will review the data to ensure that the sampling and data meets the DQOs.

²The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

³Project action limits are not required since the purpose of these blanks is to assess the adequacy of the decontamination process, and provide information about contaminants that may have been introduced during sample collection, storage, and or transport. Blanks will be evaluated during the data review and verification process. Requires blanks to be analyzed by the same method.

SAP Worksheet #15.5 -- Reference Limits and Evaluation Table
SITE 11 - Confirmation Samples

Matrix: Soil

Analytical Group: 4,4'-DDD and 4,4'-DDE by - SW-846 3550B/8081A

Analyte	CAS Number	Project Action Limit ¹ (µg/kg) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (µg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/kg)	QLs (µg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
4,4'-DDD ⁴	72-54-8	100	3.3	Ecological ⁴	0.67	3.3	30-135	30-135	30	NA	50
4,4'-DDE ⁴	72-55-9	100	3.3	Ecological ⁴	0.67	3.3	70-125	70-125	30	NA	50
Tetrachloro-m-xylene	877-09-8	NA	NA	NA	NA	NA	NA	NA	NA	70-125	NA
Decachlorobiphenyl	2051-24-3	NA	NA	NA	NA	NA	NA	NA	NA	55-130	NA

NA = Not Applicable.

¹Project action limits are based upon dry weight basis. The project quantitation limit goals are based upon a wet weight basis. Following the receipt of the analytical results for the final confirmation soil sample for a site, the project team will review the data to ensure that the sampling and data meets the DQOs.

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories* (DoD QSM), Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

⁴Basis for this PRG is the Ecological Soil Screening Concentration (EPA Region 3 Biological Technical Assistance Group, 1995).

SAP Worksheet #15.6 -- Reference Limits and Evaluation Table
Site 11- Field and Equipment Blanks

Matrix: Field and Equipment Blanks
 Analytical Group: 4,4'-DDD and 4,4'-DDE by - SW-846 3510C/8081A

Analyte	CAS Number	Project Action Limit (µg/l) Equal to or Less Than	Project Quantitation Limit Goal (µg/l)	Project Action Limit Reference	Achievable Laboratory Limits ¹		Precision and Accuracy Method Performance Criteria ²				
					MDLs (µg/l)	QLs (µg/l)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
4,4'-DDD	72-54-8	Not Required ³	0.1	Not Required ³	0.02	0.1	25-150	25-150	30	NA	50
4,4'-DDE	72-55-9	Not Required ³	0.1	Not Required ³	0.02	0.1	35-140	35-140	30	NA	50
Tetrachloro-m-xylene	877-09-8	NA	NA	NA	NA	NA	NA	NA	NA	25-140	NA
Decachlorobiphenyl	2051-24-3	NA	NA	NA	NA	NA	NA	NA	NA	30-135	NA

NA = Not Applicable.

¹Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis. Following the receipt of the analytical results for the final confirmation soil sample for a site, the project team will review the data to ensure that the sampling and data meets the DQOs.

²The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

³Project action limits are not required since the purpose of these blanks is to assess the adequacy of the decontamination process, and provide information about contaminants that may have been introduced during sample collection, storage, and or transport. Blanks will be evaluated during the data review and verification process.

SAP Worksheet #15.7 -- Reference Limits and Evaluation Table
Site 11 - Waste Disposal Profile Samples

Matrix: Soil

Analytical Group: Organics - TCLP Volatiles SW-846 1311/5030B/8260B

Analyte	CAS Number	Project Action Limit ¹ (mg/L) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (mg/L)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (mg/L)	QLs (mg/L)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Benzene	71-43-2	0.5	0.01	USEPA 40CFR 261 (June, 1996)	0.005	0.01	80-120	NA	NA	NA	NA
Chlorobenzene	108-90-7	100	0.02		0.005	0.02	80-120	NA	NA	NA	NA
Chloroform	67-66-3	6.0	0.02		0.005	0.02	65-135	NA	NA	NA	NA
Carbon tetrachloride	56-23-5	0.5	0.02		0.005	0.02	65-140	NA	NA	NA	NA
1,1-Dichloroethylene	75-35-4	0.7	0.02		0.005	0.02	70-130	NA	NA	NA	NA
1,2-Dichloroethane	107-06-2	0.5	0.02		0.005	0.02	80-120	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	7.5	0.02		0.005	0.02	75-125	NA	NA	NA	NA
Methyl ethyl ketone	78-93-3	200	0.10		0.025	0.10	30-150	NA	NA	NA	NA
Tetrachloroethylene	127-18-4	0.7	0.02		0.005	0.02	45-150	NA	NA	NA	NA
Trichloroethylene	79-01-6	0.5	0.02		0.005	0.02	70-125	NA	NA	NA	NA
Vinyl chloride	75-01-4	0.2	0.01		0.005	0.01	50-145	NA	NA	NA	NA
Dibromofluoromethane	1868-53-7	NA	NA		NA	NA	NA	NA	NA	85-115	NA
Toluene-D8	2037-26-5	NA	NA	NA	NA	NA	NA	NA	85-120	NA	
4-Bromofluorobenzene	460-00-4	NA	NA	NA	NA	NA	NA	NA	75-120	NA	
1,2-Dichloroethane-D4	17060-07-0	NA	NA	NA	NA	NA	NA	NA	70-120	NA	

NA = Not Applicable.

¹Project action limits are based upon USEPA TCLP Maximum Concentration of Contaminants 40CFR 261 (June, 1996).

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.*

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories* (DoD QSM), Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM. No field duplicate or MS/MSD are required for TCLP analysis.

SAP Worksheet #15.8 -- Reference Limits and Evaluation Table
Site 11 - Waste Disposal Profile Samples

Matrix: Soil

Analytical Group: Organics - TCLP Semivolatiles SW-846 1311/3510C/8270C

Analyte	CAS Number	Project Action Limit ¹ (mg/L) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (mg/L)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (mg/L)	QLs (mg/L)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
2-Methylphenol	95-48-7	200	0.05	USEPA 40CFR 261 (June, 1996)	0.02	0.05	40-110	NA	NA	NA	NA
3&4-Methylphenol	NA	200	0.05		0.02	0.05	30-110	NA	NA	NA	NA
Pentachlorophenol	87-86-5	100	0.25		0.1	0.25	40-115	NA	NA	NA	NA
2,4,5-Trichlorophenol	95-95-4	400	0.05		0.02	0.05	50-110	NA	NA	NA	NA
2,4,6-Trichlorophenol	88-06-2	2.0	0.05		0.02	0.05	50-115	NA	NA	NA	NA
1,4-Dichlorobenzene	106-46-7	7.5	0.05		0.01	0.05	30-100	NA	NA	NA	NA
2,4-Dinitrotoluene	121-14-2	0.13	0.05		0.02	0.05	50-120	NA	NA	NA	NA
Hexachlorobenzene	118-74-1	0.13	0.05		0.01	0.05	50-110	NA	NA	NA	NA
Hexachlorobutadiene	87-68-3	0.5	0.05		0.02	0.05	25-105	NA	NA	NA	NA
Hexachloroethane	67-72-1	3.0	0.05		0.02	0.05	30-95	NA	NA	NA	NA
Nitrobenzene	98-95-3	2.0	0.05		0.01	0.05	45-110	NA	NA	NA	NA
Pyridine	110-86-1	5.0	0.10		0.03	0.10	50-150	NA	NA	NA	NA
2-Fluorophenol	367-12-4	NA	NA	NA	NA	NA	NA	NA	50-110	NA	
Phenol-d5	4165-62-2	NA	NA	NA	NA	NA	NA	NA	10-115	NA	
2,4,6-Tribromophenol	118-79-6	NA	NA	NA	NA	NA	NA	NA	40-125	NA	
Nitrobenzene-d5	4165-60-0	NA	NA	NA	NA	NA	NA	NA	40-110	NA	
2-Fluorobiphenyl	321-60-8	NA	NA	NA	NA	NA	NA	NA	50-110	NA	
Terphenyl-d14	1718-51-0	NA	NA	NA	NA	NA	NA	NA	50-135	NA	

NA = Not Applicable.

¹Project action limits are based upon USEPA TCLP Maximum Concentration of Contaminants 40CFR 261 (June, 1996).

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.*

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM. No field duplicate or MS/MSD are required for TCLP analysis.

SAP Worksheet #15.9 -- Reference Limits and Evaluation Table
Site 11 - Waste Disposal Profile Samples

Matrix: Soil

Analytical Group: Organics - TCLP Pesticide SW-846 1311/3510C/8081A

Analyte	CAS Number	Project Action Limit ¹ (mg/L) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (mg/L)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (mg/L)	QLs (mg/L)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
gamma-BHC (Lindane)	58-89-9	0.4	0.0005	USEPA 40CFR 261 (June, 1996)	0.0002	0.0005	25-135	NA	NA	NA	NA
Chlordane	12789-03-6	0.03	0.005		0.0025	0.005	60-125	NA	NA	NA	NA
Endrin	72-20-8	0.02	0.001		0.0004	0.001	55-135	NA	NA	NA	NA
Heptachlor	76-44-8	0.008	0.0005		0.0002	0.0005	40-130	NA	NA	NA	NA
Heptachlor epoxide	1024-57-3	0.008	0.0005		0.0002	0.0005	60-130	NA	NA	NA	NA
Methoxychlor	72-43-5	10	0.0010		0.0004	0.0010	55-150	NA	NA	NA	NA
Toxaphene	8001-35-2	0.5	0.025		0.015	0.025	50-150	NA	NA	NA	NA
Tetrachloro-m-xylene	877-09-8	NA	NA	NA	NA	NA	NA	NA	25-140	NA	
Decachlorobiphenyl	2051-24-3	NA	NA	NA	NA	NA	NA	NA	30-135	NA	

NA = Not Applicable.

¹Project action limits are based upon USEPA TCLP Maximum Concentration of Contaminants 40CFR 261 (June, 1996).

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.*

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories* (DoD QSM), Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM. No field duplicate or MS/MSD is required for TCLP analysis.

SAP Worksheet #15.10 -- Reference Limits and Evaluation Table
Site 11 - Waste Disposal Profile Samples

Matrix: Soil

Analytical Group: Organics - TCLP Herbicides SW-846 1311/8151A

Analyte	CAS Number	Project Action Limit ¹ (mg/L) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (mg/L)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (mg/L)	QLs (mg/L)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
2,4-D	94-75-7	10	0.015	USEPA 40CFR 261 (June, 1996)	0.011	0.015	35-115	NA	NA	NA	NA
2,4,5-TP (Silvex)	93-72-1	1.0	0.0020		0.0006	0.0020	50-115	NA	NA	NA	NA
2,4-Dichlorophenylacetic acid	19719-28-9	NA	NA	NA	NA	NA	NA	NA	NA	50-150	NA

NA = Not Applicable.

¹Project action limits are based upon USEPA TCLP Maximum Concentration of Contaminants 40CFR 261 (June, 1996).

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Accutest Lab Southeast will subcontract the analysis to Accutest Lab Gulf Coast, Houston, TX. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.*

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM. No field duplicate or MS/MSD is required for TCLP analysis.

SAP Worksheet #15.11 -- Reference Limits and Evaluation Table
Site 11 - Waste Disposal Profile Samples

Matrix: Soil

Analytical Group: Inorganics - TCLP Metals SW-846 1311/3010A/6010B/7470A

Analyte	CAS Number	Project Action Limit ¹ (mg/L) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (mg/L)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (mg/L)	QLs (mg/L)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Arsenic	7440-38-2	5.0	0.02	USEPA 40CFR 261 (June, 1996)	0.0029	0.02	80-120	NA	NA	NA	NA
Barium	7440-39-3	100	1.0		0.2	1.0	80-120	NA	NA	NA	NA
Cadmium	7440-43-9	1.0	0.005		0.0003	0.005	80-120	NA	NA	NA	NA
Chromium	7440-47-3	5.0	0.010		0.0006	0.010	80-120	NA	NA	NA	NA
Lead	7439-92-1	5.0	0.050		0.0017	0.050	80-120	NA	NA	NA	NA
Mercury	7439-97-6	0.2	0.010		0.0008	0.010	80-120	NA	NA	NA	NA
Selenium	7782-49-2	1.0	0.050		0.02	0.050	80-120	NA	NA	NA	NA
Silver	7440-22-4	5.0	0.010		0.0009	0.010	80-120	NA	NA	NA	NA

NA = Not Applicable.

¹Project action limits are based upon USEPA TCLP Maximum Concentration of Contaminants 40CFR 261 (June, 1996).

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.*

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories* (DoD QSM), Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM. No field duplicate or MS/MSD is required for TCLP analysis.

SAP Worksheet #15.12 -- Reference Limits and Evaluation Table
Site 11 - Waste Disposal Profile Samples

Matrix: Soil

Analytical Group: Inorganics - Cyanide SW846 9012, Sulfide EPA SM19 4500S=2, Ignitability (Flashpoint) SW846 1010, Corrosivity as pH SW846 CHAP7

Analyte	CAS Number	Project Action Limit ¹ Equal to or Less Than	Project Quantitation Limit Goal ¹	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs	QLs	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Total Cyanide	57-12-5	20,440 mg/kg Fill ⁴	0.12 mg/kg	USEPA 40CFR 261 (June, 1996) Fill ⁴	0.06 mg/kg	0.12 mg/kg	75-125	75-125	20	NA	50
Total Sulfide	7783-06-4	3,066 mg/kg	20 mg/kg		11 mg/kg	20 mg/kg	75-125	75-125	20	NA	50
Ignitability (Flashpoint)	NA	<200 Deg. F	NA		NA	NA	NA	NA	NA	NA	NA
Corrosivity as pH	NA	≥12.5 and <2.0 pH units	NA		NA	NA	NA	NA	NA	NA	NA

NA = Not Applicable.

¹Project action limits are based upon project goals for sulfide and cyanide and USEPA 40CFR 261 (June, 1996) for ignitability and corrosivity as pH on a dry weight basis.

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.*

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM. No field duplicate or MS/MSD are required for waste characterization analysis.

⁴Results will be submitted to the partnering team for discussion and review, the results may be compared to site specific background levels for some or all of the analytes. Fill will not be placed without written approval from the partnering team

SAP Worksheet #15.13 -- Reference Limits and Evaluation Table
Site 11 - Waste Disposal Profile and Fill Material Samples

Matrix: Soil

Analytical Group: Organic – Total PCBs by SW-846 3550B 8082

Analyte	CAS Number	Project Action Limit ¹ (µg/kg) Equal to or Less Than	Project Quantitation Limit Goal ¹ (µg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/kg)	QLs (µg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Aroclor 1016	12674-11-2	Above 50,000 Total PCBs for Waste Characterization samples ¹ Fill Material ⁴	17	50,000 µg/kg is for the characterization	8.3	17	40-140	40-140	30	NA	50
Aroclor 1221	11104-28-2		17		13	17	NA	NA	NA	NA	50
Aroclor 1232	11141-16-5		17		13	17	NA	NA	NA	NA	50
Aroclor 1242	53469-21-9		17		8.3	17	NA	NA	NA	NA	50
Aroclor 1248	12672-29-6		17		8.3	17	NA	NA	NA	NA	50
Aroclor 1254	11097-69-1		17		8.3	17	NA	NA	NA	NA	50
Aroclor 1260	11096-82-5		17		8.3	17	60-130	60-130	30	NA	50
Tetrachloro-m-xylene	877-09-8	NA	NA	NA	NA	NA	NA	NA	NA	52-136	NA
Decachlorobiphenyl	2051-24-3	NA	NA	NA	NA	NA	NA	NA	NA	60-125	NA

NA = Not Applicable

¹Project action limit of 50,000 µg/kg is for the characterization of excavated soil for disposal of soil as hazardous to an approved off site facility on a dry weight basis. Fill materials for placement on site must not have any detects above the laboratory reporting limit for Total PCBs. The project quantitation limit goals are based upon a wet weight basis. Following the receipt of the analytical results for the final confirmation soil sample for a site, the project team will review the data to ensure that the sampling and data meets the DQOs.

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

⁴Results will be submitted to the partnering team for discussion and review, the results may be compared to site specific background levels for some or all of the analytes. Fill will not be placed without written approval from the partnering team.

SAP Worksheet #15.14 -- Reference Limits and Evaluation Table

Matrix: Soil
 Analytical Group: Organic – TPH DRO/ORO SW-846 3550B/8015M
 Concentration Level: Low

Analyte	CAS Number	Project Action Limit ¹ (mg/kg) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (mg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ³		Precision and Accuracy Method Performance Criteria ⁴				
					MDLs (mg/kg)	QLs (mg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
TPH-DRO (C10-C28) TPH-ORO (C28-C40) <i>ORO only required for Waste Characterization Samples</i>	NA	Above 3,000 Total TPH for Waste Characterization on samples ¹ Equal to or Less than 50 ²	8.3	Virginia 9VAC20-80-700 section D.5	5.0	8.3	62-114	31-136	36	NA	50
o-Terphenyl	84-15-1	NA	NA	NA	NA	NA	NA	NA	NA	57-115	NA

NA = Not Applicable.

¹The 3,000 mg/kg is for the characterization of excavated soil for disposal of soil as hazardous to an approved off site facility. The project action limits are based upon a dry weight basis and the project quantitation limit goals are based upon a wet weight basis. Following the receipt of the analytical results for the final confirmation soil sample for a site, the project team will review the data to ensure that the sampling and data meets the DQOs.

²Fill Material - If the TPH is between non-detect and 50 ppm, Clean fill can not be placed closer than 100 feet to any surface water body, 500 feet from any well, spring, or groundwater source of drinking water, 200 feet from any residential use (including schools, daycares, etc.) based on Virginia 9VAC20-80-700 section D.5. The project action limits are based upon a dry weight basis and the project quantitation limit goals are based upon a wet weight basis.

³Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

⁴The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

SAP Worksheet #15.15 -- Reference Limits and Evaluation Table

Matrix: Soil

Analytical Group: Organic – TPH GRO SW-846 5035A/8015M

Analyte	CAS Number	Project Action Limit ¹ (mg/kg) Equal to or Less Than	Project Quantitation Limit Goal ¹ (mg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ³		Precision and Accuracy Method Performance Criteria ⁴				
					MDLs (mg/kg)	QLs (mg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
TPH-GRO (C6-C10)	NA	Above 3,000 Total TPH for Waste Characterization samples ¹ Equal to or Less than 50 ²	0.1	3,000 mg/kg is for the characterization Virginia 9VAC20-80-700 section D.5	0.05	0.1	66-122	37-142	17	NA	50
4-Bromofluorobenzene	460-00-4	NA	NA	NA	NA	NA	NA	NA	NA	62-135	NA
aaa-Trifluorotoluene	98-08-8	NA	NA	NA	NA	NA	NA	NA	NA	65-118	NA

NA = Not Applicable.

¹The 3,000 mg/kg is for the characterization of excavated soil for disposal of soil as hazardous to an approved off site facility. The project action limits are based upon a dry weight basis and the project quantitation limit goals are based upon a wet weight basis. Following the receipt of the analytical results for the final confirmation soil sample for a site, the project team will review the data to ensure that the sampling and data meets the DQOs.

²Fill Material - If the TPH is between non-detect and 50 ppm, Clean fill can not be placed closer than 100 feet to any surface water body, 500 feet from any well, spring, or groundwater source of drinking water, 200 feet from any residential use (including schools, daycares, etc.) per Virginia 9VAC20-80-700 section D.5. The project action limits are based upon a dry weight basis and the project quantitation limit goals are based upon a wet weight basis.

³Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

⁴The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

SAP Worksheet #15.16 -- Reference Limits and Evaluation Table

Matrix: Soil

Analytical Group: TCL Volatiles Organic - SW-846 5035A/8260B

Analyte	CAS Number	Project Action Limit ¹ (µg/kg) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (µg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/kg)	QLs (µg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Acetone	67-64-1	TBD ¹	50	TBD ¹	25	50	20-160	20-160	30	NA	50
Benzene	71-43-2	TBD ¹	5		2	5	75-125	75-125	30	NA	50
Bromodichloromethane	75-27-4	TBD ¹	5		2	5	70-130	70-130	30	NA	50
Bromoform	75-25-2	TBD ¹	5		2	5	55-135	55-135	30	NA	50
Chlorobenzene	108-90-7	TBD ¹	5		2	5	75-125	75-125	30	NA	50
Chloroethane	75-00-3	TBD ¹	5		3	5	40-155	40-155	30	NA	50
Chloroform	67-66-3	TBD ¹	5		2	5	70-125	70-125	30	NA	50
Carbon disulfide	75-15-0	TBD ¹	5		2	5	30-160	30-160	30	NA	50
Carbon tetrachloride	56-23-5	TBD ¹	5		2	5	65-135	65-135	30	NA	50
1,1-Dichloroethane	75-34-3	TBD ¹	5		2	5	75-125	75-125	30	NA	50
1,1-Dichloroethylene	75-35-4	TBD ¹	5		2	5	65-135	65-135	30	NA	50
1,2-Dichloroethane	107-06-2	TBD ¹	5		2	5	70-135	70-135	30	NA	50
1,2-Dichloropropane	78-87-5	TBD ¹	5		2	5	70-120	70-120	30	NA	50
Dibromochloromethane	124-48-1	TBD ¹	5		2	5	65-130	65-130	30	NA	50
cis-1,2-Dichloroethylene	156-59-2	TBD ¹	5		2	5	65-125	65-125	30	NA	50
cis-1,3-Dichloropropene	10061-01-5	TBD ¹	5		2	5	70-125	70-125	30	NA	50
trans-1,2-Dichloroethylene	156-60-5	TBD ¹	5		2	5	65-135	65-135	30	NA	50
trans-1,3-Dichloropropene	10061-02-6	TBD ¹	5		2	5	65-125	65-125	30	NA	50
Ethylbenzene	100-41-4	TBD ¹	5		2	5	75-125	75-125	30	NA	50
2-Hexanone	591-78-6	TBD ¹	25		10	25	45-145	45-145	30	NA	50
4-Methyl-2-pentanone	108-10-1	TBD ¹	25	10	25	45-145	45-145	30	NA	50	
Methyl bromide	74-83-9	TBD ¹	5	2	5	30-160	30-160	30	NA	50	
Methyl chloride	74-87-3	TBD ¹	5	2	5	50-130	50-130	30	NA	50	

SAP Worksheet #15.16 -- Reference Limits and Evaluation Table
 (Continued)

Matrix: Soil

Analytical Group: TCL Volatiles Organic - SW-846 5035A/8260B

Analyte	CAS Number	Project Action Limit ¹ (µg/kg) Equal to or Less Than	Project Quantitation Limit Goal ¹ (µg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/kg)	QLs (µg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Methylene chloride	75-09-2	TBD ¹	10	TBD ¹	5	10	55-140	55-140	30	NA	50
Methyl ethyl ketone	78-93-3	TBD ¹	25		10	25	30-160	30-160	30	NA	50
Styrene	100-42-5	TBD ¹	5		2	5	75-125	75-125	30	NA	50
1,1,1-Trichloroethane	71-55-6	TBD ¹	5		2	5	70-135	70-135	30	NA	50
1,1,2,2-Tetrachloroethane	79-34-5	TBD ¹	5		2	5	55-130	55-130	30	NA	50
1,1,2-Trichloroethane	79-00-5	TBD ¹	5		2	5	60-125	60-125	30	NA	50
Tetrachloroethylene	127-18-4	TBD ¹	5		2	5	65-140	65-140	30	NA	50
Toluene	108-88-3	TBD ¹	5		2	5	70-125	70-125	30	NA	50
Trichloroethylene	79-01-6	TBD ¹	5		2	5	75-125	75-125	30	NA	50
Vinyl chloride	75-01-4	TBD ¹	5		2	5	60-125	60-125	30	NA	50
Xylene (total)	1330-20-7	TBD ¹	15		5	15	80-125	80-125	30	NA	50
Dibromofluoromethane	1868-53-7	NA	NA	NA	NA	NA	NA	NA	78-123	NA	
Toluene-D8	2037-26-5	NA	NA	NA	NA	NA	NA	NA	85-115	NA	
4-Bromofluorobenzene	460-00-4	NA	NA	NA	NA	NA	NA	NA	85-120	NA	
1,2-Dichloroethane-D4	17060-07-0	NA	NA	NA	NA	NA	NA	NA	74-125	NA	

NA = Not Applicable.

¹Results will be submitted to the partnering team for discussion and review, the results analysis may be compared to site specific background levels for some or all of the analytes. Fill will not be placed without written approval from the partnering team. The project quantitation limit goals are based upon a wet weight basis.

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

SAP Worksheet #15.17 -- Reference Limits and Evaluation Table

Matrix: Soil
 Analytical Group: TCL Semivolatiles Organic - SW-846 3550B/8270C

Analyte	CAS Number	Project Action Limit ¹ (µg/kg) Equal to or Less Than	Project Quantitation Limit Goal ¹ (µg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/kg)	QLs (µg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Benzoic acid	65-85-0	TBD ¹	830	TBD ¹	330	830	10-110	10-110	30	NA	50
2-Chlorophenol	95-57-8	TBD ¹	170		33	170	45-105	45-105	30	NA	50
4-Chloro-3-methyl phenol ¹	59-50-7	TBD ¹	170		33	170	45-115	45-115	30	NA	50
2,4-Dichlorophenol	120-83-2	TBD ¹	170		33	170	45-110	45-110	30	NA	50
2,4-Dimethylphenol	105-67-9	TBD ¹	170		33	170	30-105	30-105	30	NA	50
2,4-Dinitrophenol	51-28-5	TBD ¹	830		330	830	15-130	15-130	30	NA	50
4,6-Dinitro-o-cresol	534-52-1	TBD ¹	330		67	330	30-135	30-135	30	NA	50
2-Methylphenol	95-48-7	TBD ¹	170		33	170	40-105	40-105	30	NA	50
3&4-Methylphenol	NA	TBD ¹	170		33	170	40-105	40-105	30	NA	50
2-Nitrophenol	88-75-5	TBD ¹	170		33	170	40-110	40-110	30	NA	50
4-Nitrophenol	100-02-7	TBD ¹	830		330	830	15-140	15-140	30	NA	50
Pentachlorophenol	87-86-5	TBD ¹	830		330	830	25-120	25-120	30	NA	50
Phenol	108-95-2	TBD ¹	170		33	170	40-100	40-100	30	NA	50
2,4,5-Trichlorophenol	95-95-4	TBD ¹	170		33	170	50-110	50-110	30	NA	50
2,4,6-Trichlorophenol	88-06-2	TBD ¹	170		33	170	45-110	45-110	30	NA	50
Acenaphthene	83-32-9	TBD ¹	170		33	170	45-110	45-110	30	NA	50
Acenaphthylene	208-96-8	TBD ¹	170		33	170	45-105	45-105	30	NA	50
Anthracene	120-12-7	TBD ¹	170		33	170	55-105	55-105	30	NA	50
Acetophenone	98-86-2	TBD ¹	170		33	170	55-105	55-105	30	NA	50
Benzo(a)anthracene	56-55-3	TBD ¹	170		33	170	50-110	50-110	30	NA	50
Benzo(a)pyrene	50-32-8	TBD ¹	170		33	170	50-110	50-110	30	NA	50
Benzo(b)fluoranthene	205-99-2	TBD ¹	170		33	170	45-115	45-115	30	NA	50
Benzo(g,h,i)perylene	191-24-2	TBD ¹	170		67	170	40-125	40-125	30	NA	50
Benzo(k)fluoranthene	207-08-9	TBD ¹	170	33	170	45-125	45-125	30	NA	50	

SAP Worksheet #15.17 -- Reference Limits and Evaluation Table

Matrix: Soil

Analytical Group: TCL Semivolatiles Organic - SW-846 3550B/8270C

Analyte	CAS Number	Project Action Limit ¹ (µg/kg) Equal to or Less Than	Project Quantitation Limit Goal ¹ (µg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/kg)	QLs (µg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
4-Bromophenyl phenyl ether ¹	101-55-3	TBD ¹	170	TBD ¹	33	170	45-115	45-115	30	NA	50
Butyl benzyl phthalate	85-68-7	TBD ¹	330		83	330	50-125	50-125	30	NA	50
Benzyl Alcohol	100-51-6	TBD ¹	170		33	170	20-125	20-125	30	NA	50
2-Chloronaphthalene	91-58-7	TBD ¹	170		33	170	45-105	45-105	30	NA	50
4-Chloroaniline	106-47-8	TBD ¹	330		130	330	10-95	10-95	30	NA	50
Carbazole	86-74-8	TBD ¹	170		33	170	45-115	45-115	30	NA	50
Chrysene	218-01-9	TBD ¹	170		33	170	55-110	55-110	30	NA	50
bis(2-Chloroethoxy)methane	111-91-1	TBD ¹	170		33	170	45-110	45-110	30	NA	50
bis(2-Chloroethyl)ether	111-44-4	TBD ¹	170		67	170	40-105	40-105	30	NA	50
bis(2-Chloroisopropyl)ether	108-60-1	TBD ¹	170		33	170	20-115	20-115	30	NA	50
4-Chlorophenyl phenyl ether ¹	7005-72-3	TBD ¹	170		33	170	45-110	45-110	30	NA	50
1,2-Dichlorobenzene	95-50-1	TBD ¹	170		33	170	45-95	45-95	30	NA	50
1,3-Dichlorobenzene	541-73-1	TBD ¹	170		33	170	40-100	40-100	30	NA	50
1,4-Dichlorobenzene	106-46-7	TBD ¹	170		33	170	35-105	35-105	30	NA	50
2,4-Dinitrotoluene	121-14-2	TBD ¹	170		67	170	50-115	50-115	30	NA	50
2,6-Dinitrotoluene	606-20-2	TBD ¹	170		67	170	50-110	50-110	30	NA	50
3,3'-Dichlorobenzidine	91-94-1	TBD ¹	330		170	330	10-130	10-130	30	NA	50
Dibenzo(a,h)anthracene ¹	53-70-3	TBD ¹	170		67	170	40-125	40-125	30	NA	50
Dibenzofuran	132-64-9	TBD ¹	170		33	170	50-105	50-105	30	NA	50
Di-n-butyl phthalate	84-74-2	TBD ¹	330		83	330	55-110	55-110	30	NA	50
Di-n-octyl phthalate	117-84-0	TBD ¹	330	170	330	40-130	40-130	30	NA	50	
Diethyl phthalate	84-66-2	TBD ¹	330	83	330	50-115	50-115	30	NA	50	

SAP Worksheet #15.17 -- Reference Limits and Evaluation Table
 (Continued)

Matrix: Soil
 Analytical Group: TCL Semivolatiles Organic - SW-846 3550B/8270C

Analyte	CAS Number	Project Action Limit ¹ (µg/kg) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (µg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/kg)	QLs (µg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Dimethyl phthalate	131-11-3	TBD ¹	330	TBD ¹	83	330	50-110	50-110	30	NA	50
bis(2-Ethylhexyl)phthalate	117-81-7	TBD ¹	330		170	330	45-125	45-125	30	NA	50
Fluoranthene	206-44-0	TBD ¹	170		33	170	55-115	55-115	30	NA	50
Fluorene	86-73-7	TBD ¹	170		33	170	50-110	50-110	30	NA	50
Hexachlorobenzene	118-74-1	TBD ¹	170		33	170	45-120	45-120	30	NA	50
Hexachlorobutadiene	87-68-3	TBD ¹	170		67	170	40-115	40-115	30	NA	50
Hexachlorocyclopentadiene	77-47-4	TBD ¹	170		67	170	40-115	40-115	30	NA	50
Hexachloroethane	67-72-1	TBD ¹	170		67	170	35-110	35-110	30	NA	50
Indeno(1,2,3-cd)pyrene	193-39-5	TBD ¹	170		67	170	40-120	40-120	30	NA	50
Isophorone	78-59-1	TBD ¹	170		33	170	45-110	45-110	30	NA	50
2-Methylnaphthalene	91-57-6	TBD ¹	170		33	170	45-105	45-105	30	NA	50
2-Nitroaniline	88-74-4	TBD ¹	330		83	330	45-120	45-120	30	NA	50
3-Nitroaniline	99-09-2	TBD ¹	330		83	330	25-110	25-110	30	NA	50
4-Nitroaniline	100-01-6	TBD ¹	330		120	330	35-115	35-115	30	NA	50
Naphthalene	91-20-3	TBD ¹	170		33	170	40-105	40-105	30	NA	50
Nitrobenzene	98-95-3	TBD ¹	170		33	170	40-115	40-115	30	NA	50
N-Nitroso-di-n-propylamine	621-64-7	TBD ¹	170		120	330	40-115	40-115	30	NA	50
N-Nitrosodiphenylamine	86-30-6	TBD ¹	170		33	170	50-115	50-115	30	NA	50
Phenanthrene	85-01-8	TBD ¹	170		33	170	50-110	50-110	30	NA	50
Pyrene	129-00-0	TBD ¹	170		67	170	45-125	45-125	30	NA	50
1,2,4-Trichlorobenzene	120-82-1	TBD ¹	170	33	170	45-110	45-110	30	NA	50	
2-Fluorophenol	367-12-4	NA	NA	NA	NA	NA	NA	NA	35-105	NA	

SAP Worksheet #15.17 -- Reference Limits and Evaluation Table
 (Continued)

Matrix: Soil

Analytical Group: TCL Semivolatiles Organic - SW-846 3550B/8270C

Analyte	CAS Number	Project Action Limit ¹ (µg/kg) Equal to or Less Than	Project Quantitation Limit Goal ¹ (µg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/kg)	QLs (µg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Phenol-d5	4165-62-2	NA	NA	NA	NA	NA	NA	NA	NA	40-100	NA
2,4,6-Tribromophenol	118-79-6	NA	NA	NA	NA	NA	NA	NA	NA	35-125	NA
Nitrobenzene-d5	4165-60-0	NA	NA	NA	NA	NA	NA	NA	NA	35-100	NA
2-Fluorobiphenyl	321-60-8	NA	NA	NA	NA	NA	NA	NA	NA	45-105	NA
Terphenyl-d14	1718-51-0	NA	NA	NA	NA	NA	NA	NA	NA	30-125	NA

NA = Not Applicable.

¹Results will be submitted to the partnering team for discussion and review, the results may be compared to site specific background levels for some or all of the analytes. Fill will not be placed without written approval from the partnering team. The project quantitation limit goals are based upon a wet weight basis.

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

SAP Worksheet #15.18 -- Reference Limits and Evaluation Table

Matrix: Soil
 Analytical Group: TCL Pesticides Organic - SW-846 3550B/8081A

Analyte	CAS Number	Project Action Limit ¹ (µg/kg) Equal to or Less Than	Project Quantitation Limit Goal ¹ (µg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (µg/kg)	QLs (µg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Aldrin	309-00-2	TBD ¹	1.7	TBD ¹	0.67	1.7	45-140	45-140	30	NA	50
alpha-BHC	319-84-6	TBD ¹	1.7		0.67	1.7	60-125	60-125	30	NA	50
beta-BHC	319-85-7	TBD ¹	1.7		0.67	1.7	60-125	60-125	30	NA	50
delta-BHC ¹	319-86-8	TBD ¹	1.7		0.67	1.7	55-130	55-130	30	NA	50
gamma-BHC (Lindane)	58-89-9	TBD ¹	1.7		0.67	1.7	60-125	60-125	30	NA	50
alpha-Chlordane	5103-71-9	TBD ¹	1.7		0.67	1.7	65-120	65-120	30	NA	50
gamma-Chlordane	5103-74-2	TBD ¹	1.7		0.67	1.7	65-125	65-125	30	NA	50
Dieldrin	60-57-1	TBD ¹	1.7		0.67	1.7	65-125	65-125	30	NA	50
4,4'-DDD	72-54-8	(100)	3.3		0.67	3.3	30-135	30-135	30	NA	50
4,4'-DDE	72-55-9	(100)	3.3		0.67	3.3	70-125	70-125	30	NA	50
4,4'-DDT	50-29-3	TBD ¹	3.3		1.00	3.3	45-140	45-140	30	NA	50
Endrin	72-20-8	TBD ¹	3.3		0.67	3.3	60-135	60-135	30	NA	50
Endosulfan sulfate ¹	1031-07-8	TBD ¹	3.3		0.67	3.3	60-135	60-135	30	NA	50
Endrin aldehyde ¹	7421-93-4	TBD ¹	3.3		1.30	3.3	35-145	35-145	30	NA	50
Endrin ketone ¹	53494-70-5	TBD ¹	3.3		0.67	3.3	65-135	65-135	30	NA	50
Endosulfan-I ¹	959-98-8	TBD ¹	1.7		0.67	1.7	15-135	15-135	30	NA	50
Endosulfan-II ¹	33213-65-9	TBD ¹	3.3		0.67	3.3	35-140	35-140	30	NA	50
Heptachlor	76-44-8	TBD ¹	1.7		0.67	1.7	50-140	50-140	30	NA	50
Heptachlor epoxide	1024-57-3	TBD ¹	1.7		0.67	1.7	65-130	65-130	30	NA	50
Methoxychlor	72-43-5	TBD ¹	3.3		1.30	3.3	65-130	65-130	30	NA	50
Toxaphene	8001-35-2	TBD ¹	170	83	170	50-150	50-150	30	NA	50	
Tetrachloro-m-xylene	877-09-8	NA	NA	NA	NA	NA	NA	NA	70-125	NA	
Decachlorobiphenyl	2051-24-3	NA	NA	NA	NA	NA	NA	NA	55-130	NA	

SAP Worksheet #15.18 -- Reference Limits and Evaluation Table (Continued)

Matrix: Soil

Analytical Group: TCL Pesticides Organic - SW-846 3550B/8081A

NA = Not Applicable.

¹Results will be submitted to the partnering team for discussion and review, the results may be compared to site specific background levels for some or all of the analytes. Fill will not be placed without written approval from the partnering team. The project quantitation limit goals are based upon a wet weight basis. The Site 11 project remediation goals for 4,4'-DDD, and 4,4'-DDE are noted in parenthesis.

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories* (DoD QSM), Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

SAP Worksheet #15.19 -- Reference Limits and Evaluation Table

Matrix: Soil

Analytical Group: Inorganic TAL Metals - SW-846 3050B/6010B/7471A

Analyte	CAS Number	Project Action Limit ¹ (mg/kg) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (mg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (mg/kg)	QLs (mg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Aluminum	7429-90-5	TBD ¹	10	TBD ¹	1.0	10	80-120	80-120	20	NA	50
Antimony	7440-36-0	TBD ¹	3.0		0.24	3.0	80-120	80-120	20	NA	50
Arsenic	7440-38-2	TBD ¹	0.4		0.18	0.4	80-120	80-120	20	NA	50
Barium	7440-39-3	TBD ¹	10		0.5	10	80-120	80-120	20	NA	50
Beryllium	7440-41-7	TBD ¹	0.25		0.10	0.25	80-120	80-120	20	NA	50
Cadmium	7440-43-9	TBD ¹	0.2		0.05	0.2	80-120	80-120	20	NA	50
Calcium	7440-70-2	TBD ¹	250		5.0	250	80-120	80-120	20	NA	50
Chromium	7440-47-3	TBD ¹	0.5		0.08	0.5	80-120	80-120	20	NA	50
Cobalt	7440-48-4	TBD ¹	2.5		0.06	2.5	80-120	80-120	20	NA	50
Copper ¹	7440-50-8	(70)	1.25		0.10	1.25	80-120	80-120	20	NA	50
Iron	7439-89-6	TBD ¹	5.0		1.3	5.0	80-120	80-120	20	NA	50
Lead ¹	7439-92-1	(120)	5.0		0.22	5.0	80-120	80-120	20	NA	50
Magnesium	7439-95-4	TBD ¹	250		5.0	250	80-120	80-120	20	NA	50
Manganese	7439-96-5	TBD ¹	0.75		0.06	0.75	80-120	80-120	20	NA	50
Mercury ¹	7439-97-6	(0.24)	0.083		0.012	0.083	80-120	80-120	20	NA	50
Nickel	7440-02-0	TBD ¹	2.0		0.16	2.0	80-120	80-120	20	NA	50
Potassium	7440-09-7	TBD ¹	500		5.0	500	80-120	80-120	20	NA	50
Selenium ¹	7782-49-2	(1.8)	5.0		0.15	5.0	80-120	80-120	20	NA	50
Silver	7440-22-4	TBD ¹	0.5		0.06	0.5	75-120	75-120	20	NA	50
Sodium	7440-23-5	TBD ¹	500		41	500	80-120	80-120	20	NA	50

SAP Worksheet #15.19 -- Reference Limits and Evaluation Table
 (Continued)

Matrix: Soil
 Analytical Group: Inorganic TAL Metals - SW-846 3050B/6010B/7471A

Analyte	CAS Number	Project Action Limit ¹ (mg/kg) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (mg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (mg/kg)	QLs (mg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Thallium	7440-28-0	TBD ¹	0.5	TBD ¹	0.17	0.5	80-120	80-120	20	NA	50
Vanadium	7440-62-2	TBD ¹	2.5		0.02	2.5	80-120	80-120	20	NA	50
Zinc ¹	7440-66-6	(120)	1.0		0.19	1.0	80-120	80-120	20	NA	50

NA = Not Applicable.

¹Results will be submitted to the partnering team for discussion and review, the results may be compared to site specific background levels for some or all of the analytes. Fill will not be placed without written approval from the partnering team. The Site 11 project remediation goals for copper, lead, mercury, selenium, and zinc are noted in parenthesis. The project quantitation limit goals are based upon a wet weight basis.

²Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

³The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

SAP Worksheet #15.20 -- Reference Limits and Evaluation Table

Matrix: Soil
 Analytical Group: Inorganic – Total Organic Halogens SW-846 9020
 Concentration Level: Low

Analyte	CAS Number	Project Action Limit ¹ (mg/kg) <i>Equal to or Less Than</i>	Project Quantitation Limit Goal ¹ (mg/kg)	Project Action Limit Reference	Achievable Laboratory Limits ²		Precision and Accuracy Method Performance Criteria ³				
					MDLs (mg/kg)	QLs (mg/kg)	LCS Control Limit (%R)	MS/MSD Control Limit (%R)	MS/MSD Precision Limit (RPD)	Surrogate Control Limit (%R)	Project Field Precision Limit (RPD)
Total Organic Halogens (TOX)	NA	Equal to or Less than 100 mg/kg	10.0	<100	2.33	10.0	75-125	75-125	20	NA	50

NA = Not Applicable.

¹ The project action limits are based upon a dry weight basis and the project quantitation limit goals are based upon a wet weight basis. All results of these samples shall be evaluated by the project team and approved by the Navy prior to placement.

² Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Accutest Lab Southeast will subcontract the analysis to Accutest Laboratories New Jersey. *Laboratory Generated Limits are subject to change, the laboratory will use the most current limits at the time of analysis.* The listed MDLs and QLs are based upon a wet weight basis.

³ The laboratory precision and accuracy method performance criteria are based upon the *DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)*, Version 3, January 2006. If a compound/analyte is not listed, then the established laboratory in-house limits are listed per DoD QSM.

SAP Worksheet #16 (UFP-SAP Manual Section 2.8.2) -- Project Schedule / Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Work Plan Preparation	Shaw Environmental, Inc.	06/13/2008	06/13/2008	Work Plan Document	06/13/2008
SAP Preparation	Shaw Environmental, Inc.	06/13/2008	06/13/2008	SAP Document	06/13/2008
Waste Characterization Sampling & Laboratory Analysis	Shaw Environmental, Inc. Accutest Orlando	TBD	TBD	Analytical Report	TBD
Clearing and Grubbing	Shaw Environmental, Inc.	TBD	TBD	NA	TBD
Fill Material Sampling and Laboratory Analysis	Shaw Environmental, Inc. Accutest Orlando	TBD	TBD	Analytical Report	TBD
Excavation	Shaw Environmental, Inc.	TBD	TBD	NA	TBD
Confirmation Sampling and Laboratory Analysis	Shaw Environmental, Inc. Accutest Orlando	TBD	TBD	Analytical Report	TBD
Field Sampling Audit	Shaw Environmental, Inc.	TBD	TBD	Daily QC Report	TBD
Data Review and Sample Verification	Shaw Environmental, Inc.	TBD	TBD	Data Report	TBD
Grading and Planting	Shaw Environmental, Inc.	TBD	TBD	NA	TBD
Closure Report Preparation	Shaw Environmental, Inc.	TBD	TBD	Project Closure Report	TBD

NA = Not Applicable

SAP Worksheet #17 -- Sampling Design and Rationale

The tasks primarily focus on remediation efforts at Site 11(Bone Yard), Naval Weapons Station (WPNSTA) Yorktown, Cheatham Annex.

Site 11 encompasses an estimated 2.7-acre area located approximately 250 feet south of Antrim Road and the Public Works Department. Site 11 consists of an open, overgrown, grassy field surrounded by mixed-hardwood woodland. Old building foundations, concrete pads, and low retaining walls litter the site, both inside and outside of the wooded areas. Two creeks running eastward to Penniman Lake drain Site 11 and border the site to the north and south. Access to the site is from the north via a dirt road off of Antrim road. Site 11 was reportedly used between 1940 and 1978 to store containers of waste-oil and tar as well as asphalt and other scrap materials on the ground. Oil, asphalt, gasoline, and other unspecified materials have been identified in the disposal area

The overall objective of these documents is to plan field activities that will mitigate unacceptable risks posed by direct contact by human and ecological receptors with contaminated soil.

This will be accomplished by excavating and disposing of all contaminated soil.

The sampling task encompasses three types of sampling events:

- Pre-excavation sampling to delineate the area of the excavation of soil to ensure that the Project Remediation Goals (PRGs) will be met.
- Confirmation sampling after the excavation of soil to ensure that the Project Remediation Goals (PRGs) have been met.
- Disposal sampling to determine if the excavated soil is not hazardous as per RCRA 40 CFR 261 6/96.
- Fill Material sampling prior to placement at the site to ensure that the material is acceptable for use.

Pre – Excavation and Confirmation Floor Soil Sampling (see worksheet 19 for analytical methods):

Site 11

Pre-excavation grab samples will be collected from each of the Areas as described in Worksheet 10.

Confirmation floor samples will be collected. One 5 point (four corners, one center) composite soil sample will be collected from the bottom of the excavation at one per 500-square feet. Pre-Excavation and confirmatory floor soil samples will be taken and analyzed for the analytes shown below:

- Copper 70 mg/kg Ecological (Area 1, and 3)
- Lead 120 mg/kg Ecological (Area 1, 3, and 4)
- Mercury 0.24 mg/kg Background (Area 1, 3, and 4)
- Selenium 1.8 mg/kg Ecological (Area 3, and 4)
- Zinc 120 mg/kg Ecological (Area 1, 2, 3, and 4)
- Iron 46,400 mg/kg Ecological (Area 3)
- 4,4'-DDD 100 µg/kg Ecological (Area 1, 3, and 4)
- 4,4'-DDE 100 µg/kg Ecological (Area 1, 3, and 4)
- PAHs 18,000 µg//kg Ecological (Area 1, 3, and 4)

SAP Worksheet #17 -- Sampling Design and Rationale (Continued)

Site 11 (continued)

Pre-Excavation Soil samples:

Prior to the excavation soil samples will be collected from:

Area 1: Collect grab co-located surface (0-6 inches) and subsurface soils (2-3 ft bgs) samples at the three locations shown on Figure 3 to delineate the western portion of Area 1. Samples will be analyzed for total PAHs, 4,4-DDD, 4,4-DDE, copper, lead, mercury, and zinc.

Area 2: Collect grab co-located surface (0-6 inches) and subsurface soils (2-3 ft bgs) at the four locations shown on Figure 3 to delineate all four corners of the Area 2 excavation area. Samples will only be analyzed for zinc.

Area 3: Collect one grab surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression shown on Figure 3. The lateral extent of contamination is constrained by the limits of the pit. Samples will be analyzed for 4,4-DDD, 4,4-DDE, copper, iron, lead, mercury, selenium, and zinc.

Area 4: Collect one grab surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression shown on Figure 3. The lateral extent of contamination is constrained by the limits of the pit. Samples will be analyzed for 4,4-DDD, 4,4-DDE, copper, lead, mercury, selenium, and zinc.

If detected constituent concentrations are less than the PRGs for the site, the limits of the excavation have been delineated and excavation can begin.

If detected constituent concentrations exceed the soil remediation goals, additional grab samples will be collected at intervals of 5 feet from the initial sampling point until clean margins are established. Pre-excavation sampling will then be repeated as described above until sampling results show that the constituent concentrations are below the soil PRGs. However, after two iterations of the above process, if the constituent concentrations still exceed the PRGs, excavation activities will cease and NAVFAC will be notified for evaluation and decision as to how to proceed.

Confirmation Floor Samples (Vertical Excavation):

Following the removal of all contaminated soils and sediments, post-excavation confirmation samples will be collected from the bottom of the excavation to ensure removal of the contaminated material has been completed. Confirmation sampling will consist of one 5-point composite sample every 500 square feet on the excavation bottom. Confirmation samples collected will be analyzed for the analytes specific to each Area.

If detected constituent concentrations are less than the PRGs for the site, excavation is complete.

If detected constituent concentrations exceed the soil remediation goals, additional 1 to 2 feet of material will be removed from the base of the excavation within 500 square feet area represented by the composite sample. Confirmation sampling will then be repeated as described above **(only for the constituents that exceeded)** until sampling results show that the constituent concentrations are below the soil PRGs. However, after two iterations of the above process, if the constituent concentrations still exceed the PRGs, excavation activities will cease and NAVFAC will be notified for evaluation and decision as to how to proceed.

Excavation may be stopped at anytime at any of the sites at the discretion of the Navy RPM.

SAP Worksheet #17 -- Sampling Design and Rationale (Continued)

Waste Disposal Profile Sampling (see worksheet 19 for analytical methods):

One five-point composite sample will be collected in-situ per 500 cubic yards and analyzed for Toxicity Characteristic Leachate Procedure (TCLP) VOCs, SVOCs, herbicides, and pesticides, total PCBs, Reactivity (Total Cyanide and Total Sulfide), Corrosivity, and Ignitability and total petroleum hydrocarbons (DRO/ORO and GRO) as part of the waste profiling to ensure proper disposal to an approved off-site facility. All samples with results above any TCLP Maximum Contaminant Concentrations and/or above 50 mg/kg of Total PCBs, and/or above 3,000 mg/kg of Total TPH will be considered and manifested as hazardous waste. See worksheets 15 for the listing of the TCLP Maximum Concentrations.

Soil samples will be collected from in-situ for the material to be excavated to characterize the material for disposal. Waste Disposal Profile samples will be collected as follows:

Site 11 – Approximately 2,000 cubic yards of soil will be excavated and stockpiled.

One five-point composite sample will be collected in-situ per ~one per 500 cubic yards of soil from each Area. Area 1 will have two five-point composite samples and Areas 2, 3, and 4 will have one five-point composite.

Composite soil samples will be collected in-situ from each of the Areas and analyzed for full toxicity characteristic leaching procedure (TCLP) parameters as listed in Worksheet 19 minus TCLP Mercury and or TCLP Lead, polychlorinated biphenyls (PCBs), Resource Conservation and Recovery Act (RCRA) characteristics and total petroleum hydrocarbons (TPH) to characterize the material for disposal. The analytical data will be compared to TCLP Maximum Contaminant Concentrations (40 CFR 261 6/96), PCB limits and TPH limits to determine if the concentrations exceed the regulatory requirements for land disposal.

Upon review of the 1999, 2000 and 2002 RI data, it was determined that Mercury in Areas 3 and 4 and Lead in all Areas is elevated from a potential RCRA characterization perspective. The following sampling scenario was developed to further delineate any potential TCLP Mercury and or TCLP Lead exceedance.

Area 1 - Collect ten grab samples, using the locations selected for the five point composite sample. Analyze for TCLP Lead. Results will be evaluated against the TCLP Maximum Contaminant Concentration (40 CFR 261 6/96). For TCLP Lead, if the results exceed 5.0 mg/l further division of the grids may be conducted and additional TCLP Lead samples may be taken to further delineate the grids.

Area 2 - Collect three grab samples, using the locations selected for the five point composite sample. Analyze for TCLP Lead. Results will be evaluated against the TCLP Maximum Contaminant Concentration (40 CFR 261 6/96). For TCLP Lead, if the results exceed 5.0 mg/l further division of the grids may be conducted and additional TCLP Lead samples may be taken to further delineate the grids.

Area 3 and 4 - Collect three grab samples, using the locations selected for the five point composite sample. Analyze for TCLP Lead and TLCP Mercury. Results will be evaluated against the TCLP Maximum Contaminant Concentration (40 CFR 261 6/96). If the results exceed 5.0 mg/l for TCLP Lead or 0.2 mg/l for TCLP Mercury further division of the grids may be conducted and additional TCLP Lead and or TCLP Mercury samples may be taken to further delineate the grids.

SAP Worksheet #17 -- Sampling Design and Rationale (Continued)

Fill Material Sampling (see worksheet 19 for analytical methods):

The fill material to be imported into the site one five-point composite soil sample will be collected from each type fill material (i.e. topsoil, clay, sand) and analyzed for TCL VOCs, SVOCs, pesticides, PCBs, TAL Metals, Total Cyanide, TOX, total petroleum hydrocarbons (DRO and GRO), and the Site 11 PRGs as part clean fill requirements. If the concentrations are equal to or less than the PRGs listed in Worksheet 15 for Copper, Lead, Mercury, Selenium, Zinc, Total PAHs, 4,4'-DDD, and 4,4'-DDE, then the material maybe considered acceptable for use. The results will then be submitted to the partnering team for discussion and review of the additional analysis, additional analysis may be compared to site specific background levels for some or all of the analytes. Fill will not be placed without written approval from the partnering team. Fill materials must be equal to or below 10 ppm Total BTEX, equal to or below 50 ppm of Total TPH, equal to or below 100 ppm of TOX and have non-detects of total PCBs above the laboratory reporting limits. If the TPH is between non-detect and 50 ppm, Clean fill can not be placed closer than 100 feet to any surface water body, 500 feet from any well, spring, or groundwater source of drinking water, 200 feet from any residential use (including schools, daycares, etc.). Any fill material that has a detection of TPH above 50 ppm is not to be considered for use as fill material. All fill materials will be evaluated by the project team and approved by the Navy RPM prior to placement.

**SAP Worksheet #18
 Sampling Locations and Methods/SOP Requirements Table
 Site 11**

Sampling Location / ID Number	Matrix	Depth (ft)	Analytical Group	Number of Samples	Sampling SOP Reference	Rationale for Sampling Location
Pre-Excavation Samples						
Area 1 NWSY-113-11-PER-NNN	Soil	0-6 inches	Copper, Lead, Mercury, Zinc Total PAHs 4,4'-DDD and 4,4'-DDE	6 (3 at 0-6 inches and 3 at 2-3 feet) Grab Samples	Sample Homogenization, 9/08/08, SOP EI-FS010 Trowel/Spoon Soil Sampling, 9/11/06, EI- FS101 Hand Auger, 9/08/06, EI- FS100	Delineate boundaries of the proposed excavation.
Area 1 NWSY-113-11-PER-NNN		2-3 ft bgs				
Area 2 NWSY-113-11-PER-NNN		0-6 inches	Zinc	8 (4 at 0-6 inches and 4 at 2-3 feet) Grab Samples		
Area 2 NWSY-113-11-PER-NNN		2-3 ft bgs				
Area 3 NWSY-113-11-PER-NNN		0-6 inches	Copper, Iron, Lead, Mercury, Selenium, Zinc 4,4'-DDD and 4,4'-DDE	1 Grab Samples		
Area 4 NWSY-113-11-PER-NNN		0-6 inches	Copper, Lead, Mercury, Selenium, Zinc 4,4'-DDD and 4,4'-DDE	1 Grab Samples		
Confirmation Floor Samples						
Area 1 Floor of excavation/ NWSY-113-11-FLR-NNN	Soil	Floor	Copper, Lead, Mercury, Zinc Total PAHs 4,4'-DDD and 4,4'-DDE	TBD (1 five-point composite per 500 ft ²)	Sample Homogenization, 9/08/08, SOP EI-FS010 Compositing, 9/08/06, SOP EI-FS011 Trowel/Spoon Soil Sampling, 9/11/06, EI- FS101	Confirm that the remediation goals have been met.
Area 2 NWSY-113-11-FLR-NNN			Zinc			
Area 3 NWSY-113-11-PER-NNN			Copper, Iron, Lead, Mercury, Selenium, Zinc 4,4'-DDD and 4,4'-DDE			
Area 4 NWSY-113-11-PER-NNN			Copper, Lead, Mercury, Selenium, Zinc 4,4'-DDD and 4,4'-DDE			
Blanks/- Water NWSY-113-11-FB-NNN NWSY-113-11-EB-NNN	Field Blanks Equipment Blanks	NA	Copper, Iron, Lead, Mercury, Selenium, Zinc Total PAHs 4,4'-DDD and 4,4'-DDE (IF ONLY SAMPLING ONE AREA, ONLY THE PARAMETERS FOR THAT AREA ARE REQUIRED)	Rinsate	Decontamination of Contact Sampling Equipment, 9/08/06, SOP EI-FS014	Confirm no contamination from bottles and or introduced during sample collection, storage, and transport; assess the adequacy of the decontamination process, also a clean sample exposed to sampling conditions, transported to the laboratory, and treated as an environmental sample.

**SAP Worksheet #18
 Sampling Locations and Methods/SOP Requirements Table
 (Continued)
 Site 11**

Sampling Location / ID Number	Matrix	Depth (ft)	Analytical Group	Number of Samples	Sampling SOP Reference	Rationale for Sampling Location
Disposal Soil (Area 1 and 2) Area 1 - Collect 10 grab samples. Area 2 - Collect 3 grab samples. NWSY-113-11-CS-NNN (Select Locations from the five composite locations as the grabs, pin flag locations used)	Soil	Area 1 0-3 feet Area 2 0-3 feet (various depths)	TCLP Lead	13 (grab samples)	Sample Homogenization, 9/08/08, SOP EI-FS010 Trowel/Spoon Soil Sampling, 9/11/06, EI-FS101 Hand Auger, 9/08/06, EI-FS100	Profiling the soil to verify that it is not hazardous.
Disposal Soil (Area 3 and 4) Area 3 - Collect 3 grab samples. Area 4 - Collect 3 grab samples. NWSY-113-11-CS-NNN (Select Locations from the five composite locations as the grabs, pin flag locations used)	Soil	0-3 feet (various depths)	TCLP Lead and TCLP Mercury	6 (grab samples)	Sample Homogenization, 9/08/08, SOP EI-FS010 Trowel/Spoon Soil Sampling, 9/11/06, EI-FS101 Hand Auger, 9/08/06, EI-FS100	Profiling the soil to verify that it is not hazardous.
Disposal Soil (All Sites) NWSY-113-11-CS-NNN	Soil	Area 1, 2, 3, and 4 0-3 feet (various depths)	Full TCLP (VOCs, SVOCs, Herbicides, Pesticides, Metals minus Mercury and or Lead), TPH DRO/ORO/GRO, PCBs, total cyanide and sulfide, corrosivity, ignitability	~6 Area 1 - 2 five-point composite in-situ Area 2, 3, and 4 - 1 five-point composite in-situ ~500 cubic yards of material	Sample Homogenization, 9/08/08, SOP EI-FS010 Compositing, 9/08/06, SOP EI-FS011 Trowel/Spoon Soil Sampling, 9/11/06, EI-FS101 Hand Auger, 9/08/06, EI-FS100	Profiling the soil to verify that it is not hazardous.
Fill Material (All Sites) NWSY-113-11-TS-NNN NWSY-113-11-BF-NNN NWSY-113-11-SAND-NNN	Soil	--	TCL VOCs (which includes BTEX), TCL SVOCs, PAHs, TCL Pesticides/PCBs, TAL Metals, Cyanide, TOX, and TPH(DRO/GRO)	3 (1 composite per 1,000 cubic yards per source and type)	Sample Homogenization, 9/08/08, SOP EI-FS010 Compositing, 9/08/06, SOP EI-FS011 Trowel/Spoon Soil Sampling, 9/11/06, EI-FS101	Verify that imported fill material does not contain any COCs or petroleum hydrocarbons and meets the requirements the Navy. All fill material is approved prior to placement by the Navy RPM.

SAP Worksheet #19 -- Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference ³	Sample Size	Containers (number, size, and type) ²	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation / analysis)
Pre-Excavation and Confirmation Samples						
Area 1						
Pre- Excavation and Floor - Soil	Total PAHs	SW-846 3550B 8270C/ SOP # OP007/MS006	30 grams	(1)-8oz jar	Cool 4°C ± 2°C	14 days / 40 days
	Metals (Cu, Pb, Zn) – ICP	SW-846 3050B 6010B/ SOP #MET104/MET100	5 grams			6 months
	Metals – Mercury	SW-846 3050B 7471A/ SOP #MET 105	2 grams			28 days
	4,4'-DDD and 4,4'-DDE	SW-846 3550B 8081A/ SOP #OP009/GC015	30 grams			14 days / 40 days
Area 2						
Pre- Excavation and Floor - Soil	Metals (Zn) – ICP	SW-846 3050B 6010B/ SOP #MET104/MET100	5 grams	(1)-8oz jar	Cool 4°C ± 2°C	6 months
Area 3						
Pre- Excavation and Floor - Soil	Metals (Cu, Fe, Pb, Se, Zn) – ICP	SW-846 3050B 6010B/ SOP #MET104/MET100	5 grams	(1)-8oz jar	Cool 4°C ± 2°C	6 months
	Metals – Mercury	SW-846 3050B 7471A/ SOP #MET 105	2 grams			28 days
	4,4'-DDD and 4,4'-DDE	SW-846 3550B 8081A/ SOP #OP009/GC015	30 grams			14 days / 40 days
Area 4						
Pre- Excavation and Floor - Soil	Metals (Cu, Pb, Se, Zn) – ICP	SW-846 3050B 6010B/ SOP #MET104/MET100	5 grams	(1)-8oz jar	Cool 4°C ± 2°C	6 months
	Metals – Mercury	SW-846 3050B 7471A/ SOP #MET 105	2 grams			28 days
	4,4'-DDD and 4,4'-DDE	SW-846 3550B 8081A/ SOP #OP009/GC015	30 grams			14 days / 40 days
Field and Equipment Blanks						
Blanks – Water ⁴	Metals (Cu, Fe, Pb, Se, Zn) – ICP	SW-846 3010A 6010B/ SOP #MET 103/MET100	1000 mls	(1)-1 liter naigene bottle	PH <2 with 1:1 HNO ₃ , ambient	6 months
	Metals – Mercury	SW-8467470A/ SOP # MET106				28 days
	4,4'-DDD and 4,4'-DDE	SW-846 3510B 8081A/ SOP # OP006/GC015	1000 mls	(1)-1 liter amber bottle	Cool 4°C ± 2°C	7 days / 40 days
	Total PAHs	SW-846 3510B 8270C/ SOP # OP006/MS006	1000 mls	(1)-1 liter amber bottle	Cool 4°C ± 2°C	7 days / 40 days
Fill Materials for Site 11						
Fill Material	TCL VOC	SW-846 5035A 8260B/ SOP #MS005/OP020	15 grams	(3) 5g EnCore Samplers	Cool 4°C ± 2°C	48 hours to preservation/14 Days
	TCL SVOC	SW-846 3550B 8270C/ SOP # OP007/MS006	30 grams	(3)-8oz jar	Cool 4°C ± 2°C	14 days / 40 days
	TCL Pesticides	SW-846 3550B 8081A/ SOP #OP009/GC015	30 grams		Cool 4°C ± 2°C	14 days / 40 days
	Total PCB's	SW-846 3550B 8082/ SOP # OP009/GC014	30 grams		Cool 4°C ± 2°C	14 days / 40 days
	TAL Metals – ICP	SW-846 3050B 6010B/ SOP #MET104/MET100	2 grams		Cool 4°C ± 2°C	6 months
	Metals – Mercury	SW-846 3050B 7471A/ SOP #MET 105	2 grams		Cool 4°C ± 2°C	28 days
	Cyanide, Total	SW-846 9012/ SOP #GN113/GN115	15 grams		Cool 4°C ± 2°C	14 Days
	TOX	SW-846 9023/ SOP # EGN219-03 ³	5 grams		Cool 4°C ± 2°C	28 days
	TPH DRO	SW-846 3550B 8015M/ SOP # OP011/GC011	30 grams	Cool 4°C ± 2°C	14 days / 40 days	
TPH GRO	SW-846 5035A 8015M/ SOP #OP020/GC010	15 grams	(3) 5g EnCore Samplers	Cool 4°C ± 2°C	48 hours to preservation/14 Days	
Trip Blanks / Aqueous	TCL VOC	SW-846 8260B/ SOP #MS005/OP021	120 mls	(3) 40 ml VOC vials	Cool 4°C ± 2°C, pH <2	14 days

SAP Worksheet #19 -- Analytical SOP Requirements Table
 (Continued)

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference ²	Sample Size	Containers (number, size, and type) ¹	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation / analysis)
Waste Characterization Samples – Site 11						
Disposal Soil	TCLP Volatiles	SW-846 1311 5030B 8260B/ SOP #OP041/OP021/MS005	30 grams	(1)-4 oz glass jar	Cool 4°C ± 2°C	14 days to leaching/14 Days
	TCLP Semivolatiles	SW-846 1311 3510C 8270C/ SOP #OP040/OP006/MS006	30 grams	(3)-8oz jar	Cool 4°C ± 2°C	14 days to leaching 7 days / 40 days
	TCLP Pesticide	SW-846 1311 3510C 8081A/ SOP # OP040/OP008/GC015	30 grams		Cool 4°C ± 2°C	14 days to leaching 7 days / 40 days
	TCLP Herbicides	SW-846 1311 3510C 8151/SOP# OP040/OP037/GC031	30 grams		Cool 4°C ± 2°C	14 days to leaching 7 days / 40 days
	TCLP Metals ICP	SW-846 1311 3010A 6010B/ SOP# OP040/MET 103/MET100	30 grams		Cool 4°C ± 2°C	180 Days
	TCLP Metals Hg	SW-846 1311 7470A/ SOP # OP040/MET106	30 grams		Cool 4°C ± 2°C	28 days
	Cyanide, Total	SW-846 9012/ SOP #GN113/GN115	15 grams		Cool 4°C ± 2°C	14 Days
	Sulfide, Total	SM19 4500S=2/ SOP #GN140	15 grams		Cool 4°C ± 2°C	14 Days
	Ignitability (Flashpoint)	SW-846 1010/ SOP #GN121	5 grams		Cool 4°C ± 2°C	14 Days
	Corrosivity as pH	SW-846 CHAP7/9045/ SOP #GN179	5 grams		Cool 4°C ± 2°C	Immediate
	Total PCB's	SW-846 3550B 8082/ SOP # OP009/GC014	30 grams		Cool 4°C ± 2°C	14 days / 40 days
	TPH DRO/ORO	SW-846 3550B 8015M/ SOP # OP011/GC011	30 grams		Cool 4°C ± 2°C	14 days / 40 days
	TPH GRO	SW-846 5035A 8015M/ SOP #OP020/GC010	15 grams		(3) 5g EnCore Samplers	Cool 4°C ± 2°C

¹Sample size is a minimum; the containers listed will be filled to compensate for any required re-analysis or re-extractions. For samples requiring Matrix Spike(MS)/Matrix Spike Duplicate(MSD) containers listed should be tripled.

²Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

³Analysis performed by Accutest Laboratories New Jersey, Inc., Dayton, NJ

⁴If only sampling one area, only the parameters for that area are required to be analyzed.

SAP Worksheet #20 -- Field Quality Control Sample Summary Table

Matrix	Analytical Group	Analytical and Preparation SOP Reference	No. of Sampling Locations ⁷	No. of Field Duplicate Pairs ⁶	No. of MS/MSDs ⁴	No. of Field Blanks ⁵	No. of Equip. Blanks ⁵	No. of PT Samples	Total No. of Samples to Lab
Soil – Site 11	Metals (Cu, Fe, Pb, Se and Zn) – ICP	SW-846 3050B 6010B/ SOP #MET104/MET100	TBD	1 per 10	1 per 20	1 per 20	1 per 20	0 ¹	~TBD
Soil – Site 11	Metals – Mercury	SW-846 3050B 7471A/ SOP #MET 105	TBD	1 per 10	1 per 20	1 per 20	1 per 20	0 ¹	~TBD
Soil – Site 11	Total PAHs	SW-846 3550B 8270C/ SOP # OP007/MS006	TBD	1 per 10	1 per 20	1 per 20	1 per 20	0 ¹	~TBD
Soil – Site 11	4,4'-DDD and 4,4'-DDE	SW-846 3550B 8081A/ SOP #OP009/GC015	TBD	1 per 10	1 per 20	1 per 20	1 per 20	0 ¹	~TBD
Fill Material ⁸	TCL VOC	SW-846 5035A 8260B/ SOP #MS005/OP020	3	0 ³	0 ⁴	0 ²	0 ²	0 ¹	3
Fill Material ⁸	TCL SVOC + PAHS	SW-846 3550B 8270C/ SOP # OP007/MS006	3	0 ³	0 ⁴	0 ²	0 ²	0 ¹	3
Fill Material ⁸	TCL Pesticides	SW-846 3550B 8081A/ SOP #OP009/GC015	3	0 ³	0 ⁴	0 ²	0 ²	0 ¹	3
Fill Material ⁸	Select PCB's	SW-846 3550B 8082/ SOP # OP009/GC014	3	0 ³	0 ⁴	0 ²	0 ²	0 ¹	3
Fill Material ⁸	TAL Metals – ICP	SW-846 3050B 6010B/ SOP #MET104/MET100	3	0 ³	0 ⁴	0 ²	0 ²	0 ¹	3
Fill Material ⁸	Metals – Mercury	SW-846 3050B 7471A/ SOP #MET 105	3	0 ³	0 ⁴	0 ²	0 ²	0 ¹	3
Fill Material ⁸	Cyanide, Total	SW-846 9012/ SOP #GN113/GN115	3	0 ³	0 ⁴	0 ²	0 ²	0 ¹	3
Fill Material ⁸	TOX	SW-846 9023/SOP #EGN219-03	3	0 ³	0 ⁴	0 ²	0 ²	0 ¹	3
Fill Material ⁸	TPH DRO	SW-846 3550B 8015M/ SOP #OP011/GC011	3	0 ³	0 ⁴	0 ²	0 ²	0 ¹	3
Fill Material ⁸	TPH GRO	SW-846 5035A 8015M/ SOP # OP020/GC010	3	0 ³	0 ⁴	0 ²	0 ²	0 ¹	3
Disposal Soil	TCLP Volatiles	SW-846 1311 5030B 8260B/ SOP #OP041/OP021/MS005	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	TCLP Semivolatiles	SW-846 1311 3510C 8270C/ SOP #OP040/OP006/MS006	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9

SAP Worksheet #20 -- Field Quality Control Sample Summary Table
 (Continued)

Matrix	Analytical Group	Analytical and Preparation SOP Reference	No. of Sampling Locations ⁷	No. of Field Duplicate Pairs ⁶	No. of MS/MSDs ⁴	No. of Field Blanks ⁵	No. of Equip. Blanks ⁵	No. of PT Samples	Total No. of Samples to Lab
Disposal Soil	TCLP Pesticide	SW-846 1311 3510C 8081A/ SOP # OP040/OP008/GC015	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	TCLP Herbicides	SW-846 1311 8151A/ SOP #OP040/OP037/GC031	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	TCLP Metals ICP	SW-846 1311 3010A 6010B/ SOP# OP040/MET 103/MET100	~5 19 TCLP Lead (grabs)	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	TCLP Metals Hg	SW-846 1311 7470A/ SOP # OP040/MET106	~5 6 TCLP Mercury (grabs)	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	Cyanide, Total	SW-846 9012/ SOP #GN113/GN115	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	Sulfide, Total	SM19 4500S=2/ SOP #GN140	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	Ignitability (Flashpoint)	SW-846 1010/ SOP #GN121	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	Corrosivity as pH	SW-846 CHAP7/9045/ SOP #GN179	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	Total PCB's	SW-846 3550B 8082/ SOP # OP009/GC014	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	TPH DRO/ORO	SW-846 3550B 8015M/ SOP # OP011/GC011	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9
Disposal Soil	TPH GRO	SW-846 5035A 8015M/ SOP #OP020/GC010	~5	0 ³	0 ⁴	0 ²	0 ²	0 ¹	~9

¹Accutest at a minimum participates in two single blind studies per year for every parameter in aqueous and solid matrices for each field of testing for which the laboratory maintains accreditation. Data from these studies are reported to accrediting agencies. These studies are available upon request and meet the requirements for this project; no additional PT samples are required.

² Field blanks and Equipment blanks are not required for disposal characterization or fill placement samples.

³ Duplicate samples are not required for disposal characterization or fill samples since data will be used to characterize waste for disposal or fill for placement.

⁴Matrix Spike/Matrix Spike Duplicate samples are not required for disposal characterization or fill samples since data will be used to characterize waste for disposal or fill for placement. However, the analytical methods and laboratory SOPs require that a Matrix Spike (MS)/Matrix Spike Duplicates (MSD) be analyzed one per twenty samples or one for each analytical batch. Additional MS/MSD samples may be analyzed per laboratory analytical batches. For some wet chemistry methods (Ignitability and Corrosivity) MS/MSD samples are not required the method and laboratory SOPs have additional QC requirements (performing samples in duplicate).

⁵Field and Equipment blank samples are collected at a frequency of five percent (1 per 20) of the total number of samples collected or per sampling event (i.e. one per day of sampling), whichever is greater per sampling technique. Field blanks and Equipment blanks are not required for disposal characterization or fill placement samples.

⁶1 per 10 analytical samples.

⁷Additional confirmatory sampling may be required after evaluation of initial sampling data is received and compared to the site specific project action limits.

⁸All fill materials that may be needed will be tested prior to placement. All fill materials will be approved by the Navy prior to placement.

SAP Worksheet #21-- Project Sampling SOP References Table

Reference Number	Title, Revision Date and / or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
1	Chain of Custody Documentation – Paper, 9/08/06, SOP EI-FS003	Shaw Environmental, Inc.	N/A	N	Provides requirements for the completion of Chain of Custody documentation
2	Custody Seals, 9/08/06, SOP EI-FS005	Shaw Environmental, Inc.	N/A	N	Includes procedure for completion and attachment of custody seals on environmental samples and shipping containers
3	Sample Labeling, 9/08/06, SOP EI-FS006	Shaw Environmental, Inc.	N/A	N	Provides requirements for completion and attachment of sample labels on environmental sample containers
4	Sample Homogenization, 9/08/06, SOP EI-FS010	Shaw Environmental, Inc.	N/A	N	Establishes method for homogenizing soil, sediment, and other solid/semi-solid matrices so that a uniform matrix is available for sampling
5	Compositing, 9/08/06, SOP EI-FS011	Shaw Environmental, Inc.	N/A	N	Method for compositing samples collected in the course of environmental program activities
6	Shipping and Packaging of Non Hazardous Samples, 9/08/06, SOP EI-FS012	Shaw Environmental, Inc.	Shipping Container	N	Includes sample packaging, shipping, and requirements for Non Hazardous Samples
7	Packaging and Shipping of DOT –Hazardous Samples, 9/01/06, SOP EI-FS013	Shaw Environmental, Inc.	Shipping Container	N	Includes sample packaging, shipping, and requirements for Hazardous Samples
8	Decontamination of Contact Sampling Equipment, 9/08/06, SOP EI-FS014	Shaw Environmental, Inc.	N/A	N	Standard to be implemented for decontamination of contact sampling equipment
9	Trowel/Spoon Surface Soil Sampling, 9/11/06, SOP EI-FS101	Shaw Environmental, Inc.	Trowel/Spoon	N	Methods/procedures for sampling of surface soils using trowels/spoons
10	Sampling for VOCs in soil – Sealed-Cap (EnCore®) Sampler FS-104	Shaw Environmental, Inc.	Encore Sampler	N	Provide information about the procedure for using EnCore® samplers for collecting soil samples for volatiles.
11	Hand Auger Sampling, 9/08/09 SOP EI-FS-100	Shaw Environmental, Inc.	Hand Auger	N	Provide the methods and procedures for sampling of soils and other solids using hand auger techniques.

SAP Worksheet #22 -- Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maint. Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Resp. Person	SOP Reference
<i>No field equipment that requires calibration or maintenance.</i>									

SAP Worksheet #23 -- Analytical SOP References Table

Reference Number	Title, Revision Date, and / or Number ¹	Definitive or Screening Data	Matrix	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
MET100	Metals by ICP, February 2008	Definitive	Soil/Water	Metals – ICP 6010B	TJA Trace	Accutest Laboratories Southeast, Inc., Orlando, FL	No
MET104	Digestion of Soils for ICP Analysis, February 2008	Definitive	Soil	Prep Method Metals – ICP SW-846 3050B	SCP Science	Accutest Laboratories Southeast, Inc., Orlando, FL	No
MET103	Digestion of Waters for ICP Analysis, February 2008	Definitive	Water	Prep Method Metals – ICP SW-846 3010A	SCP Science	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP041	Standard Operating Procedure For The Toxicity Characteristic Leaching Of Volatile Organics (TCLP), April 2007	Definitive	Soil	TCLP Volatiles ZHE SW-846 1311	Millipore Tumbler	Accutest Laboratories Southeast, Inc., Orlando, FL	No
MS005	Analysis of Volatile Organics by EPA Method 8260B, April 2007	Definitive	Soil/Water	Volatiles SW-846 8260B	HP5890/5970, HP5890/5973, HP6890/5975	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP020	SOP for Sample Introduction via SW846-5035, April 2007	Definitive	Soil	Prep Method Volatiles SW-846 5035	OI 4560/4552 Archon	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP040	Standard Operating Procedure For The Toxicity Characteristic Leaching Of Semivolatile Organics And Metals (TCLP), April 2007	Definitive	Soil	TCLP Procedure Herbicides, Pesticides, Semivolatiles SW-846 1311	TCLP Tumbler	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP006	Standard Operating Procedure For The Extraction Of Base-Neutral And Acid (BNAS) Extractables From Water Samples, April 2007	Definitive	Water	Prep method for Semivolatiles SW-846 8270C	Glas-Col 3-D SepFunnel Shaker	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP007	Standard Operating Procedure For The Extraction Of Base-Neutral And Acid (BNAS) Extractables From Solid Samples, April 2007	Definitive	Soil	Prep method for Semivolatiles SW-846 8270C	Sonic Dismembrator 550	Accutest Laboratories Southeast, Inc., Orlando, FL	No
MS006	Analysis of Semivolatile Organics by method 8270, April 2007	Definitive	Soil/Water	Semivolatiles SW-846 8270C	HP6890/5973, HP6890/5975	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP008	SOP for the Extraction of Pesticides/PCBs from Aqueous Samples, April 2007	Definitive	Water	Prep Method PCBs, Pesticides, PCBs SW-846 3510C	Glas-Col 3-D SepFunnel Shaker	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GC015	Analysis Of Organochlorine Pesticides By Gas Chromatography, Electron Capture Detector SW-846 8081, April 2007	Definitive	Soil/Water	Pesticides SW-846 8081A	HP5890, HP6890, Dual ECD	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP009	SOP for the Extraction of Pesticides/PCBs from Solid Samples, April 2007	Definitive	Soil	Prep Method PCBs, Pesticides, PCBs SW-846 3550B	Sonic Dismembrator 550	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP037	SOP for the Extraction chlorinated Herbicides from Aqueous Samples April 2007	Definitive	Water	Prep Method Herbicides SW-846 3510C	Glas-Col 3-D SepFunnel Shaker	Accutest Laboratories Southeast, Inc., Orlando, FL	No

SAP Worksheet #23 -- Analytical SOP References Table
 (Continued)

Reference Number	Title, Revision Date, and / or Number ¹	Definitive or Screening Data	Matrix	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
GC031	Herbicide analysis by Method 8151 Dual ECD; April 2007	Definitive	Soil/Water	Herbicides SW-846 8151A	HP6890/7673	Accutest Laboratories Southeast, Inc., Orlando, FL	No
MET106	CVAA Analysis of Hg in Water, February 2008	Definitive	Water	Metals – Mercury 7470A	Leeman HydraAA/ Environmental Express digestion block	Accutest Laboratories Southeast, Inc., Orlando, FL	No
MET105	CVAA Analysis of Hg in Soil, February 2008	Definitive	Soil	Metals – Mercury 7471A	Leeman HydraAA/ Environmental Express digestion block	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GN113 - GN115	Cyanide Distillation/Aqueous And Solid Samples; Cyanide, Total, July 2007	Definitive	Soil/Water	Cyanide, Total SW-846 9012	Lachat QuickChem 8500	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GN140	Sulfide, July 2007	Definitive	Soil	Sulfide, Total EPA SM19 4500S=2	burette	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GN121	Ignitability, March 2008	Definitive	Soil	Ignitability (Flashpoint) SW-846 1010	Pensky-Marten	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GN179	Corrosivity in soil as pH, November 2007	Definitive	Soil	Corrosivity as pH SW-846 CHAP7	pH meter(Fisher)	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GC014	Analysis Of Polychlorinated Biphenyls By Gas Chromatography, Electron Capture Detector SW-846 8082, April 2007	Definitive	Soil/Water	Total PCB's SW-846 8082	HP5890, HP6890, Dual ECD	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GC011	Analysis Of Diesel Range Organics By Gas Chromatography Using Flame Ionization Detector, April 2007	Definitive	Soil/Water	TPH DRO/ORO SW-846 8015	HP6890/7683, HP5890/7673, Dual FID	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP011	SOP for the Extraction of Diesel Range Organics (DRO/ORO) from Solid Samples, March April 2007	Definitive	Soil	Prep Method DRO/ORO SW-846 3550B	Sonic Dismembrator 550	Accutest Laboratories Southeast, Inc., Orlando, FL	No
GC010	Analysis Of Gasoline Range Organics By Gas Chromatography Using Flame Ionization Detector, April 2007	Definitive	Soil/Water	TPH GRO SW-846 8015M	HP6890, HP5890, PID/FID	Accutest Laboratories Southeast, Inc., Orlando, FL	No
OP021	SOP for Sample Introduction via SW846-5030B, April 2007	Definitive	Water	Prep Method Volatiles SW-846 5030B	OI 4560/4552 Archon	Accutest Laboratories Southeast, Inc., Orlando, FL	No
EGN219-03	Total Organic Halides, Soil and Oil matrices, June 2004	Definitive	Soil	Total Organic Halides SW-846 9023	TOX-10 Mitsubishi/Cosa	Accutest Laboratories New Jersey, Dayton, NJ	No

¹ Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #24 -- Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference¹
HP6890/7683, Dual ECD	SW-846 8081A	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <20%, or Correlation coefficient $R \geq 0.995$ CCV %D <15%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC015
HP5890/7673, HP6890/7683, Dual ECD	SW-846 8082	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <20%, or Correlation coefficient $R \geq 0.995$ CCV %D <15%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC014
HP6890/5973, HP6890/5975	SW-846 8270C	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <15%, or Correlation coefficient $R \geq 0.995$ CCV %D <20%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	MS006, MS008
HP5890/5970, HP5890/5973, HP6890/5975	SW-846 8260B	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <15%, or Correlation coefficient $R \geq 0.995$ CCV %D <20%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	MS005
HP6890/7683, Dual ECD	SW-846 8151A	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <20%, or Correlation coefficient $R \geq 0.995$ CCV %D <15%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC031
HP6890/7683, HP5890/7673, Dual FID	DRO/ORO (SW-846 8015M)	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <20%, or Correlation coefficient $R \geq 0.995$ CCV %D <15%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC011

SAP Worksheet #24 -- Analytical Instrument Calibration Table
 (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference¹
HP6890, HP5890, PID/FID	GRO (SW-846 8015M)	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL %RSD <20%, or Correlation coefficient $R \geq 0.995$ CCV %D <15%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC010
Lachat QuickChem 8500	SW-846 9012	Major maintenance (per method) or second consecutive failure of opening CCV warrants recalibration	ICAL Correlation coefficient $R \geq 0.995$; intercept <RL CCV %D < 10%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GN115
Leeman HydraAA/	SW-846 7470A	Initial calibration daily	ICAL Correlation coefficient $R \geq 0.995$ CCV %D <10%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	MET105
Leeman HydraAA/	SW-846 7471A	Initial calibration daily	ICAL Correlation coefficient $R \geq 0.995$ CCV %D <10%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	MET106
TOX-10 and TOX-100 (Mitsubishi/Cosa)	SW-846 9023	Initial calibration daily	Cell Check daily within 10% of true value, CCV within 12% of true value	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	EGN219
TJA Trace	SW-846 6010B	Initial calibration daily	ICAL %RSD <5%, or Correlation coefficient $R \geq 0.995$ CCV %D <10%	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	MET100

¹Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #25 -- Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference ¹
HP5890, HP6890, Dual ECD	Injector port, column maintenance	SW-846 8081A	Leak test, column and injector port inspection	Need for maintenance determined by passing calibration and DDT/Endrin breakdown – see GC015	Passing DDT and Endrin breakdown; Passing CCV	Column clipping, seals and liners replacement, recalibrate and reanalyze affected samples	Laboratory Analyst	GC015
HP5890, HP6890, Dual ECD	Injector port, column maintenance	SW-846 8082	Leak test, column and injector port inspection	Need for maintenance determined by passing calibration– see GC014	Passing CCV	Column clipping, seals and liners replacement, recalibrate and reanalyze affected samples	Laboratory Analyst	GC014
HP6890/5973, HP6890/5975	Injector port, column maintenance, source cleaning	SW-846 8270C,	Leak test, column and injector port inspection, source insulator integrity	Need for maintenance determined by passing calibration and DFTPP/DDT/PCP/Benzidine breakdown – see MS006	Passing DFTPP etc. and CCV, passing Internal Standard response	Column clipping and/or reconditioning, seal and liners replacement, filaments and insulators as needed	Laboratory Analyst	MS006
HP5890/5970, HP5890/5973, HP6890/5975	Injector port, column maintenance, source cleaning	SW-846 8260B	Leak test, column and injector port inspection, source insulator integrity	Need for maintenance determined by passing calibration and BFB – see MS005	Passing BFB and CCV, passing Internal Standard response	Column clipping and/or reconditioning, seal and liners replacement, filaments and insulators as needed	Laboratory Analyst	MS005
HP5890/7673	Injector port, column maintenance	SW-846 8151A	Leak test, column and injector port inspection	Frequency determined by instrument remaining in calibration and free of interference – See TGC011	Passing calibration.	Column clipping, seals and liners replacement, recalibrate and reanalyze affected samples	Laboratory Analyst	GC031
HP6890/7683, HP5890/7673, Dual FID	Injector port, column maintenance	DRO/ORO (SW-846 8015M)	Leak test, column and injector port inspection	Frequency determined by instrument remaining in calibration and free of interference – GC011	Passing calibration	Column clipping, seals and liners replacement, recalibrate and reanalyze affected samples	Laboratory Analyst	GC011

SAP Worksheet #25 -- Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table
 (Continued)

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference¹
HP6890, HP5890, PID/FID	Injector port, column maintenance	GRO (SW-846 8015M)	Leak test, column and injector port inspection	Frequency determined by instrument remaining in calibration and free of interference – GC010	Passing calibration	Column clipping, seals and liners replacement, recalibrate and reanalyze affected samples	Laboratory Analyst	GC010
Lachat QuickChem 8500	Pump maintenance, photocell cleaning	SW-846 9012	Clean or replace tubing, check connections	Frequency determined by instrument remaining in calibration and free of interference – GN115	Passing calibration	Reconnect tubes, check pump rate. Rerun calibration and samples	Laboratory Analyst	GN115
Leeman HydraAA/	Pump tubing, absorption cell, and lens cleaning.	SW-846 7470A/74 71A	Check connections, flush sample lines	Frequency determined by instrument remaining in calibration and free of interference – Met 105,106	Passing calibration	Reconnect sample pathways, recalibrate, reanalyze affected samples	Laboratory Analyst	MET105, 106
TX-10 Mitsubishi/Cosa	Electrolyte change, reference electrode solution change, electrode cleaning	TOX	Inspect proper placement of glass wool in furnace	Frequency as outlined in Sec. 15 of EGN219- 03	Passing calibration and cell check	Perform addition maintenance as per manual, rerun calibration and samples	Lab Analyst	EGN219-03
TJA Trace	Torch, nebulizer, spray chamber, autosampler, pump tubing maintenance,	SW-846 6010B	Check connections, flush lines, clean nebulizer	Frequency determined by instrument remaining in calibration and free of interference – Met 100	Passing calibration	Reconnect sample pathways, recalibrate, reanalyze affected samples	Laboratory Analyst	MET100

¹ Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

SAP Worksheet #26 -- Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Dennis Kelley/Shaw Environmental, Norfolk, Virginia
Sample Packaging (Personnel/Organization): Dennis Kelley/Shaw Environmental, Norfolk, Virginia
Coordination of Shipment (Personnel/Organization): Dennis Kelley/Shaw Environmental, Norfolk, Virginia
Type of Shipment/Carrier: Federal Express or United Parcel Service – Priority Overnight
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Aaron Ben David, Sample Management Supervisor, Accutest Laboratories Southeast, Inc.
Sample Custody and Storage (Personnel/Organization): Sample Management Technicians with oversight from Aaron Ben David, Sample Management Supervisor, Accutest Laboratories Southeast, Inc.
Sample Preparation (Personnel/Organization): Sample Prep Technicians with oversight from Rick Watkins, Organics Supervisor, Accutest Laboratories Southeast, Inc.
Sample Determinative Analysis (Personnel/Organization): Natasha Sullivan, Shaw Chemist and Heather Wandrey, Project Manager, Accutest Laboratories Southeast, Inc.
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): minimum 30 days after final report sent to the client.
Sample Extract/Digestate Storage (No. of days from extraction/digestion): minimum 30 days after final report sent to the client
Biological Sample Storage (No. of days from sample collection): Not Required, No biological samples.
SAMPLE DISPOSAL
Personnel/Organization: Sample Management Technicians, with oversight from Aaron Ben David, Sample Management Supervisor, Accutest Laboratories Southeast, Inc.
Number of Days from Analysis: minimum 30 days after final report sent to the client(Shaw).

SAP Worksheet #27 – Sample Custody Requirements Table

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):

Sample custody can be defined as physical possession of samples, having samples within visual range, or having samples located in a restricted access area. Sample possession during all sampling efforts must be traceable from the time of collection until the results are verified and reported. The sample custody procedures provide a mechanism for documentation of all information related to sample collection and handling. The primary piece of documentation to ensure sample custody is the Chain of Custody Form (COC). Shaw personnel are responsible for providing evidence of sample custody from the time of collection until the laboratory receives the samples. The laboratory will be able to provide documentation of sample custody from that point to sample disposal.

As part of appropriate documentation, all sample bottles will be adequately labeled. The label will present sample identification and collection information. It will be pre-printed from the sample tracking system or completed with indelible ink. At a minimum, all sample labels will include the following sample information:

- Field sample location and unique sample identifier
- Project name and number
- Analysis requested for each bottle
- Method of preservation for each bottle
- Date and time of collection
- Initials of sample technician.

Transfer of custody and shipping procedures will include:

- The Site Supervisor instructing sampling team personnel in the proper COC procedures before sampling begins,
- A COC entry made in the field for each sample. This document will accompany the samples in shipment, and a copy will be maintained at the site for placement in the project files at the conclusion of field activities. The custody of individual sample containers will be documented by recording each sample identification and the number of bottles on the appropriate COC form.
- COC records initiated in the field will be placed in a plastic bag and taped to the underside of the top of the shipping cooler used for sample transport,
- Each time responsibility for custody of the sample changes, the new custodian will sign and date the record,
- All coolers must be secured at the site with two custody seals prior to transport. Custody seals should be signed and dated by the person relinquishing custody of the samples being shipped. They should be placed over the opening of each cooler so that the cooler cannot be opened without breaking the seal.

Sample packaging and shipment

Samples that are collected for off-site laboratory analysis that require overnight shipment will be generally prepared by:

- Sealing the container in an outer ziplock storage bag,
- Securely wrapping and taping each collected bottle in bubble wrap (or other similar shock-adsorbing material).
- A temperature blank will be included in each cooler. The temperature will be recorded upon receipt at the laboratory to verify sample temperatures during transport.
- When collecting volatile samples, including GRO samples, the field personnel will include trip blanks in each of the coolers containing volatile samples.
- At least three sides of the container must be wrapped or surrounded with material when placing the samples into the shipping cooler. Adequate ice will be placed in doubled ziplock bags and added to the cooler around and over the top of the sample containers to form a cooling layer to help ensure proper preservation during shipment.
- Samples should be pre-cooled to the desired temperature prior to packing for shipment.
- Trip blanks are volatile bottles that have been prepped by the laboratory using laboratory grade water and are shipped with the field sample containers, and returned unopened to the laboratory for volatile analysis. Trip blanks are used to indicate if any contamination during shipment of containers to the field, storage of containers at the site, or shipment from the site to the laboratory has occurred. Trip Blanks will be included in each cooler used for shipping volatile samples. If more than one cooler will be sent on a given day; each cooler should contain a set of Trip Blank samples. To minimize the number of Trip Blanks being analyzed, care should be taken to place all volatile samples in one cooler.
- Temperature blanks are nalgene bottles containing water that will be included in each sample cooler.
- Completed and signed COCs will be placed into the cooler in a protective ziplock bag and taped to the underside of the cooler lid. A minimum of 2 custody seals will be applied across the opening of the cooler and the lid secured by wrapping the cooler with clear plastic packing tape.
- The cooler will then be ready for shipment according to the methods required by the overnight delivery service. At a minimum, the laboratory address, telephone number, and contact name should be included on the original air bill and, if multiple packages are sent, on each sample cooler.

SAP Worksheet #27 – Sample Custody Requirements Table (Continued)

Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal):

All samples to be analyzed by the fixed-base laboratory will be shipped via overnight courier service. Upon receipt, per the attached Laboratory SOP, a representative of the laboratory shall check the integrity of the custody seals, then locate, sign, and date the COC. The temperature will be recorded to verify the sample temperatures during transport. The laboratory is responsible for verifying that the COC and containers are in agreement. The COC, a Cooler Receipt Form, and information regarding any discrepancies between the COC and bottle labels will be faxed to the Project Chemist prior to preparation for analysis. The Laboratory Information Management System will provide evidence of sample custody from receipt by the laboratory until appropriate disposal see **Worksheet 26** and laboratory SOPs.

Sample Identification Procedures:

A sample numbering system will be utilized in the field to uniquely identify each sample collected at Site23, Naval Weapons Station, Williamsburg, Virginia. The sample number will be traceable to the site, location, and depth (where applicable). The sample identification and description will be recorded by the Site Supervisor or representative in the sample collection logs.

Sampling Nomenclature as follows:

Confirmation Floor Soil/Sediment Samples:	NWSY-XXX-##- FLR-NNN
Confirmation Perimeter Soil/Sediment Samples:	NWSY-XXX-##- PER-NNN
Equipment Blank Samples:	NWSY-XXX-##- EB-NNN
Field Blank Samples:	NWSY-XXX-##- FB-NNN
Disposal Soil Samples:	NWSY-XXX-##-CS-NNN
Fill and Top Soil Samples:	NWSY-XXX-##- TS-NNN (Topsoil) NWSY-XXX-##- BF-NNN (Backfill Soil) NWSY-XXX-##- Sand-NNN (Sand) <i>If Required</i>

Where:

NWSY = Naval Weapons Station Yorktown

XXX = Task Order for the project (131)

= Site Number 21

DD = Matrix identifier and/or QC identifier

e.g. CS = Disposal Characterization Soil
SC = Soil Confirmation
FLR = Floor
PER = Perimeter
BF = Backfill Material
TS = Topsoil Material
FB = Field Blank
EB = Equipment Rinse Blank

NNN = Sequential number starting at 001, including QC samples such as a field blank, equipment blanks, and duplicates. Duplicate samples will not be identified to the laboratory.

Chain-of-Custody Procedures:

- Project Name will be identified on the COC Form.
- Project Number will be identified on the COC Form.
- Shaw contact information will be listed on the COC Form, this information should include Shaw Project Manager, Shaw Chemist, Shaw address, telephone numbers and facsimile number.
- Analysis and required analytical methods should be listed on the COC form refer to **Worksheet 19**.
- Required turnaround time and report format will be listed on the COC form.
- Each sample should be listed on the COC form using the sampling nomenclature listed above, sample description, date of sampling, time of sampling, number of containers being submitted to the laboratory.
- Sampler will sign and relinquish COC form, dates and times of relinquishment will be included.

SAP Worksheet #27 – Example Laboratory Sample Receipt Checklist

ACCUTEST LABORATORIES SAMPLE RECEIPT CONFIRMATION

ACCUTEST'S JOB NUMBER: _____ CLIENT: _____ PROJECT: _____
 DATE/TIME RECEIVED: _____ # OF COOLERS RECEIVED: _____ COOLER TEMPS: _____
 METHOD OF DELIVERY: FEDEX UPS ACCUTEST COURIER GREYHOUND DELIVERY OTHER
 AIRBILL NUMBERS: _____

COOLER INFORMATION

- CUSTODY SEAL NOT PRESENT OR NOT INTACT
- CHAIN OF CUSTODY NOT RECEIVED (COC)
- ANALYSIS REQUESTED IS UNCLEAR OR MISSING
- SAMPLE DATES OR TIMES UNCLEAR OR MISSING
- TEMPERATURE CRITERIA NOT MET

TRIP BLANK INFORMATION

- TRIP BLANK NOT PROVIDED
- TRIP BLANK NOT ON COC
- TRIP BLANK INTACT
- TRIP BLANK NOT INTACT
- RECEIVED WATER TRIP BLANK
- RECEIVED SOIL TRIP BLANK

MISC. INFORMATION

NUMBER OF ENCORES ? _____
 NUMBER OF 5035 FIELD KITS ? _____
 NUMBER OR LAB FILTERED METALS ? _____

SAMPLE INFORMATION

- SAMPLE LABELS PRESENT ON ALL BOTTLES
- CORRECT NUMBER OF CONTAINERS USED
- SAMPLE RECEIVED IMPROPERLY PRESERVED
- INSUFFICIENT VOLUME FOR ANALYSIS
- TIMES ON COC DON'T MATCH LABEL
- ID'S ON COC DON'T MATCH LABEL
- VOC VIALS HAVE HEADSPACE (MACRO BUBBLES)
- BOTTLES RECEIVED BUT ANALYSIS NOT REQUESTED
- NO BOTTLES RECEIVED FOR ANALYSIS REQUESTED
- UNCLEAR FILTERING INSTRUCTIONS
- UNCLEAR COMPOSITING INSTRUCTIONS
- SAMPLE CONTAINER(S) RECEIVED BROKEN
- % SOLIDS JAR NOT RECEIVED
- 5035 FIELD KIT FROZEN WITHIN 48 HOUR'S

SUMMARY OF COMMENTS: _____

TECHNICIAN SIGNATURE/DATE _____ TECHNICIAN SIGNATURE/DATE _____

ASBD03/27/06

SAP Worksheet #28.1 -- QC Samples Table

Matrix	Solid, Rinse and Field Blanks					
Analytical Group	ICP Metals					
Analytical Method / SOP Reference	SW-846 6010B/ LAB SOP# Met 104, Met 100, Met 103					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Blank	1 per 20 field samples or per day	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous	If the criterion is not met for the field blanks, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the blank contamination and usefulness of the data. Apply B-flag (Region III) to all results for the specific analyte(s) in all samples in the associated preparatory batch using the 5x/10x rule.	Field Personnel/Lantdiv Shaw Chemist	Field Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous

SAP Worksheet #28.1 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Equipment Blank	1 per 20 field samples or per day per matrix per sampling technique	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous	If the criterion is not met for the field blanks, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the blank contamination and usefulness of the data. Apply B-flag (Region III) to all results for the specific analyte(s) in all samples in the associated preparatory batch using the 5x/10x rule.	Field Personnel/Lantdiv Shaw Chemist	Field Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous
Field Duplicate	1 per 10 field samples per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous	If the criterion is not met for the field duplicates, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the high RPD and the usefulness of the data. If one of the duplicate pair is detected above the method reporting limit (RL) and the remaining pair is non-detect, then the data will be qualified as estimated or rejected depending upon the severity (i.e. >2RL). Region III flag to sample and duplicate pair.	Field Personnel/Lantdiv Shaw Chemist	Field Precision	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous

SAP Worksheet #28.1 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis.	Initial calibration for all analytes (ICAL): Minimum one high standard and a calibration blank; No acceptance criteria unless more than one standard is used, in which case $r \geq 0.995$.	Correct problem then repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until ICAL has passed.	Analyst	Laboratory Precision	Initial calibration for all analytes (ICAL): Minimum one high standard and a calibration blank; No acceptance criteria unless more than one standard is used, in which case $r \geq 0.995$.
Linear dynamic range or High-level calibration check standard	Every 6 months	Within $\pm 10\%R$ of expected value.	Not Applicable	Analyst	Laboratory Accuracy	Within $\pm 10\%R$ of expected value.
Low-level calibration check standard	Daily, after one-point initial calibration	Within $\pm 20\%R$ of expected value. Low-level calibration check standard should be less than or equal to the reporting limit.	Correct problem then repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until ICAL has passed.	Analyst	Laboratory Accuracy	Within $\pm 20\%R$ of expected value. Low-level calibration check standard should be less than or equal to the reporting limit.
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration, prior to sample analysis.	Value of second source for all analyte(s) within $\pm 10\%R$ of expected value (initial source).	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Accuracy	Value of second source for all analyte(s) within $\pm 10\%R$ of expected value (initial source).

SAP Worksheet #28.1 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration verification (initial [ICV] and continuing [CCV])	<u>ICV</u> : Daily, before sample analysis <u>CCV</u> : After every 10 field samples and at the end of the analysis sequence	ICV and CCV within $\pm 10\%$ of expected value.	<u>ICV</u> : Correct problem, rerun ICV. If that fails, repeat initial calibration. <u>CCV</u> : Correct problem then repeat CCV and reanalyze all samples since last successful CCV. If that fails, then repeat initial calibration..	Analyst	Laboratory Accuracy	ICV and CCV within $\pm 10\%$ of expected value.
Calibration blanks (initial [ICB] and continuing [CCB])	<u>ICB</u> : Daily, before sample run. <u>CCB</u> : After every 10 field samples and at the end of the analysis sequence	ICB and CCB $\leq 2x$ MDL.	<u>ICB and CCB</u> : Correct problem, then repeat ICB and CCB and reanalyze all samples since last successful CCB. If that fails, then Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.	Analyst	Laboratory Representativeness (Absence of interference/contamination)	ICB and CCB $< 1/2$ RL.
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous Worksheet 15.19 for TAL ICP metals Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous Worksheet 15.19 for TAL ICP metals Solids

SAP Worksheet #28.1 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous Worksheet 15.19 for TAL ICP metals Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>	<p>Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.</p>	Analyst/Prep analyst	Laboratory Accuracy	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous Worksheet 15.19 for TAL ICP metals Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Matrix Spike (MS)	One MS per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous Worksheet 15.19 for TAL ICP metals Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p>	<p>Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.</p>	Analyst/Prep analyst	Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous Worksheet 15.19 for TAL ICP metals Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>

SAP Worksheet #28.1 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicates (MSD) or Sample Duplicates	One per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous Worksheet 15.19 for TAL ICP metals Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>	See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.	Analyst	Precision and Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for metals Solids Worksheet 15.2 for metals Aqueous Worksheet 15.19 for TAL ICP metals Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>
Interference check solutions (ICS)	At the beginning of an analytical run.	<p><u>ICS-A</u>: Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes)</p> <p><u>ICS-AB</u>: Within ± 20% of expected value</p>	Terminate analysis; locate and correct problem; reanalyze ICS. Flagging criteria are not appropriate. No samples may be analyzed without a valid ICS.	Analyst	Accuracy	<p><u>ICS-A</u>: Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes)</p> <p><u>ICS-AB</u>: Within ± 20% of expected value</p>
Serial Dilution Test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.	Perform post-digestion spike (PDS) addition. Flagging criteria are not appropriate.	Analyst	Precision (field samples)	Five-fold dilution must agree within ± 10% of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.

SAP Worksheet #28.1 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Post-digestion spike (PDS) addition	When dilution test fails or analyte concentration in all samples <50x MDL	Recovery within 75-125% of expected result. The spike addition should produce a level between 10x to 100x MDL.	Run samples by method of standard additions (MSA) or Apply J-flag to all sample results (for same matrix) for specific analyte(s) for all samples associated with the post-digestion spike addition.	Analyst	Accuracy	Recovery within 75-125% of expected result. The spike addition should produce a level between 10x to 100x MDL.
Method of standard additions (MSA) or Internal Standard calibration	When matrix interference is suspected	Document use of MSA in the case narrative.	Not Applicable	Analyst	Accuracy	Document use of MSA in the case narrative.
Results reported between LOD and LOQ	All positive results must be confirmed	Not Applicable	Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	Not Applicable

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.2 -- QC Samples Table

Matrix	Solid					
Analytical Group	TCLP Volatiles					
Analytical Method / SOP Reference	SW-846 8260/ LAB SOP#MS005					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
MS Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
Initial Calibration (ICAL)	Initial calibration prior to sample analysis as needed (see CCV passing criteria below)	<u>Average response factor (RF) for SPCCs:</u> VOCs - RF \geq 0.30 for Chlorobenzene and 1,1,2,2-tetrachloroethane, \geq 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. <u>RSD for RFs for CCCs:</u> VOCs - RSD \leq 30% and one option below; Option 1: RSD for each analyte \leq 15% Option 2: linear least squares regression R \geq 0.995 Option 3: non-linear regression - coefficient of determination (COD) R ² \geq 0.99 (6 points shall be used for second order, 7 points shall be used for third order)	If the acceptance criteria were not met, correct problem and re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Precision	<u>%RSDs and correlations:</u> %RSD \leq 15% (\leq 30% for CCCs) or Correlation coefficient R \geq 0.995 or COD R ² \geq 0.99 <u>RF for SPCCs:</u> VOCs - RF \geq 0.30 for Chlorobenzene and 1,1,2,2-tetrachloroethane, \geq 0.1 for chloromethane, bromoform, and 1,1-dichloroethane.

SAP Worksheet #28.2 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration and before field samples	Value of second source for all analytes within $\pm 25\%$ of expected value (initial source).	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Analyst	Laboratory Accuracy	Value of second source for all analytes within $\pm 25\%$ of expected value (initial source).
Continuing Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	<u>Average RF for SPCCs:</u> VOCs $RF \geq 0.30$ for Chlorobenzene and 1,1,2,2- tetrachloroethane, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane. <u>%Difference/Drift for CCCs:</u> VOCs and SVOCs $\leq 20\%D$ (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)	Correct problem, then rerun CV. If that fails, repeat initial calibration. Corrective action may include re-analysis of samples. Apply Q-flag if no sample material remains and analyte exceeds criteria.	Analyst	Laboratory Precision	<u>%Ds or %Drift:</u> $\%D \leq 20\%$; $\%Drift \leq 20\%$ <u>RF for SPCCs:</u> VOCs - $RF \geq 0.30$ for Chlorobenzene and 1,1,2,2- tetrachloroethane, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane.
Method Blank (MB)	One per analytical batch per matrix	All Target Compounds $< 1/2$ RL. For the common laboratory contaminant 2-butanone, all analytes $< RL$. Project QLs for all target compounds are specified in: Worksheet 15.7 for TCLP VOCs Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds $< 1/2$ RL. For the common laboratory contaminant 2-butanone, all analytes $< RL$. Project QLs for all target compounds are specified in: Worksheet 15.7 for TCLP VOCs Solids

SAP Worksheet #28.2 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One LCS per analytical batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.7 for TCLP VOCs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>	<p>Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.</p>	Analyst	Laboratory Accuracy	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.7 for TCLP VOCs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Surrogate Spikes	All field and QC samples	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.7 for TCLP VOCs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>	<p>For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.</p>	Analyst	Accuracy (Individual sample preparation efficiency control)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.7 for TCLP VOCs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>

SAP Worksheet #28.2 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal standards (IS) verification	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within -50% to +100% of ICAL midpoint standard	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory. If corrective action fails in field samples, apply Q-flag to analytes associated with the non-compliant IS. Flagging criteria are not appropriate for failed standards.	Analyst	Accuracy (Instrument sensitivity control)	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within -50% to +100% of ICAL midpoint standard
Quantitation Verification	All field samples and standards	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	Correct problem, then rerun ICAL. Flagging criteria are not appropriate. Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.3 -- QC Samples Table

QC Sample	Frequency / Number	Method / SOP	QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix	Solid						
Analytical Group	TCLP Semivolatiles						
Analytical Method / SOP Reference	SW-846 8270/ LAB SOP#MS006						
Field Sampling Organization	Shaw Environmental						
Analytical Organization	Accutest Laboratories Southeast, Inc.						
MS Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.		Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
Initial Calibration (ICAL)	Initial calibration prior to sample analysis as needed (see CCV passing criteria below)	<u>Average response factor (RF) for SPCCs:</u> SVOCs - RF \geq 0.050. <u>RSD for RFs for CCCs:</u> SVOCs - RSD \leq 30% and one option below; Option 1: RSD for each analyte \leq 15% Option 2: linear least squares regression R \geq 0.995 Option 3: non-linear regression - coefficient of determination (COD) R ² \geq 0.99 (6 points shall be used for second order, 7 points shall be used for third order)		If the acceptance criteria were not met, correct problem and re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Precision	<u>%RSDs and correlations:</u> %RSD \leq 15% (\leq 30% for CCCs) or Correlation coefficient R \geq 0.995 or COD R ² \geq 0.99 <u>RF for SPCCs:</u> SVOCs - RF \geq 0.050.
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration and before field samples	Value of second source for all analytes within \pm 25%D of expected value (initial source).		Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Analyst	Laboratory Precision	Value of second source for all analytes within \pm 25%D of expected value (initial source).
Continuing Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	<u>Average RF for SPCCs:</u> SVOCs RF \geq 0.050. <u>%Difference/Drift for CCCs:</u> SVOCs \leq 20%D (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)		Correct problem, then rerun CV. If that fails, repeat initial calibration. Corrective action may include re-analysis of samples. Apply Q-flag if no sample material remains and analyte exceeds criteria.	Analyst	Laboratory Precision	<u>%Ds or %Drift:</u> %D \leq 20%; %Drift \leq 20% <u>RF for SPCCs:</u> SVOCs - RF \geq 0.050.

SAP Worksheet #28.3 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.8 for TCLP SVOCs Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.8 for TCLP SVOCs Solids
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.8 for TCLP SVOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.8 for TCLP SVOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$

SAP Worksheet #28.3 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate Spikes	All field and QC samples	QC acceptance criteria for all target compounds as specified in: Worksheet 15.8 for TCLP SVOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Accuracy (Individual sample preparation efficiency control)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.8 for TCLP SVOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$
Internal standards (IS) verification	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within -50% to +100% of ICAL midpoint standard	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory. If corrective action fails in field samples, apply Q-flag to analytes associated with the non-compliant IS. Flagging criteria are not appropriate for failed standards.	Analyst	Accuracy (Instrument sensitivity control)	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within -50% to +100% of ICAL midpoint standard
Quantitation Verification	All field samples and standards	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	Correct problem, then rerun ICAL. Flagging criteria are not appropriate. Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.4 -- QC Samples Table

Matrix	Solid					
Analytical Group	TCLP Pesticides					
Analytical Method / SOP Reference	SW-846 8081/ LAB SOP#GC015					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis as needed (see CCV passing criteria below)	One of the options below: Option 1: $RSD \leq 20\%$ for each analyte. Option 2: linear least squares regression: $R \geq 0.995$ Option 3: non-linear regression: coefficient of determination (COD) $R^2 \geq 0.99$ (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration. Flagging criteria are not appropriate.	Analyst	Laboratory Precision	One of the options below: Option 1: $RSD \leq 20\%$ for each analyte. Option 2: linear least squares regression: $R \geq 0.995$ Option 3: non-linear regression: coefficient of determination (COD) $R^2 \geq 0.99$ (6 points shall be used for second order, 7 points shall be used for third order)
Retention time window position establishment and verification for each analyte and surrogate	Once per ICAL and at the beginning of the analytical shift for position establishment. Each calibration verification standard for retention time verification.	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift. Analyte shall be within established window for each calibration verification.	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window. Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window. No samples shall be run without a verified retention time window at the initial verification.	Analyst	Laboratory Representativeness	Each analyte shall be within established window.
Breakdown check (Endrin/DDT)	Daily prior to analysis of samples	Degradation $\leq 15\%D$ for both Endrin and DDT.	Correct problems then repeat breakdown check. Flagging criteria are not appropriate. No samples shall be run until degradation $\leq 15\%$.	Analyst	Laboratory Precision	Degradation $\leq 15\%D$ for both Endrin and DDT.

SAP Worksheet #28.4 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration	Value of second source for all analytes within $\pm 20\%$ D of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Precision	Value of second source for all analytes within $\pm 20\%$ D of expected value (initial source)
Calibration verification (initial [ICV] and continuing [CCV])	<u>ICV</u> : Daily, before sample analysis <u>CCV</u> : After every 10 field samples and at the end of the analysis sequence	All analytes within $\pm 20\%$ D of expected value from the ICAL	<u>ICV</u> : Correct problem, rerun ICV. If that fails, repeat initial calibration. <u>CCV</u> : Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification. As long as the CCV is acceptable, a new initial instrument calibration is not necessary.	Analyst	Laboratory Precision	All analytes within $\pm 20\%$ D of expected value from the ICAL
Retention time (RT) window width calculated for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	Correct problem, then rerun ICAL. Flagging criteria are not appropriate.	Analyst	Laboratory Representativeness	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds $< 1/2$ RL. Project QLS for all target compounds are specified in: Worksheet 15.9 for TCLP pesticides Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds $< 1/2$ RL. Project QLS for all target compounds are specified in: Worksheet 15.9 for TCLP pesticides Solids.

SAP Worksheet #28.4 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.9 for TCLP pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.9 for TCLP pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$
Surrogate Spikes	All field and QC samples	QC acceptance criteria for all target compounds as specified in: Worksheet 15.9 for TCLP pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Accuracy (Individual sample preparation efficiency control)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.9 for TCLP pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$

SAP Worksheet #28.4 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Quantitation Verification and Confirmation	All positive results must be confirmed (exclude toxaphene and technical chlordane)	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column or detector RPD ≤40%.	Apply J-flag if RPD >40% or Q-flag if sample is not confirmed. Discuss in the case narrative. Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non-affected result and document in the case narrative. Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness and Precision	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column or detector RPD ≤40%.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.5 -- QC Samples Table

Matrix	Soil					
Analytical Group	TCLP Herbicides					
Analytical Method / SOP Reference	SW-846 8151/ LAB SOP# GC031					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Gulf Coast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis as needed (see CCV passing criteria below)	One of the options below: Option 1: RSD≤20% for each analyte. Option 2: linear least squares regression: R≥0.995 Option 3: non-linear regression: coefficient of determination (COD) R ² ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration. Flagging criteria are not appropriate.	Analyst	Laboratory Precision	One of the options below: Option 1: RSD≤20% for each analyte. Option 2: linear least squares regression: R≥0.995 Option 3: non-linear regression: coefficient of determination (COD) R ² ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)
Retention time window position establishment and verification for each analyte and surrogate	Once per ICAL and at the beginning of the analytical shift for position establishment. Each calibration verification standard for retention time verification.	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift. Analyte shall be within established window for each calibration verification.	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window. Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window. No samples shall be run without a verified retention time window at the initial verification.	Analyst	Representativeness	Each analyte shall be within established window.

SAP Worksheet #28.5 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration	Value of second source for all analytes within $\pm 20\%D$ of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Precision	Value of second source for all analytes within $\pm 20\%D$ of expected value (initial source)
Calibration verification (initial [ICV] and continuing [CCV])	<u>ICV</u> : Daily, before sample analysis <u>CCV</u> : After every 10 field samples and at the end of the analysis sequence	All analytes within $\pm 20\%D$ of expected value from the ICAL	<u>ICV</u> : Correct problem, rerun ICV. If that fails, repeat initial calibration. <u>CCV</u> : Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification. As long as the CCV is acceptable, a new initial instrument calibration is not necessary.	Analyst	Laboratory Precision	All analytes within $\pm 20\%D$ of expected value from the ICAL
Retention time (RT) window width calculated for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	Correct problem, then rerun ICAL. Flagging criteria are not appropriate.	Analyst	Laboratory Representativeness	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.10 for TCLP herbicides Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.10 for TCLP herbicides Solids.

SAP Worksheet #28.5 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.10 for TCLP herbicides Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>	<p>Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.</p>	Analyst/Prep analyst	Laboratory Accuracy	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.10 for TCLP herbicides Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Surrogate Spikes	All field and QC samples	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.10 for TCLP herbicides Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>	<p>For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.</p>	Analyst/Prep analyst	Accuracy (Individual sample preparation efficiency control)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.10 for TCLP herbicides Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>

SAP Worksheet #28.5 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Quantitation Verification and Confirmation	All positive results must be confirmed	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column or detector RPD \leq 40%.	Apply J-flag if RPD >40% or Q-flag if sample is not confirmed. Discuss in the case narrative. Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non-affected result and document in the case narrative. Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness and Precision	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column or detector RPD \leq 40%.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.6 -- QC Samples Table

Matrix	Solid						
Analytical Group	TCLP ICP Metals						
Analytical Method / SOP Reference	SW-846 6010B/ LAB SOP# Met 100, Met 103						
Field Sampling Organization	Shaw Environmental						
Analytical Organization	Accutest Laboratories Southeast, Inc.						
QC Sample	Frequency / Number	Method / SOP	QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis.	Initial calibration for all analytes (ICAL): Minimum one high standard and a calibration blank; No acceptance criteria unless more than one standard is used, in which case $r \geq 0.995$.		Correct problem then repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until ICAL has passed.	Analyst	Laboratory Precision	Initial calibration for all analytes (ICAL): Minimum one high standard and a calibration blank; No acceptance criteria unless more than one standard is used, in which case $r \geq 0.995$.
Linear dynamic range or High-level calibration check standard	Every 6 months	Within $\pm 10\%R$ of expected value.		Not Applicable	Analyst	Laboratory Accuracy	Within $\pm 10\%R$ of expected value.
Low-level calibration check standard	Daily, after one-point initial calibration	Within $\pm 20\%R$ of expected value. Low-level calibration check standard should be less than or equal to the reporting limit.		Correct problem then repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until ICAL has passed.	Analyst	Laboratory Accuracy	Within $\pm 20\%R$ of expected value. Low-level calibration check standard should be less than or equal to the reporting limit.
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration, prior to sample analysis.	Value of second source for all analyte(s) within $\pm 10\%R$ of expected value (initial source).		Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Accuracy	Value of second source for all analyte(s) within $\pm 10\%R$ of expected value (initial source).

SAP Worksheet #28.6 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration verification (initial [ICV] and continuing [CCV])	<u>ICV</u> : Daily, before sample analysis <u>CCV</u> : After every 10 field samples and at the end of the analysis sequence	ICV and CCV within $\pm 10\%$ of expected value.	<u>ICV</u> : Correct problem, rerun ICV. If that fails, repeat initial calibration. <u>CCV</u> : Correct problem then repeat CCV and reanalyze all samples since last successful CCV. If that fails, then repeat initial calibration..	Analyst	Laboratory Accuracy	ICV and CCV within $\pm 10\%$ of expected value.
Calibration blanks (initial [ICB] and continuing [CCB])	<u>ICB</u> : Daily, before sample run. <u>CCB</u> : After every 10 field samples and at the end of the analysis sequence	ICB and CCB $\leq 2x$ MDL.	<u>ICB and CCB</u> : Correct problem, then repeat ICB and CCB and reanalyze all samples since last successful CCB. If that fails, then Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.	Analyst	Laboratory Representativeness (Absence of interference/contamination)	ICB and CCB $\leq 2x$ MDL.
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.11 for TCLP metals Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.11 for TCLP metals Solids

SAP Worksheet #28.6 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.11 for TCLP metals Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.11 for TCLP metals Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$
Interference check solutions (ICS)	At the beginning of an analytical run.	<u>ICS-A</u> : Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes) <u>ICS-AB</u> : Within $\pm 20\%$ of expected value	Terminate analysis; locate and correct problem; reanalyze ICS. Flagging criteria are not appropriate. No samples may be analyzed without a valid ICS.	Analyst	Accuracy	<u>ICS-A</u> : Absolute value of concentration for all nonspiked analytes <2x MDL (unless they are a verified trace impurity from one of the spiked analytes) <u>ICS-AB</u> : Within $\pm 20\%$ of expected value
Serial Dilution Test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within $\pm 10\%$ of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.	Perform post-digestion spike (PDS) addition. Flagging criteria are not appropriate.	Analyst	Precision (field samples)	Five-fold dilution must agree within $\pm 10\%$ of the original determination. Only applicable for samples with concentrations >50x MDL for ICP.

SAP Worksheet #28.6 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Post-digestion spike (PDS) addition	When dilution test fails or analyte concentration in all samples <50x MDL	Recovery within 75-125% of expected result. The spike addition should produce a level between 10x to 100x MDL.	Run samples by method of standard additions (MSA) or Apply J-flag to all sample results (for same matrix) for specific analyte(s) for all samples associated with the post-digestion spike addition.	Analyst	Accuracy	Recovery within 75-125% of expected result. The spike addition should produce a level between 10x to 100x MDL.
Method of standard additions (MSA) or Internal Standard calibration	When matrix interference is suspected	Document use of MSA in the case narrative.	Not Applicable	Analyst	Accuracy	Document use of MSA in the case narrative.
Results reported between LOD and LOQ	All positive results must be confirmed	Not Applicable	Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	Not Applicable

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.7 -- QC Samples Table

Matrix	Solid					
Analytical Group	TCLP Mercury					
Analytical Method / SOP Reference	SW-846 7470 LAB SOP#MET106					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis.	Initial calibration for all analytes (ICAL) Minimum 5 standards and a calibration blank with linear least squares regression: $R \geq 0.995$.	Correct problem then repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until ICAL has passed.	Analyst	Laboratory Precision	Initial calibration for all analytes (ICAL) Minimum 5 standards and a calibration blank with linear least squares regression: $R \geq 0.995$.
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration, prior to sample analysis.	Value of second source for all analyte(s) within $\pm 10\%R$ of expected value (initial source).	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Accuracy	Value of second source for all analyte(s) within $\pm 10\%R$ of expected value (initial source).
Calibration verification (initial [ICV] and continuing [CCV])	<u>ICV</u> : Daily, before sample analysis <u>CCV</u> : After every 10 field samples and at the end of the analysis sequence	ICV within $\pm 10\%$ of expected value and CCV within $\pm 20\%$ of expected value.	<u>ICV</u> : Correct problem, rerun ICV. If that fails, repeat initial calibration. <u>CCV</u> : Correct problem then repeat CCV and reanalyze all samples since last successful CCV. If that fails, then repeat initial calibration..	Analyst	Laboratory Accuracy	ICV within $\pm 10\%$ of expected value and CCV within $\pm 20\%$ of expected value.
Calibration blanks (initial [ICB] and continuing [CCB])	<u>ICB</u> : Daily, before sample run. <u>CCB</u> : After every 10 field samples and at the end of the analysis sequence	ICB and CCB $\leq 2x$ MDL.	<u>ICB and CCB</u> : Correct problem, then repeat ICB and CCB and reanalyze all samples since last successful CCB. If that fails, then Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.	Analyst	Laboratory Representativeness (Absence of interference/contamination)	ICB and CCB $\leq 2x$ MDL.

SAP Worksheet #28.7 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.11 for TCLP Mercury Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.11 for TCLP Mercury Solids
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.11 for TCLP Mercury Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.11 for TCLP Mercury Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$
Serial Dilution Test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within $\pm 10\%$ of the original determination. Only applicable for samples with concentrations >25x MDL for CVAA.	Perform matrix spike. Flagging criteria are not appropriate.	Analyst	Precision (field samples)	Five-fold dilution must agree within $\pm 10\%$ of the original determination. Only applicable for samples with concentrations >25x MDL for CVAA.

SAP Worksheet #28.7 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method of standard additions (MSA) or Internal Standard calibration	When matrix interference is suspected	Document use of MSA in the case narrative.	Not Applicable	Analyst	Accuracy	Document use of MSA in the case narrative.
Results reported between LOD and LOQ	All positive results must be confirmed	Not Applicable	Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	Not Applicable

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.8 -- QC Samples Table

Matrix	Solid					
Analytical Group	Total Cyanide					
Analytical Method / SOP Reference	SW-846 9012 LAB SOP#GN113, 115					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis.	Initial calibration for all analytes (ICAL) Minimum 6 standards and a calibration blank with linear least squares regression: $R \geq 0.995$.	Correct problem then repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until ICAL has passed.	Analyst	Laboratory Precision	Initial calibration for all analytes (ICAL) Minimum 6 standards and a calibration blank with linear least squares regression: $R \geq 0.995$.
Distilled standards (one high and one low)	Once per multipoint calibration	Within $\pm 15\%R$ of true value.	Correct problem, then repeat distilled standards. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until distilled standards have passed.	Analyst	Laboratory Accuracy	Within $\pm 15\%R$ of true value.
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration, prior to sample analysis.	Value of second source for all analyte(s) within $\pm 15\%D$ of expected value (initial source).	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Precision	Value of second source for all analyte(s) within $\pm 15\%D$ of expected value (initial source).
Continuing Calibration Verification (CCV)	Opening CCV, then every 10 samples, with closing CCV	$\%D \leq 10\%$	Correct problem then repeat CCV and reanalyze all samples since last successful CCV. If that fails, then repeat initial calibration.	Analyst	Laboratory Precision	$\%D \leq 10\%$

SAP Worksheet #28.8 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds <1/2 RL. Project QLS for all target compounds are specified in: Worksheet 15.12 for Total Cyanide Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLS for all target compounds are specified in: Worksheet 15.12 for Total Cyanide Solids
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Cyanide Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value/True Value) *100% %Recovery = (Calculated Value/True Value) *100%	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Cyanide Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value/True Value) *100% %Recovery = (Calculated Value/True Value) *100%
Matrix Spike (MS)	One MS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Cyanide Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. %Recovery = (Calculated Value - Sample Value/True Value) *100%	Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.	Analyst/Prep analyst	Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Cyanide Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. %Recovery = (Calculated Value/True Value) *100%

SAP Worksheet #28.8 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicates (MSD) or Sample Duplicates	One per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Cyanide Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>	See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.	Analyst	Precision and Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Cyanide Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>
Results reported between LOD and LOQ	All positive results must be confirmed	Not Applicable	Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	Not Applicable

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.9 -- QC Samples Table

Matrix	Solid					
Analytical Group	Total Sulfide					
Concentration Level	Low					
Analytical Method / SOP Reference	USEPA SM19 4500S=2/ LAB SOP#GN140					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	One per analytical batch per matrix	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.12 for Total Sulfide Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.12 for Total Sulfide Solids
Laboratory Control Sample (LCS)	One LCS per analytical batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Sulfide Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value/True Value) *100% %Recovery = (Calculated Value/True Value) *100%	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Sulfide Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value/True Value) *100% %Recovery = (Calculated Value/True Value) *100%

SAP Worksheet #28.9 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike (MS)	One MS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Sulfide Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.	Analyst/Prep analyst	Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Sulfide Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$
Matrix Spike Duplicates (MSD) or Sample Duplicates	One per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Sulfide Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$	See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.	Analyst	Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.12 for Total Sulfide Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$
Results reported between LOD and LOQ	All positive results must be confirmed	Not Applicable	Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	Not Applicable

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.10 -- QC Samples Table

Matrix	Solid					
Analytical Group	Flash Point					
Analytical Method / SOP Reference	SW-846 1010/ LAB SOP#GN121					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Opening sequence, then every 10 samples and at the end	p-Xylene, first source flash point of p-Xylene is 77 ± 4.3°F	Second analyst witnessing flash. Calibrate thermometer	Analyst	Laboratory Accuracy	flash point of p-Xylene is 77 ± 4.3°F
Initial calibration verification (ICV) (Second Source)	1 per day	p-Xylene, second source flash point of p-Xylene is 77 ± 4.3°F	Second analyst witnessing flash. Calibrate thermometer	Analyst	Laboratory Accuracy	flash point of p-Xylene is 77 ± 4.3°F

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.11 -- QC Samples Table

Matrix	Solid					
Analytical Group	Corrosivity as pH					
Analytical Method / SOP Reference	SW-846 9045/ LAB SOP#GN179					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis.	Initial calibration for all analytes (ICAL): Minimum three standards. pH 4.00, 7.00, and 10.00. Percent recoveries for initial calibration must be within ±0.05 units of standard true value for pH.	Correct problem then repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until ICAL has passed.	Analyst	Laboratory Accuracy	Initial calibration for all analytes (ICAL): Minimum three standards. pH 4.00, 7.00, and 10.00. Percent recoveries for initial calibration must be within ±0.05 units of standard true value for pH.
Continuing Calibration Verification (CCV)	Every 10 samples	Percent recoveries for continuing calibration must be within ±0.05 units of standard true value for pH.	Rerun standard, and/or recalibrate instrument and reanalyzed all samples since last acceptable CCV.	Analyst	Laboratory Accuracy	Percent recoveries for continuing calibration must be within ±0.05 units of standard true value for pH.
Sample Duplicate	One per batch per matrix or every 20 samples	QC acceptance criteria for all target compounds as: %RPD ≤ 10% RPD = (Difference between S and SD) * 100 / (Average of S and SD)	If sufficient sample volume is available, reanalyze affected samples. Qualify data as needed.	Analyst	Laboratory Precision	QC acceptance criteria for all target compounds as: %RPD ≤ 10% RPD = (Difference between MS and MSD) * 100 / (Average of MS and MSD)

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.12 -- QC Samples Table

Matrix	Solid						
Analytical Group	PCBs						
Analytical Method / SOP Reference	SW-846 8082/ LAB SOP#GC014						
Field Sampling Organization	Shaw Environmental						
Analytical Organization	Accutest Laboratories Southeast, Inc.						
QC Sample	Frequency / Number	Method / SOP	QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis as needed (see CCV passing criteria below)	One of the options below: Option 1: RSD≤20% for each analyte. Option 2: linear least squares regression: R≥0.995 Option 3: non-linear regression: coefficient of determination (COD) R ² ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order) For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.		Correct problem then repeat initial calibration. Flagging criteria are not appropriate.	Analyst	Laboratory Precision	One of the options below: Option 1: RSD≤20% for each analyte. Option 2: linear least squares regression: R≥0.995 Option 3: non-linear regression: coefficient of determination (COD) R ² ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order) For PCB analysis, a mixture of Aroclors 1016 and 1260 is normally used to establish detector calibration linearity, unless project-specific data suggest the presence of another Aroclor (e.g., 1232). In addition, a mid-level or lower standard for each of the remaining Aroclors is analyzed for pattern recognition and response factor.

SAP Worksheet #28.12 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Retention time window position establishment and verification for each analyte and surrogate	Once per ICAL and at the beginning of the analytical shift for position establishment. Each calibration verification standard for retention time verification.	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift. Analyte shall be within established window for each calibration verification.	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window. Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window. No samples shall be run without a verified retention time window at the initial verification.	Analyst	Laboratory Representativeness	Each analyte shall be within established window.
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration	Value of second source for all analytes within $\pm 20\%D$ of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Precision	Value of second source for all analytes within $\pm 20\%D$ of expected value (initial source)
Calibration verification (initial [ICV] and continuing [CCV])	<u>ICV</u> : Daily, before sample analysis <u>CCV</u> : After every 10 field samples and at the end of the analysis sequence	All analytes within $\pm 20\%D$ of expected value from the ICAL	<u>ICV</u> : Correct problem, rerun ICV. If that fails, repeat initial calibration. <u>CCV</u> : Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification. As long as the CCV is acceptable, a new initial instrument calibration is not necessary.	Analyst	Laboratory Precision	All analytes within $\pm 20\%D$ of expected value from the ICAL

SAP Worksheet #28.12 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Retention time (RT) window width calculated for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	Correct problem, then rerun ICAL. Flagging criteria are not appropriate.	Analyst	Laboratory Representativeness	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.13 for PCBs Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.13 for PCBs Solids
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.13 for PCBs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.13 or PCBs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$

SAP Worksheet #28.12 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike (MS)	One MS per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in:</p> <p>Worksheet 15.13 for PCBs Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p>	<p>Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.</p>	Analyst/Prep analyst	Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in:</p> <p>Worksheet 15.13 for PCBs Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Matrix Spike Duplicates (MSD) or Sample Duplicates	One per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in:</p> <p>Worksheet 15.13 for PCBs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>	<p>See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.</p>	Analyst	Precision and Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in:</p> <p>Worksheet 15.13 for PCBs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>

SAP Worksheet #28.12 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate Spikes	All field and QC samples	<p>QC acceptance criteria for all target compounds as specified in:</p> <p>Worksheet 15.13 for PCBs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>	<p>For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.</p>	Analyst/Prep analyst	Accuracy (Individual sample preparation efficiency control)	<p>QC acceptance criteria for all target compounds as specified in:</p> <p>Worksheet 15.13 for PCBs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Quantitation Verification and Confirmation	All positive results must be confirmed	<p>Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column or detector RPD $\leq 40\%$.</p>	<p>Apply J-flag if RPD $> 40\%$ or Q-flag if sample is not confirmed. Discuss in the case narrative. Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non-affected result and document in the case narrative. Apply J-flag to all results between LOD and LOQ.</p>	Analyst	Representativeness and Precision	<p>Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column or detector RPD $\leq 40\%$.</p>

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.13 -- QC Samples Table

Matrix	Solid					
Analytical Group	DRO/ORO Petroleum					
Analytical Method / SOP Reference	SW-846 8015 DRO/ORO/ LAB SOP#GC011					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis as needed (see CCV passing criteria below)	One of the options below: Option 1: $RSD \leq 20\%$ for each analyte. Option 2: linear least squares regression: $R \geq 0.995$ Option 3: non-linear regression: coefficient of determination (COD) $R^2 \geq 0.99$ (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration. Flagging criteria are not appropriate.	Analyst	Laboratory Precision	One of the options below: Option 1: $RSD \leq 20\%$ for each analyte. Option 2: linear least squares regression: $R \geq 0.995$ Option 3: non-linear regression: coefficient of determination (COD) $R^2 \geq 0.99$ (6 points shall be used for second order, 7 points shall be used for third order)
Retention time window position establishment and verification for each analyte and surrogate	Once per ICAL and at the beginning of the analytical shift for position establishment. Each calibration verification standard for retention time verification.	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift. Analyte shall be within established window for each calibration verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO/ORO).	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window. Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window. No samples shall be run without a verified retention time window at the initial verification.	Analyst	Laboratory Representativeness	Each analyte shall be within established window. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO) or diesel range organics (DRO/ORO).

SAP Worksheet #28.13 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration	Value of second source for all analytes within $\pm 20\%D$ of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Precision	Value of second source for all analytes within $\pm 20\%D$ of expected value (initial source)
Calibration verification (initial [ICV] and continuing [CCV])	<u>ICV</u> : Daily, before sample analysis <u>CCV</u> : After every 10 field samples and at the end of the analysis sequence	All analytes within $\pm 20\%D$ of expected value from the ICAL	<u>ICV</u> : Correct problem, rerun ICV. If that fails, repeat initial calibration. <u>CCV</u> : Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification. As long as the CCV is acceptable, a new initial instrument calibration is not necessary.	Analyst	Laboratory Precision	All analytes within $\pm 20\%D$ of expected value from the ICAL
Retention time (RT) window width calculated for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	Correct problem, then rerun ICAL. Flagging criteria are not appropriate.	Analyst	Laboratory Representativeness	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.14 for DRO/ORO Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.14 for DRO/ORO Solids

SAP Worksheet #28.13 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for DRO/ORO Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value/True Value) *100% %Recovery = (Calculated Value/True Value) *100%	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for DRO/ORO Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value/True Value) *100% %Recovery = (Calculated Value/True Value) *100%
Matrix Spike (MS)	One MS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for DRO/ORO Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. %Recovery = (Calculated Value - Sample Value/True Value) *100%	Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.	Analyst/Prep analyst	Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for DRO/ORO Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. %Recovery = (Calculated Value/True Value) *100%

SAP Worksheet #28.13 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicates (MSD) or Sample Duplicates	One per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for DRO/ORO Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$	See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.	Analyst	Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for DRO/ORO Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$
Surrogate Spikes	All field and QC samples	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for DRO/ORO Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Accuracy (Individual sample preparation efficiency control)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.14 for DRO/ORO Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$
Results reported between LOD and LOQ	All positive results must be confirmed	Not Applicable	Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	Not Applicable

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.14-- QC Samples Table

Matrix	Solid						
Analytical Group	GRO Petroleum						
Concentration Level	Low						
Field Sampling Organization	Shaw Environmental						
Analytical Organization	Accutest Laboratories Southeast, Inc.						
QC Sample	Frequency / Number	Method / SOP	QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis as needed (see CCV passing criteria below)	One of the options below: Option 1: RSD≤20% for each analyte. Option 2: linear least squares regression: R≥0.995 Option 3: non-linear regression: coefficient of determination (COD) R ² ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)		Correct problem then repeat initial calibration. Flagging criteria are not appropriate.	Analyst	Laboratory Precision	One of the options below: Option 1: RSD≤20% for each analyte. Option 2: linear least squares regression: R≥0.995 Option 3: non-linear regression: coefficient of determination (COD) R ² ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)
Retention time window position establishment and verification for each analyte and surrogate	Once per ICAL and at the beginning of the analytical shift for position establishment. Each calibration verification standard for retention time verification.	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift. Analyte shall be within established window for each calibration verification. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO).		Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window. Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window. No samples shall be run without a verified retention time window at the initial verification.	Analyst	Laboratory Representativeness	Each analyte shall be within established window. For method 8015, check state methods for use of modified retention time markers with gasoline range organics (GRO).

SAP Worksheet #28.14-- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration	Value of second source for all analytes within $\pm 20\%D$ of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Precision	Value of second source for all analytes within $\pm 20\%D$ of expected value (initial source)
Calibration verification (initial [ICV] and continuing [CCV])	<u>ICV</u> : Daily, before sample analysis <u>CCV</u> : After every 10 field samples and at the end of the analysis sequence	All analytes within $\pm 20\%D$ of expected value from the ICAL	<u>ICV</u> : Correct problem, rerun ICV. If that fails, repeat initial calibration. <u>CCV</u> : Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification. As long as the CCV is acceptable, a new initial instrument calibration is not necessary.	Analyst	Laboratory Precision	All analytes within $\pm 20\%D$ of expected value from the ICAL
Retention time (RT) window width calculated for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	Correct problem, then rerun ICAL. Flagging criteria are not appropriate.	Analyst	Laboratory Representativeness	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.
Method Blank (MB)	One per analytical batch per matrix	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.15 for TPH GRO Solids	Correct problem, if required, reprep then reanalyze method blank and all samples processed with the contaminated blank. Any sample associated with a blank that fails these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be flagged. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.15 for TPH GRO Solids

SAP Worksheet #28.14-- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One LCS per analytical batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>	<p>Correct problem, then re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.</p>	Analyst/Prep analyst	Laboratory Accuracy	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Matrix Spike (MS)	One MS per analytical batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p>	<p>Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.</p>	Analyst	Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>

SAP Worksheet #28.14-- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicates (MSD)	One per analytical batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>	See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.	Analyst	Precision and Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>
Surrogate Spikes	All field and QC samples	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p> <p>Alternative surrogates are recommended when there are obvious chromatographic interferences.</p>	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Accuracy (Individual sample preparation efficiency control)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.15 for TPH GRO Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Results reported between LOD and LOQ	All positive results must be confirmed	Not Applicable	Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	Not Applicable

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.15 -- QC Samples Table

Matrix	Solid						
Analytical Group	TOX						
Analytical Method / SOP Reference	SW-846 9023/SOP EGN219-03						
Field Sampling Organization	Shaw Environmental						
Analytical Organization	Accutest Laboratories New Jersey, Inc.						
QC Sample	Frequency / Number	Method / SOP	QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Continuing Calibration Verification (CCV)	Opening CCV, then every 10 samples, with closing CCV		%D _≤ 15%	If the criterion has not achieved corrective action, re-calibration is performed before any samples may be analyzed. Corrective action may include re-analysis of the samples.	Analyst	Laboratory Precision	%D _≤ 15%
Method Blank (MB)	1 per extraction batch	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.20 for TOX Solids		The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.20 for TOX Solids
Laboratory Control Sample (LCS)	1 per extraction batch	QC acceptance criteria for all target compounds as specified in: Worksheet 15.20 for TOX Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value/True Value) *100%		Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.20 for TOX Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. %Recovery = (Calculated Value/True Value) *100%

SAP Worksheet #28.15 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike (MS)	1 per 20 samples or one for each extraction batch	QC acceptance criteria for all target compounds as specified in: Worksheet 15.20 for TOX Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.	Analyst	Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.20 for TOX Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$
Matrix Spike Duplicates (MSD)	1 per 20 samples or one for each extraction batch	QC acceptance criteria for all target compounds as specified in: Worksheet 15.20 for TOX Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$	See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.	Analyst	Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.20 for TOX Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.16 -- QC Samples Table

Matrix	Solid					
Analytical Group	TCL Volatiles					
Analytical Method / SOP Reference	SW-846 8260/ LAB SOP#MS005					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Trip Blank	1 per cooler	All Target Compounds <1/2 RL. For the common laboratory contaminants methylene chloride, acetone, and 2-butanone, all analytes <RL. Project QLS for all target compounds are specified in: Worksheet 15.16 for TCL VOCs Solids	If the criterion is not met for the trip blanks, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the blank contamination and usefulness of the data. Apply B-flag (Region III) to all results for the specific analyte(s) in all samples in the associated preparatory batch using the 5x/10x rule.	Field Personnel/Lantdiv Shaw Chemist	Field Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. For the common laboratory contaminants methylene chloride, acetone, and 2-butanone, all analytes <RL. Project QLS for all target compounds are specified in: Worksheet 15.16 for TCL VOCs Solids
MS Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.

SAP Worksheet #28.16 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration (ICAL)	Initial calibration prior to sample analysis as needed (see CCV passing criteria below)	<p><u>Average response factor (RF) for SPCCs:</u> VOCs - $RF \geq 0.30$ for Chlorobenzene and 1,1,2,2-tetrachloroethane, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane.</p> <p><u>RSD for RFs for CCCs:</u> VOCs - $RSD \leq 30\%$ and one option below; Option 1: RSD for each analyte $\leq 15\%$ Option 2: linear least squares regression $R \geq 0.995$ Option 3: non-linear regression - coefficient of determination (COD) $R^2 \geq 0.99$ (6 points shall be used for second order, 7 points shall be used for third order)</p>	If the acceptance criteria were not met, correct problem and re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Precision	<p><u>%RSDs and correlations:</u> $\%RSD \leq 15\%$ ($\leq 30\%$ for CCCs) or Correlation coefficient $R \geq 0.995$ or COD $R^2 \geq 0.99$</p> <p><u>RF for SPCCs:</u> VOCs - $RF \geq 0.30$ for Chlorobenzene and 1,1,2,2-tetrachloroethane, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane.</p>
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration and before field samples	Value of second source for all analytes within $\pm 25\%$ of expected value (initial source).	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Analyst	Laboratory Accuracy	Value of second source for all analytes within $\pm 25\%$ of expected value (initial source).
Continuing Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	<p><u>Average RF for SPCCs:</u> VOCs $RF \geq 0.30$ for Chlorobenzene and 1,1,2,2-tetrachloroethane, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane.</p> <p><u>%Difference/Drift for CCCs:</u> VOCs and SVOCs $\leq 20\%D$ (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)</p>	Correct problem, then rerun CV. If that fails, repeat initial calibration. Corrective action may include re-analysis of samples. Apply Q-flag if no sample material remains and analyte exceeds criteria.	Analyst	Laboratory Precision	<p><u>%Ds or %Drift:</u> $\%D \leq 20\%$; $\%Drift \leq 20\%$</p> <p><u>RF for SPCCs:</u> VOCs - $RF \geq 0.30$ for Chlorobenzene and 1,1,2,2-tetrachloroethane, ≥ 0.1 for chloromethane, bromoform, and 1,1-dichloroethane.</p>

SAP Worksheet #28.16 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	One per analytical batch per matrix	All Target Compounds <1/2 RL. For the common laboratory contaminants methylene chloride, acetone, and 2-butanone, all analytes <RL. Project QLS for all target compounds are specified in: Worksheet 15.16 for TCL VOCs Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. For the common laboratory contaminants methylene chloride, acetone, and 2-butanone, all analytes <RL. Project QLS for all target compounds are specified in: Worksheet 15.16 for TCL VOCs Solids
Laboratory Control Sample (LCS)	One LCS per analytical batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$

SAP Worksheet #28.16 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike (MS)	One MS per analytical batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p>	<p>Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.</p>	Analyst	Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Matrix Spike Duplicates (MSD) or Sample Duplicates	One per analytical batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>	<p>See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.</p>	Analyst	Precision and Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>

SAP Worksheet #28.16 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate Spikes	All field and QC samples	QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst	Accuracy (Individual sample preparation efficiency control)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.16 for TCL VOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$
Internal standards (IS) verification	In all field samples and standards	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within -50% to +100% of ICAL midpoint standard	Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory. If corrective action fails in field samples, apply Q-flag to analytes associated with the non-compliant IS. Flagging criteria are not appropriate for failed standards.	Analyst	Accuracy (Instrument sensitivity control)	Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL EICP area within -50% to +100% of ICAL midpoint standard
Quantitation Verification	All field samples and standards	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	Correct problem, then rerun ICAL. Flagging criteria are not appropriate. Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.17 -- QC Samples Table

Matrix	Solid, Rinse and Field Blanks						
Analytical Group	TCL Semivolatiles (SVOCs) and PAHs - Only						
Analytical Method / SOP Reference	SW-846 8270C/ LAB SOP#MS006						
Field Sampling Organization	Shaw Environmental						
Analytical Organization	Accutest Laboratories Southeast, Inc.						
QC Sample	Frequency / Number	Method / SOP	QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Blank	1 per 20 field samples or per day	All Target Compounds <1/2 RL. For the common laboratory contaminants phthalate esters, all analytes <RL. Project QLs for all target compounds are specified in: Worksheet 15.4 for PAHs Aqueous		If the criterion is not met for the field blanks, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the blank contamination and usefulness of the data. Apply B-flag (Region III) to all results for the specific analyte(s) in all samples in the associated preparatory batch using the 5x/10x rule.	Field Personnel/Lantdiv Shaw Chemist	Field Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. For the common laboratory contaminants phthalate esters, all analytes <RL. Project QLs for all target compounds are specified in: Worksheet 15.4 for PAHs Aqueous
Equipment Blank	1 per 20 field samples or per day per matrix per sampling technique	All Target Compounds <1/2 RL. For the common laboratory contaminants phthalate esters, all analytes <RL. Project QLs for all target compounds are specified in: Worksheet 15.4 for PAHs Aqueous		If the criterion is not met for the field blanks, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the blank contamination and usefulness of the data. Apply B-flag (Region III) to all results for the specific analyte(s) in all samples in the associated preparatory batch using the 5x/10x rule.	Field Personnel/Lantdiv Shaw Chemist	Field Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. For the common laboratory contaminants phthalate esters, all analytes <RL. Project QLs for all target compounds are specified in: Worksheet 15.4 for PAHs Aqueous

SAP Worksheet #28.17 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 10 field samples per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids	If the criterion is not met for the field duplicates, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the high RPD and the usefulness of the data. If one of the duplicate pair is detected above the method reporting limit (RL) and the remaining pair is non-detect, then the data will be qualified as estimated or rejected depending upon the severity (i.e. >2RL). Region III flag to sample and duplicate pair.	Field Personnel/Lantdiv Shaw Chemist	Field Precision	QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids
MS Tuning	Prior to calibration and every 12 hours during sample analysis	Refer to method for specific ion criteria.	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate and problem must be corrected. No samples may be accepted without a valid tune.	Analyst	Laboratory Accuracy	Refer to method for specific ion criteria.
Initial Calibration (ICAL)	Initial calibration prior to sample analysis as needed (see CCV passing criteria below)	<u>Average response factor (RF) for SPCCs:</u> SVOCs - RF≥0.050. <u>RSD for RFs for CCCs:</u> SVOCs - RSD≤30%and one option below: Option 1: RSD for each analyte ≤15% Option 2: linear least squares regression R ≥0.995 Option 3: non-linear regression - coefficient of determination (COD) R ² ≥0.99 (6 points shall be used for second order, 7 points shall be used for third order)	If the acceptance criteria were not met, correct problem and re-calibration is performed before any samples may be analyzed.	Analyst	Laboratory Precision	<u>%RSDs and correlations:</u> %RSD≤15% (≤30% for CCCs) or Correlation coefficient R≥0.995 or COD R ² ≥0.99 <u>RF for SPCCs:</u> SVOCs - RF≥0.050.

SAP Worksheet #28.17 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration and before field samples	Value of second source for all analytes within $\pm 25\%D$ of expected value (initial source).	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration.	Analyst	Laboratory Precision	Value of second source for all analytes within $\pm 25\%D$ of expected value (initial source).
Continuing Calibration Verification (CV)	Daily, before sample analysis, and every 12 hours of analysis time	<u>Average RF for SPCCs:</u> SVOCs RF ≥ 0.050 . <u>%Difference/Drift for CCCs:</u> SVOCs $\leq 20\%D$ (Note: D = difference when using RFs or drift when using least squares regression or non-linear calibration.)	Correct problem, then rerun CV. If that fails, repeat initial calibration. Corrective action may include re-analysis of samples. Apply Q-flag if no sample material remains and analyte exceeds criteria.	Analyst	Laboratory Precision	<u>%Ds or %Drift:</u> $\%D \leq 20\%$; $\%Drift \leq 20\%$ <u>RF for SPCCs:</u> SVOCs - RF ≥ 0.050 .
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds $< 1/2$ RL. For the common laboratory contaminants phthalate esters, all analytes $< RL$. Project QLs for all target compounds are specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds $< 1/2$ RL. For the common laboratory contaminants phthalate esters, all analytes $< RL$. Project QLs for all target compounds are specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids

SAP Worksheet #28.17 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$

SAP Worksheet #28.17 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike (MS)	One MS per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p>	<p>Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.</p>	Analyst/Prep analyst	Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Matrix Spike Duplicates (MSD) or Sample Duplicates	One per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>	<p>See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.</p>	Analyst	Precision and Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>

SAP Worksheet #28.17 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate Spikes	All field and QC samples	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>	<p>For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.</p>	Analyst/Prep analyst	Accuracy (Individual sample preparation efficiency control)	<p>QC acceptance criteria for all target compounds as specified in:</p> <p>Worksheet 15.3 for PAHs Solids Worksheet 15.4 for PAHs Aqueous Worksheet 15.17 for SVOCs Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Internal standards (IS) verification	In all field samples and standards	<p>Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL</p> <p>EICP area within -50% to +100% of ICAL midpoint standard</p>	<p>Inspect mass spectrometer and GC for malfunctions. Reanalysis of samples analyzed while system was malfunctioning is mandatory. If corrective action fails in field samples, apply Q-flag to analytes associated with the non-compliant IS. Flagging criteria are not appropriate for failed standards.</p>	Analyst	Accuracy (Instrument sensitivity control)	<p>Retention time ± 30 seconds from retention time of the midpoint standard in the ICAL</p> <p>EICP area within -50% to +100% of ICAL midpoint standard</p>
Quantitation Verification	All field samples and standards	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.	<p>Correct problem, then rerun ICAL. Flagging criteria are not appropriate.</p> <p>Apply J-flag to all results between LOD and LOQ.</p>	Analyst	Representativeness	RRT of each target analyte in each calibration standard within ± 0.06 RRT units.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.18 -- QC Samples Table

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Blank	1 per 20 field samples or per day	All Target Compounds <1/2 RL. Project QLS for all target compounds are specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids	If the criterion is not met for the field blanks, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the blank contamination and usefulness of the data.	Field Personnel/Lantdiv Shaw Chemist/Data Validator	Field Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLS for all target compounds are specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids
Equipment Blank	1 per 20 field samples or per day	All Target Compounds <1/2 RL. Project QLS for all target compounds are specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids	If the criterion is not met for the field blanks, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the blank contamination and usefulness of the data.	Field Personnel/Lantdiv Shaw Chemist/Data Validator	Field Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLS for all target compounds are specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids

SAP Worksheet #28.18 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 10 field samples per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for pesticides Solids	If the criterion is not met for the field duplicates, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the high RPD and the usefulness of the data. If one of the duplicate pair is detected above the method reporting limit (RL) and the remaining pair is non-detect, then the data will be qualified as estimated or rejected depending upon the severity (i.e. >2RL).	Field Personnel/Lantdiv Shaw Chemist/Data Validator	Field Precision	QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for pesticides Solids
Initial Calibration (ICAL)	Initial calibration prior to sample analysis as needed (see CCV passing criteria below)	One of the options below: Option 1: $RSD \leq 20\%$ for each analyte. Option 2: linear least squares regression: $R \geq 0.995$ Option 3: non-linear regression: coefficient of determination (COD) $R^2 \geq 0.99$ (6 points shall be used for second order, 7 points shall be used for third order)	Correct problem then repeat initial calibration. Flagging criteria are not appropriate.	Analyst	Laboratory Precision	One of the options below: Option 1: $RSD \leq 20\%$ for each analyte. Option 2: linear least squares regression: $R \geq 0.995$ Option 3: non-linear regression: coefficient of determination (COD) $R^2 \geq 0.99$ (6 points shall be used for second order, 7 points shall be used for third order)

SAP Worksheet #28.18 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Retention time window position establishment and verification for each analyte and surrogate	Once per ICAL and at the beginning of the analytical shift for position establishment. Each calibration verification standard for retention time verification.	Position shall be set using the midpoint standard of the calibration curve or the value in the CCV run at the beginning of the analytical shift. Analyte shall be within established window for each calibration verification.	Correct problem, then reanalyze all samples analyzed since the last acceptable retention time check. If they fail, redo ICAL and reset retention time window. Flagging criteria are not appropriate for initial verification. For CCV, apply a Q-flag to all results for analytes outside the established window. No samples shall be run without a verified retention time window at the initial verification.	Analyst	Laboratory Representativeness	Each analyte shall be within established window.
Breakdown check (Endrin/DDT)	Daily prior to analysis of samples	Degradation \leq 15%D for both Endrin and DDT.	Correct problems then repeat breakdown check. Flagging criteria are not appropriate. No samples shall be run until degradation \leq 15%.	Analyst	Laboratory Precision	Degradation \leq 15%D for both Endrin and DDT.
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration	Value of second source for all analytes within \pm 20%D of expected value (initial source)	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Precision	Value of second source for all analytes within \pm 20%D of expected value (initial source)

SAP Worksheet #28.18 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration verification (initial [ICV] and continuing [CCV])	<u>ICV</u> : Daily, before sample analysis <u>CCV</u> : After every 10 field samples and at the end of the analysis sequence	All analytes within $\pm 20\%D$ of expected value from the ICAL	<u>ICV</u> : Correct problem, rerun ICV. If that fails, repeat initial calibration. <u>CCV</u> : Correct problem then repeat CCV and reanalyze all samples since last successful calibration verification. As long as the CCV is acceptable, a new initial instrument calibration is not necessary.	Analyst	Laboratory Precision	All analytes within $\pm 20\%D$ of expected value from the ICAL
Retention time (RT) window width calculated for each analyte and surrogate	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.	Correct problem, then rerun ICAL. Flagging criteria are not appropriate.	Analyst	Laboratory Representativeness	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study.

SAP Worksheet #28.18 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds <1/2 RL. Project QLS for all target compounds are specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLS for all target compounds are specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$

SAP Worksheet #28.18 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike (MS)	One MS per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p>	<p>Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.</p>	Analyst/Prep analyst	Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids</p> <p>Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$</p>
Matrix Spike Duplicates (MSD) or Sample Duplicates	One per preparatory batch per matrix	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>	<p>See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.</p>	Analyst	Precision and Accuracy (field samples)	<p>QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids</p> <p>Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria.</p> <p>$\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$</p> <p>$\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$</p>

SAP Worksheet #28.18 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate Spikes	All field and QC samples	QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	For QC and field samples, correct problem, then reprep and reanalyze all failed samples for failed surrogates in the associated preparatory batch, if sufficient sample material is available. For the specific analyte(s) in all field samples collected from the same site matrix as the parent, apply J-flag if acceptance criteria are not met. For QC samples, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Accuracy (Individual sample preparation efficiency control)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.5 for pesticides Solids Worksheet 15.6 for pesticides Aqueous Worksheet 15.18 for pesticides Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$
Quantitation Verification and Confirmation	All positive results must be confirmed (exclude toxaphene and technical chlordane)	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column or detector RPD ≤40%.	Apply J-flag if RPD >40% or Q-flag if sample is not confirmed. Discuss in the case narrative. Report the higher of two confirmed results unless overlapping peaks are causing erroneously high results, then report the non-affected result and document in the case narrative. Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness and Precision	Calibration and QC criteria same as for initial or primary column analysis. Results between primary and second column or detector RPD ≤40%.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #28.19 -- QC Samples Table

Matrix	Solid					
Analytical Group	Mercury					
Analytical Method / SOP Reference	SW-846 7471/ LAB SOP#MET 105					
Field Sampling Organization	Shaw Environmental					
Analytical Organization	Accutest Laboratories Southeast, Inc.					
QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Blank	1 per 20 field samples or per day	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous	If the criterion is not met for the field blanks, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the blank contamination and usefulness of the data. Apply Region III validation flags to all results for the specific analyte(s) in all samples in the associated preparatory batch using the 5x/10x rule.	Field Personnel/Lantdiv Shaw Chemist	Field Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous
Equipment Blank	1 per 20 field samples or per day per matrix per sampling technique	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous	If the criterion is not met for the field blanks, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the blank contamination and usefulness of the data. Apply Region III validation flags to all results for the specific analyte(s) in all samples in the associated preparatory batch using the 5x/10x rule.	Field Personnel/Lantdiv Shaw Chemist	Field Representativeness (Absence of interference/contamination)	All Target Compounds <1/2 RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous

SAP Worksheet #28.19 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1 per 10 field samples per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids	If the criterion is not met for the field duplicates, a careful examination of the sampling techniques, sample media, and analytical procedure in conjunction with other analytical quality control criteria will be conducted to identify the cause of the high RPD and the usefulness of the data. If one of the duplicate pair is detected above the method reporting limit (RL) and the remaining pair is non-detect, then the data will be qualified as estimated or rejected depending upon the severity (i.e. >2RL). Apply Region III validation flag to sample and duplicate pair.	Field Personnel/Lantdiv Shaw Chemist	Field Precision	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids
Initial Calibration (ICAL)	Initial calibration prior to sample analysis.	Initial calibration for all analytes (ICAL) Minimum 5 standards and a calibration blank with linear least squares regression: $R \geq 0.995$.	Correct problem then repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until ICAL has passed.	Analyst	Laboratory Precision	Initial calibration for all analytes (ICAL) Minimum 5 standards and a calibration blank with linear least squares regression: $R \geq 0.995$.
Initial calibration verification (ICV) (Second Source)	Once after each initial calibration, prior to sample analysis.	Value of second source for all analyte(s) within $\pm 10\%R$ of expected value (initial source).	Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Flagging criteria are not appropriate. Problem must be corrected. No samples may be run until calibration has been verified.	Analyst	Laboratory Accuracy	Value of second source for all analyte(s) within $\pm 10\%R$ of expected value (initial source).

SAP Worksheet #28.19 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Calibration verification (initial [ICV] and continuing [CCV])	<u>ICV</u> : Daily, before sample analysis <u>CCV</u> : After every 10 field samples and at the end of the analysis sequence	ICV within $\pm 10\%$ of expected value and CCV within $\pm 20\%$ of expected value.	<u>ICV</u> : Correct problem, rerun ICV. If that fails, repeat initial calibration. <u>CCV</u> : Correct problem then repeat CCV and reanalyze all samples since last successful CCV. If that fails, then repeat initial calibration.	Analyst	Laboratory Accuracy	ICV within $\pm 10\%$ of expected value and CCV within $\pm 20\%$ of expected value.
Calibration blanks (initial [ICB] and continuing [CCB])	<u>ICB</u> : Daily, before sample run. <u>CCB</u> : After every 10 field samples and at the end of the analysis sequence	ICB and CCB $\leq 2x$ MDL.	<u>ICB and CCB</u> : Correct problem, then repeat ICB and CCB and reanalyze all samples since last successful CCB. If that fails, then Apply B-flag to all results for specific analyte(s) in all samples associated with the blank.	Analyst	Laboratory Representativeness (Absence of interference/contamination)	ICB and CCB $\leq 2x$ MDL.
Method Blank (MB)	One per preparatory batch per matrix	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids	The source of the contamination is investigated and eliminated before proceeding with further analysis. Correct the problem. Any sample associated with a blank that fail these criteria checks shall be reprocessed in a subsequent preparation batch, except when the sample analysis resulted in a non-detect. If no sample volume remains for reprocessing, the results shall be reported with appropriate data qualifying code "B".	Analyst/Prep analyst	Laboratory Representativeness (Absence of interference/contamination)	All Target Compounds $< 1/2$ RL. Project QLs for all target compounds are specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids

SAP Worksheet #28.19 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One LCS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Source of poor recovery is investigated and eliminated before proceeding with further analysis. If corrective action fails or insufficient volumes, apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Analyst/Prep analyst	Laboratory Accuracy	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$ $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$
Matrix Spike (MS)	One MS per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$	Examine the project-specific DQOs. MS is for matrix evaluation only. If MS results are outside the LCS limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error. The Shaw Chemist will decide to either report the data as is with a notation in the analytical narrative or if the samples should be re-extract and re-analyzed. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met.	Analyst/Prep analyst	Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids Ref.: DoD QSM. QC MS acceptance criteria uses LCS criteria as specified by DoD QSM. $\% \text{Recovery} = (\text{Calculated Value} / \text{True Value}) * 100\%$

SAP Worksheet #28.19 -- QC Samples Table
 (Continued)

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike Duplicates (MSD) or Sample Duplicates	One per preparatory batch per matrix	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$	See matrix spike corrective actions noted above. The data shall be evaluated to determine the source of difference.	Analyst	Precision and Accuracy (field samples)	QC acceptance criteria for all target compounds as specified in: Worksheet 15.1 for mercury Solids Worksheet 15.2 for mercury Aqueous Worksheet 15.19 for mercury Solids Ref.: DoD QSM, if available, otherwise laboratory's own in-house criteria. $\% \text{Recovery} = (\text{Calculated Value} - \text{Sample Value} / \text{True Value}) * 100\%$ $\text{RPD} = (\text{Difference between MS and MSD}) * 100 / (\text{Average of MS and MSD})$
Serial Dilution Test	Each preparatory batch or when a new or unusual matrix is encountered	Five-fold dilution must agree within $\pm 10\%$ of the original determination. Only applicable for samples with concentrations >25x MDL for CVAA.	Perform matrix spike. Flagging criteria are not appropriate.	Analyst	Precision (field samples)	Five-fold dilution must agree within $\pm 10\%$ of the original determination. Only applicable for samples with concentrations >25x MDL for CVAA.
Method of standard additions (MSA) or Internal Standard calibration	When matrix interference is suspected	Document use of MSA in the case narrative.	Not Applicable	Analyst	Accuracy	Document use of MSA in the case narrative.
Results reported between LOD and LOQ	All positive results must be confirmed	Not Applicable	Apply J-flag to all results between LOD and LOQ.	Analyst	Representativeness	Not Applicable

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DoD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DoD, 2006).

SAP Worksheet #29 -- Project Documents and Records Table

Sample Collection Documents and Records	On-Site Analysis Documents and Records	Off-Site Analysis Documents and Records	Data Assessment Documents and Records	Other
Field/ Communication Log Books	Not Applicable	Chains-of-Custody Records	Laboratory QSM Manual	
Daily Tailgate Safety Meeting Forms		Sample Receipt Confirmation Forms	Laboratory Accreditation Certificates or Letters	
Site Maps with Sampling Locations		Internal Sample Tracking Forms	Communication Logbooks	
Chain-of-Custody Records		Extraction and Prep Logs Books	Data Review-noted in Logbooks	
Custody Seals		LIMs Login	EDDs with site specific goals evaluated and or entered	
Airbill Records		Standard Logbooks	PDF of Final Laboratory Data Report	
		Non Conformance Records	Weekly Health and Safety Communications	
		Communication Logbooks	Safety Audit Checklists	
		Sample Chronology (time of receipt, extraction, and analysis)		
		Identification of QC Samples (Blanks, Duplicates, MS/MSD, LCS)		
		Definitions of Laboratory Data Qualifiers		
		Documentation of Lab QC Issues		
		Instrument Calibration Log Books		
		Instrument Maintenance Log Books		
		Electronic Data Deliverables		
		Laboratory Name		

SAP Worksheet #29 -- Project Documents and Records Table
 (Continued)

Sample Collection Documents and Records	On-Site Analysis Documents and Records	Off-Site Analysis Documents and Records	Data Assessment Documents and Records	Other
		Case Narrative		
		Laboratory Sample Accession Numbers		
		Reporting Forms		
		Reporting Checklists- for Completeness		
		Signature of laboratory sign-off		
		MDL Studies		
		PE Results		
		Laboratory Accreditation Certificates or Letters		
		Site SAP		
		Sample Disposal Records		

SAP Worksheet #30 -- Analytical Services Table

Matrix	Analytical Group	Sample Locations/ID Number	Analytical SOP	Data Package Turnaround Time	Laboratory / Organization (name and address, contact person and telephone number)	Backup Laboratory / Organization ¹ (name and address, contact person and telephone number)
Site 11 Pre-Excavation and Floor Samples Soils Area 1	Metals – ICP (Cu, Pb, Zn)	NWSY-113-11-PER-NNN NWSY-113-11-FLR-NNN	SW-846 3050B 6010B/ SOP #MET104/MET100	Form I's / CLP Like / 7 Calendar Days	Accutest Orlando 4405 Vineland Road Suite C-1 Orlando, FL 32811 Heather Wandrey (407)425-6700	Accutest Gulf Coast 10165 Harwin Drive Suite 150 Houston, TX 77036 Agnes Vicknair Phone: (713) 271-4700
	Metals – Mercury		SW-846 3050B 7471A/ SOP #MET 105			
	Total PAHs		SW-846 3550B 8270C/ SOP # OP007/MS006			
	4,4'-DDD and 4,4'-DDE		SW-846 3550B 8081A/ SOP #OP009/GC015			
Site 11 Pre-Excavation and Floor Samples Soils Area 2	Metals – ICP (Zn)	NWSY-113-11-PER-NNN NWSY-113-11-FLR-NNN	SW-846 3050B 6010B/ SOP #MET104/MET100	Form I's / CLP Like / 7 Calendar Days	Accutest Orlando 4405 Vineland Road Suite C-1 Orlando, FL 32811 Heather Wandrey (407)425-6700	Accutest Gulf Coast 10165 Harwin Drive Suite 150 Houston, TX 77036 Agnes Vicknair Phone: (713) 271-4700
Site 11 Pre-Excavation and Floor Samples Soils Area 3	Metals – ICP (Cu, Fe, Pb, Se, Zn)	NWSY-113-11-PER-NNN NWSY-113-11-FLR-NNN	SW-846 3050B 6010B/ SOP #MET104/MET100	Form I's / CLP Like / 7 Calendar Days	Accutest Orlando 4405 Vineland Road Suite C-1 Orlando, FL 32811 Heather Wandrey (407)425-6700	Accutest Gulf Coast 10165 Harwin Drive Suite 150 Houston, TX 77036 Agnes Vicknair Phone: (713) 271-4700
	Metals – Mercury		SW-846 3050B 7471A/ SOP #MET 105			
	4,4'-DDD and 4,4'-DDE		SW-846 3550B 8081A/ SOP #OP009/GC015			
Site 11 Pre-Excavation and Floor Samples Soils Area 4	Metals – ICP (Cu, Pb, Se, Zn)	NWSY-113-11-PER-NNN NWSY-113-11-FLR-NNN	SW-846 3050B 6010B/ SOP #MET104/MET100	Form I's / CLP Like / 7 Calendar Days	Accutest Orlando 4405 Vineland Road Suite C-1 Orlando, FL 32811 Heather Wandrey (407)425-6700	Accutest Gulf Coast 10165 Harwin Drive Suite 150 Houston, TX 77036 Agnes Vicknair Phone: (713) 271-4700
	Metals – Mercury		SW-846 3050B 7471A/ SOP #MET 105			
	4,4'-DDD and 4,4'-DDE		SW-846 3550B 8081A/ SOP #OP009/GC015			

SAP Worksheet #30 -- Analytical Services Table
 (Continued)

Matrix	Analytical Group	Sample Locations/ID Number	Analytical SOP	Data Package Turnaround Time	Laboratory / Organization (name and address, contact person and telephone number)	Backup Laboratory / Organization ¹ (name and address, contact person and telephone number)
Site 11 Blanks – Water	Metals – ICP (Cu, Fe, Pb, Se, Zn)	NWSY-113-11-FB-NNN NWSY-113-11-EB-NNN	SW-846 3010A 6010B/ SOP #MET 103/MET100	Form I's / CLP Like / 7 Calendar Days	Accutest Orlando 4405 Vineland Road Suite C-1 Orlando, FL 32811 Heather Wandrey (407)425-6700	Accutest Gulf Coast 10165 Harwin Drive Suite 150 Houston, TX 77036 Agnes Vicknair Phone: (713) 271-4700
	Metals – Mercury		SW-8467470A/ SOP # MET106			
	Total PAHs		SW-846 3510C 8270C/SOP # OP006/MS006			
	4,4'-DDD and 4,4'-DDE		SW-846 3550B 8081A/ SOP #OP009/GC015			
Fill Material	TCL Volatiles	NWSY-113-11-TS-NNN NWSY-113-11-BF-NNN NWSY-113-11-SAND-NNN	SW-846 5035A 8260B/ SOP #MS005/OP020	Form I's / CLP Like / 7 Calendar Days	Accutest Orlando 4405 Vineland Road Suite C-1 Orlando, FL 32811 Heather Wandrey (407)425-6700	Accutest Gulf Coast 10165 Harwin Drive Suite 150 Houston, TX 77036 Agnes Vicknair Phone: (713) 271-4700
	TCL Semivolatiles PAHs- Select List		SW-846 3550B/ 8270C/SOP #OP007 /MS006			
	TCL Pesticide		SW-846 3550B 8081A/ SOP #OP009/GC015			
	Metals – ICP (TAL Metals)		SW-846 3050B 6010B/ SOP #MET104/MET100			
	Metals - Mercury		SW-846 3050B 7471A/SOP #MET105			
	Cyanide, Total		SW-846 9012/ SOP #GN113/GN115			
	Total PCB's		SW-846 3550B 8082/ SOP # OP009/GC014			
	TOX		SW-846 9023/ SOP EGN219-03			
	TPH DRO		SW-846 3550B 8015M/ SOP # OP011/GC011			
	TPH GRO		SW-846 5035A 8015M/ SOP #OP020/GC010			

SAP Worksheet #30 -- Analytical Services Table
 (Continued)

Matrix	Analytical Group	Sample Locations/ID Number	Analytical SOP	Data Package Turnaround Time	Laboratory / Organization (name and address, contact person and telephone number)	Backup Laboratory / Organization ¹ (name and address, contact person and telephone number)
Disposal Soil	TCLP Volatiles	NWSY-113-11-CS-NNN	SW-846 1311 5030B 8260B/ SOP #OP041/OP021/MS005	Summary Report / 7 Calendar Days	Accutest Orlando 4405 Vineland Road Suite C-1 Orlando, FL 32811 Heather Wandrey (407)425-6700	Accutest Gulf Coast 10165 Harwin Drive Suite 150 Houston, TX 77036 Agnes Vicknair Phone: (713) 271-4700
	TCLP Semivolatiles		SW-846 1311 3510C 8270C/ SOP #OP040/OP006/MS006			
	TCLP Pesticide		SW-846 1311 3510C 8081A/ SOP # OP040/OP008/GC015			
	TCLP Herbicides		SW-846 1311 8151A/ SOP #OP040/OP037/GC031			
	TCLP Metals ICP		SW-846 1311 3010A 6010B/ SOP# OP040/MET 103/MET100			
	TCLP Metals Hg		SW-846 1311 7470A/ SOP # OP040/MET106			
	Cyanide, Total		SW-846 9012/ SOP #GN113/GN115			
	Sulfide, Total		EPA SM19 4500S=2/ SOP #GN140			
	Ignitability (Flashpoint)		SW-846 1010/ SOP #GN121			
	Corrosivity as pH		SW-846 CHAP7/9045/ SOP #GN179			
	Total PCB's		SW-846 3550B 8082/ SOP # OP009/GC014			
	TPH DRO/ORO/ORO		SW-846 3550B 8015M/ SOP # OP011/GC011			
	TPH GRO		SW-846 5035A 8015M/ SOP #OP020/GC010			

¹ If a backup laboratory is required due to laboratory loading or any other issues Accutest Houston will serve as a back up laboratory. Heather Wandrey will still serve as the prime laboratory project manager for this Shaw project. Alternatively, Accutest New Jersey may also serve as a back up laboratory. Accutest Orlando will notify the Shaw Chemist, Natasha Sullivan, prior to any sample transfers. All Accutest laboratories carry NELAC certification and have proper instrumentation and qualifications to perform the analysis required by this project.

SAP Worksheet #31 -- Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (title and organizational affiliation)	Person(s) Responsible for Responding to Assessment Findings (title and organizational affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (title and organizational affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (title and organizational affiliation)
Review of SAP with Field Staff	1/prior to sampling start up	Internal	Shaw Environmental, Inc.	Skip Dunham Project Manager, Shaw Environmental, Inc.	Dennis Kelley, Project Superintendent Shaw Environmental, Inc.	Dennis Kelley, Project Superintendent Shaw Environmental, Inc.	Skip Dunham, Project Manager, Shaw Environmental, Inc.
Daily QC Report	Daily	Internal	Shaw Environmental, Inc.	Dennis Kelley, Project Superintendent Shaw Environmental, Inc.	Skip Dunham, Project Manager, Shaw Environmental, Inc.	Skip Dunham, Project Manager, Shaw Environmental, Inc.	Dennis Kelley , Project Superintendent Shaw Environmental, Inc.
Laboratory Assessment for appropriate Certifications, Capacity and SAP Review with Staff	1/prior to sampling start up	Internal	Shaw Environmental, Inc.	Natasha Sullivan, Program Chemist Shaw Environmental, Inc.	Harry Behzadi Laboratory Manager, Accutest Orlando Svetlana Izosimova, Laboratory QAO Accutest Orlando	Harry Behzadi Laboratory Manager, Accutest Orlando Svetlana Izosimova, Laboratory QAO Accutest Orlando	Natasha Sullivan, Program Chemist Shaw Environmental, Inc.
Daily Tailgate Safety Meeting	Daily	Internal	Shaw Environmental, Inc.	Dennis Kelley , Project Superintendent Shaw Environmental, Inc.	Skip Dunham, Project Manager, Shaw Environmental, Inc. James Greer, Health and Safety, Shaw Environmental, Inc.	Skip Dunham, Project Manager, Shaw Environmental, Inc. Dennis Kelley, Project Superintendent Shaw Environmental, Inc.	Skip Dunham, Project Manager, Shaw Environmental, Inc. Dennis Kelley , Project Superintendent Shaw Environmental, Inc.
Field Sampling and COC Review Against SAP Requirements	Daily	Internal	Shaw Environmental, Inc.	Natasha Sullivan, Program Chemist Shaw Environmental, Inc.	Skip Dunham, Project Manager, Shaw Environmental, Inc. Dennis Kelley, Project Superintendent Shaw Environmental, Inc.	Skip Dunham, Project Manager, Shaw Environmental, Inc. Dennis Kelley, Project Superintendent Shaw Environmental, Inc.	Natasha Sullivan, Program Chemist Shaw Environmental, Inc.
Laboratory Report Deliverables and Analytical Results Against SAP Requirements Data Verification	Per Sample Delivery Group	Internal	Shaw Environmental, Inc.	Natasha Sullivan, Program Chemist Shaw Environmental, Inc.	Svetlana Izosimova, Laboratory QAO Accutest Orlando	Svetlana Izosimova, Laboratory QAO Accutest Orlando	Natasha Sullivan, Program Chemist Shaw Environmental, Inc.

SAP Worksheet #32 -- Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (name, title, organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (name, title, organization)	Timeframe for Response
Review of SAP with Field Staff	Contained with written report Daily QC Report for that day.	Skip Dunham, Project Manager, Shaw Environmental, Inc.	Immediately not to exceed with 24 hours.	Daily QC Report would be amended with corrective action.	Skip Dunham, Project Manager, Shaw Environmental, Inc.	Immediate within 24 hours.
Laboratory Assessment for appropriate Certifications, Capacity and SAP Review with Staff	Receipt of copies of certifications. Email traffic concerning lab capacity prior to sampling start-up. SAP Sign-off sheet received from laboratory.	Skip Dunham, Project Manager, Shaw Environmental, Inc.	Immediate.	Response to email.	Skip Dunham, Project Manager, Shaw Environmental, Inc.	48 hours after notification.
Daily Tailgate Safety Meeting	Verbal debriefing and daily sign off log. If a safety violation occurs, a Supervisor Injury Employee Report is completed.	Skip Dunham, Project Manager, Shaw Environmental, Inc. James Greer, Health and Safety, Shaw Environmental, Inc.	Immediately not to exceed 24 hours.	Included as part of the process of the Supervisor Injury Employee Report.	Dennis Kelley, Project Superintendent Shaw Environmental, Inc	Immediate within 24 hours.
Daily QC Report	Contained with written report.	Skip Dunham, Project Manager, Shaw Environmental, Inc.	Immediately not to exceed 24 hours.	Daily QC Report would be amended with corrective action.	Dennis Kelley, Project Superintendent Shaw Environmental, Inc.	Immediate within 24 hours.
Field Sampling and COC Review Against SAP Requirements	Communication may be in the form of email traffic	Skip Dunham, Project Manager, Shaw Environmental, Inc. Dennis Kelley, Project Superintendent Shaw Environmental, Inc.	24 hours after sampling.	Response to email.	Skip Dunham, Project Manager, Shaw Environmental, Inc.	48 hours after notification.

SAP Worksheet #32 -- Assessment Findings and Corrective Action Responses
 (Continued)

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (name, title, organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (name, title, organization)	Timeframe for Response
Laboratory Report Deliverables and Analytical Results Against SAP Requirements	Communication may be in the form of email traffic	Skip Dunham, Project Manager, Shaw Environmental, Inc. Heather Wandrey Project Manager Accutest Orlando	24 hours after completion of analytical	If required laboratory reports will be amended and corrections noted in the analytical narrative.	Skip Dunham, Project Manager, Shaw Environmental, Inc.	72 hours after notification.
Data Verification	Communication may be in the form of email traffic requesting additional laboratory forms, back up data that may be missing and or clarification of the analytical report.	Svetlana Izosimova, Laboratory QAO Accutest Orlando	24 hours after finding deficiency.	If required laboratory reports will be amended and corrections noted in the analytical narrative and contained with the validation report.	Natasha Sullivan, Chemist Shaw Environmental, Inc	Up to 7 days.
Validation	Communication may be in the form of email traffic requesting additional laboratory forms, back up data that may be missing and or clarification of the analytical report.	Svetlana Izosimova, Laboratory QAO Accutest Orlando	24 hours after finding deficiency.	If required laboratory reports will be amended and corrections noted in the analytical narrative and contained with the validation report.	Data Validator – Eric Malarek	Up to 7 days.

SAP Worksheet #33 -- QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (title and organizational affiliation)	Report Recipient(s) (title and organizational affiliation)
Progress Reports	Monthly Progress Reports	Monthly after project start up	Skip Dunham, Project Manager, Shaw Environmental, Inc.	Christopher Murray, Remedial Project Manager, NAVFAC Atlantic William Wells, ROICC, NAVFAC Atlantic Sherri Eng, Technical Manager, NAVFAC Atlantic
Final Report	Once at End of Project	TBD	Skip Dunham, Project Manager, Shaw Environmental, Inc.	Christopher Murray, Remedial Project Manager, NAVFAC Atlantic William Wells, ROICC, NAVFAC Atlantic Sherri Eng, Technical Manager, NAVFAC Atlantic William Friedmann, Navy Clean Project Manager, CH2M Hill Wade Smith, Remedial Project Manager, VDEQ

SAP Worksheet #34 -- Verification (Step I) Process Table

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Field Staff Training	<p>Personnel assigned to the project, including field personnel and subcontractors, will be qualified to perform the tasks to which they are assigned. Said personnel will meet requirements set forth in OPNAVINST 5090.1B 25-5.8. This includes but is not limited to basic sampling techniques; field testing methodology, task-specific sampling methods, maintenance of environmental paperwork, and how to avoid cross contamination. In addition to education and experience, specific training may be required to qualify individuals to perform certain activities. Training will be documented appropriately and the forms placed in the project file as a record. Project personnel will receive an orientation to the full SAP and the HASP as appropriate to their responsibilities before participation in project activities. Training of field personnel will be provided by the Site Supervisor, the QA Officer, or by a qualified designee.</p>	Internal	<p>Skip Dunham / Shaw E&I Dennis Kelley / Shaw E&I James Greer / Shaw E&I Natasha Sullivan / Shaw E&I Svetlana Izosimova / Accutest Orlando Harry Behzadi / Accutest Orlando</p>
SAP	<p>A copy of the reviewed and approved version of the SAP will be distributed to the laboratory and be available for review for all Shaw personnel involved in this project. It is the responsibility of the Shaw Chemist to ensure delivery of a copy of SAP to the laboratory. The laboratory quality control manager is responsible for review of SAP with laboratory staff. The Shaw project manager and site supervisor be responsible for ensuring that all staff have reviewed the final SAP.</p>	Internal/External	<p>Skip Dunham / Shaw E&I Dennis Kelley / Shaw E&I Natasha Sullivan / Shaw E&I Svetlana Izosimova / Accutest Orlando</p>

SAP Worksheet #34 -- Verification (Step I) Process Table
 (Continued)

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Laboratory Quality Systems Manual	Accutest has a detailed Quality Systems Manual, Volume VII, Revision I, dated March 2006 that is designed to meet the quality program requirements of NELAC and ISO Guide 25. This Quality Systems Manual is included in Appendix B. Accutest will provide Shaw Environmental a copy of the latest QSM prior to project start up.	Internal/External	Svetlana Izosimova / Accutest Orlando Harry Behzadi / Accutest Orlando Natasha Sullivan / Shaw E&I
Laboratory Staff Training	<p>Laboratory senior management staff retains oversight responsibility for the data integrity program and retains the ultimate responsibility for execution of the data integrity program elements. Senior laboratory management staff is responsible for providing the resources required to conduct SOPs, ethics training, and operate data integrity evaluation procedures.</p> <p>Laboratory employees receive technical ethics training during new employee orientation. All employees are required to attend ethics refresher training and to sign an ethical conduct agreement annually, which verifies their understanding of the laboratories ethics policy and the analyst's ethical responsibilities. Training on data integrity procedures and SOPs are conducted by the individual departments' group leaders within the laboratory. All records of training are retained at the laboratory in the individual staff training folders and are maintained by the laboratory quality assurance officer. All information related to staff qualifications, experience, external training courses, and education are placed into the individuals training file. Verification documentation for laboratory orientation, health and safety, and quality assurance training is also maintained with the training file. Additional training documentation is added to the files as it occurs. This includes data for initial and continuing demonstrations of proficiency, performance evaluations, study data and notes, and attendance lists from individual and group training sessions.</p>	Internal	Svetlana Izosimova / Accutest Orlando Harry Behzadi / Accutest Orlando

SAP Worksheet #34 -- Verification (Step I) Process Table
 (Continued)

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Laboratory Certifications	Accutest has current National Environmental Laboratories Accreditation Conference (NELAC), Army Corp validation and a Navy approval letter. Accutest will provide to Shaw copies of all current certifications prior to project start up.	Internal/External	Svetlana Izosimova / Accutest Orlando Harry Behzadi / Accutest Orlando Natasha Sullivan / Shaw E&I
Field Logbooks	The sample number will be traceable to the site, location, and depth (where applicable). The sample identification and description will be recorded by the Site Supervisor or representative in the sample collection logs. Site Supervisor will perform daily reviews of field log books each day of sampling.	Internal	Dennis Kelley / Shaw E&I Site Supervisor
Sample Location Verification	The site supervisor will verify that the sample technicians have collected the samples from the proper locations and depths as described in worksheet 18.	Internal	Dennis Kelley / Shaw E&I Site Supervisor
Chain-of-Custody- <i>Field Level</i>	Shaw Chemist will generate electronic COCs forms prior to field sampling in accordance to the sample matrices and analytical tests required as described in worksheet 19. Upon completion of the COCs forms by the field technicians and prior to placement in the cooler the Site supervisor will review the COCs against the field logbooks, worksheet 18 and worksheet 19 to insure that the samples, sample volumes, and sample nomenclature match the COC forms and the required analytical tests have been notated. A review of the COC form for completeness will also be conducted.	Internal	Dennis Kelley / Shaw E&I Site Supervisor Natasha Sullivan / Shaw E&I
Chain-of-Custody- <i>Shaw Chemist</i>	Upon completion of the COC the field technician will either fax or email the completed COC form to the Shaw Chemist. A review of the COC form against worksheet 18 and worksheet 19 will be conducted to ensure proper analytical test	Internal	Natasha Sullivan / Shaw E&I

SAP Worksheet #34 -- Verification (Step I) Process Table
 (Continued)

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Chain-of-Custody- <i>Analytical Laboratory</i>	All samples to be analyzed by the fixed-base laboratory will be shipped via overnight courier service. Upon receipt, a representative of the laboratory shall check the integrity of the custody seals, then locate, sign, and date the COC. The laboratory is responsible for verifying that the COC and containers are in agreement. The COC, a Cooler Receipt Form, and information regarding any discrepancies between the COC and bottle labels will be faxed to the Project Chemist prior to preparation for analysis. The Laboratory Information Management System will provide evidence of sample custody from receipt by the laboratory until appropriate disposal.	Internal	Aaron David / Accutest Orlando Sample Management Technicians / Accutest Orlando
LIMs Login – Analytical Laboratory	A review of the COC form against the laboratory LIMs login and the project analytical requirement as contained within worksheet 19 will be conducted to ensure proper analytical tests have been assigned and a review of the login for correctness will be conducted.	Internal	Heather Wandrey / Accutest Orlando
LIMs Login –Shaw Chemist	A secondary review of the COC form against the laboratory LIMs login and the project analytical requirement as contained within worksheet 19 will be conducted to ensure proper analytical tests have been assigned and a review of the login for correctness will be conducted.	Internal	Natasha Sullivan / Shaw E&I
Sample Receipt Form – Shaw Chemist	Accutest will provide within 48 hours of receipt of samples a copy of the sample receipt form any discrepancies between the COC and the sample containers will be noted and contained as part of the analytical record.	Internal	Natasha Sullivan / Shaw E&I

SAP Worksheet #34 -- Verification (Step I) Process Table
 (Continued)

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Laboratory Corrective Action and Report Procedure	Routine corrective action is defined as procedures used to return out of control analytical systems back to control. This level of corrective action applies to all analytical quality control parameters and analytical system specification as defined in the laboratory SOPs. Bench analysts have full responsibility and authority for performing routine corrective action. Routine corrective actions are documented as part of the analytical record. Defective processes, holding time violations, systematic errors and quality defects that occur are to be reported by the bench chemist immediately to the section supervisor and a non-conformance record initiated. The section supervisor will notify the designated Shaw Laboratory Project Manager (Heather Wandrey) who will then notify the Shaw Project Chemist (Natasha Sullivan). All notifications must be made in a timely manner. The non-conformance record should become part of the analytical record.	Internal/External	Heather Wandrey / Accutest Orlando Natasha Sullivan / Shaw E&I
Analytical Data Package – Laboratory	All data produced by the laboratory will be required to undergo several levels of review, which will include two levels of management review at the laboratory. The laboratory will review the data packages internally for completeness and verify that all of the required forms and raw data are included for each data package type. Random data packages may be chosen by the Accutest QA Officer for additional audits.	Internal	Harry Behzadi / Accutest Orlando Heather Wandrey / Accutest Orlando Svetlana Izosimova / Accutest Orlando
Analytical Data Package / Laboratory Quality Control – Shaw Chemist	The Shaw Chemist will verify that data has been received for all samples that have been sent to the laboratory. An evaluation of this data will be performed to determine whether the laboratory met the QC requirements for the analytical as stated in the analytical methods and laboratory SOPs. Refer to worksheets 19 and 28.	Internal	Natasha Sullivan / Shaw E&I

SAP Worksheet #34 -- Verification (Step I) Process Table
(Continued)

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Laboratory Electronic Data Deliverables	The laboratory will provide an electronic data deliverables in excel format that has been generated by the laboratory LIMs system. The Shaw Chemist will review these files for correctness and completeness. Project specific action goals as defined in worksheet 15 will be added and evaluated. Any quality control issues that may impact the data use will be evaluated. The project manager and site supervisor will be notified immediately of any samples that exceed the project action goals.	Internal	Natasha Sullivan / Shaw E&I

SAP Worksheet #35 -- Validation (Steps IIa and IIb) Process Table

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIa	Field SOPs	Ensure that all sampling SOPs were followed.	Dennis Kelley, Shaw Environmental, Inc.
IIa	Analytical SOPs	Ensure that all laboratory analytical SOPs were followed.	Svetlana Izosimova, Accutest Orlando
IIa	Documentation of Method QC Results	Establish that all method quality control were analyzed for and in control as listed in the analytical SOPs. If method QA was not in control, the laboratory will have contacted Shaw of non-conformant situation prior to report generation for guidance.	Natasha Sullivan, Shaw Environmental, Inc.
IIa/IIb	Documentation of SAP QC Samples Results	Establish that all SAP required QC samples were collected. Establish that the collected QC samples met the required limits as established in the SAP.	Dennis Kelley, Shaw Environmental, Inc. Natasha Sullivan, Shaw Environmental, Inc.
IIa/IIb	Documentation of Analytical Reports for Completeness	Ensure that from the Chain-of-Custody generated in the field to the delivery of the analytical data that the appropriate analytical samples have been collected, appropriate site identifications have been used, and the correct analytical methods have been applied. Review the analytical reports to establish that all required forms, case narratives, samples, Chains-of-Custody, logbooks, and raw data have been included.	Natasha Sullivan, Shaw Environmental, Inc.
IIb	Project Quantitation Limits	Review laboratory analytical met the project quantitation limits specified in SAP worksheet 15.	Natasha Sullivan, Shaw Environmental, Inc.
IIa/IIb	Project Action Limits	Review and add project action limits to the laboratory electronic data deliverable. Flag samples and notify project manager of samples that exceed the project action limits as listed in SAP worksheet 15.	Natasha Sullivan, Shaw Environmental, Inc.

SAP Worksheet #35 -- Validation (Steps IIa and IIb) Process Table
 (Continued)

Step IIa / IIb	Validation Input	Description	Responsible for Validation (name, organization)
IIa/IIb	Data Verification	Data Verification will be performed on all samples. Data verification that sample analysis was performed as stated in the SAP and per the laboratory SOPs.	Natasha Sullivan, Shaw Environmental, Inc.
IIa/IIb	Data Validation	Validation will be performed on all confirmation samples. Project Validation Criteria as per QAPP worksheets 12, 15, 19, and 28 and cited USEPA SW-846 methodology. Validation Qualifiers applied as per USEPA Region III Modifications to the National Functional Guidelines for Inorganic Data Review (April, 1993) and National Functional Guidelines for Organic Data Review (September, 1994).	Eric Malarek, Shaw Environmental, Inc.

SAP Worksheet #36 -- Validation (Steps IIa and IIb) Summary Table

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
Site 11 IIa/IIb	Confirmation Soil	Metals – ICP	Project Validation Criteria as per QAPP worksheets 12, 15, 19, and 28 and cited USEPA SW-846 methodology. Validation Qualifiers applied as per USEPA Region III Modifications to the National Functional Guidelines for Organic Data Review (September, 1994) and USEPA Region III Modifications to the National Functional Guidelines for Inorganic Data Review (April, 1993).	Natasha Sullivan, Shaw E&I, Inc. Eric Malarek – Shaw E&I, Inc.
	Blanks – Water	Metals – ICP		
	Confirmation Soil	Metals – Mercury		
	Blanks – Water	Metals – Mercury		
	Confirmation Soil	PAHs- Select List		
	Blanks – Water	PAHs- Select List		
	Confirmation Soil	4,4'-DDD and 4,4'-DDE		
(All Sites) IIa/IIb	Fill Materials	TCL VOC	Project Validation Criteria as per QAPP worksheets 12, 15, 19, and 28 and cited USEPA SW-846 methodology. Validation Qualifiers applied as per USEPA Region III Modifications to the National Functional Guidelines for Organic Data Review (September, 1994) and USEPA Region III Modifications to the National Functional Guidelines for Inorganic Data Review (April, 1993).	Natasha Sullivan, Shaw E&I, Inc. Eric Malarek – Shaw E&I, Inc.
		TCL Semivolatiles		
		PAHs- Select List		
		TCL Pesticide		
		Total PCB's		
		TAL Metals		
		Cyanide, Total		
		TOX		
		TPH DRO		
		TPH GRO		
		BTEX		

SAP Worksheet #36 -- Validation (Steps IIa and IIb) Summary Table
 (Continued)

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria	Data Validator (title and organizational affiliation)
(All Sites) IIa/IIb	Disposal Soil	TCLP Volatiles	Project Verification Criteria as per SAP worksheets 12, 15, 19, and 28 and cited USEPA SW-846 methodology.	Natasha Sullivan, Shaw E&I, Inc.
		TCLP Semivolatiles		
		TCLP Pesticide		
		TCLP Herbicides		
		TCLP Metals ICP		
		TCLP Metals Hg		
		Cyanide, Total		
		Sulfide, Total		
		Ignitability (Flashpoint)		
		Corrosivity as pH		
		Total PCB's		
		TPH DRO/ORO		
		TPH GRO		

SAP Worksheet #37 (UFP-SAP Manual Section 5.2.3) -- Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

It is the joint responsibility of the project team listed in this SAP to ensure that the data collected meets the requirements listed in this SAP.

Describe the evaluative procedures used to assess overall measurement error associated with the project:

Data Verification will be performed on all samples. The Shaw project chemist will conduct data verification that the sample analysis was performed as stated in the SAP. For Confirmation, soil data sets data validations will be performed, validation Qualifiers applied as per USEPA Region III Modifications to the National Functional Guidelines for Inorganic Data Review (April, 1993) and National Functional Guidelines for Organic Data Review (September, 1994). Usability is not limited to data validation and includes review and assessment of the procedures as defined in the SAP these will be monitored by the project team throughout the project. The data validation reports, qualifiers applied to data in conjunction with this SAP, field logs books, progress reports, and corrective action reports will be used to assess overall usability as it applies to the data sets. Project completeness will be addressed in the project close out reports.

Identify the personnel responsible for performing the usability assessment:

Members of the project team listed in this SAP are responsible for the ensuring the usability of the data sets as defined in this SAP. Following the receipt of the analytical results for the final confirmation soil sample for a site, the project team (personnel listed below) will review the data to ensure that the sampling and data meets the DQOs. The following personnel or their designee will perform the usability assessment:

- Skip Dunham, Project Manager
- Natasha Sullivan, Program Chemist
- Sherri Eng, NAVFAC Atlantic Technical Support
- William Friedmann, Navy CLEAN Contractor Activity Manager
- Wade Smith, Virginia DEQ Project Manager

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

The project closeout report will summarize the removal action, conclusions, and any recommendations. The appendices of the project closeout report will include the following supporting documents: analytical data reports, data validation narratives, field reports, field audit logs, and health and safety reports.

GLOSSARY OF TERMS

GLOSSARY OF QUALITY ASSURANCE AND RELATED TERMS

Acceptance criteria — Specified limits placed on characteristics of an item, process, or service defined in requirements documents.

Accuracy — The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator. Examples of QC measures for accuracy include proficiency testing samples, matrix spikes, laboratory control samples (LCSs), and equipment blanks.

Action limit/level — The numerical value that causes a decision maker to choose or accept one of the alternative actions. It may be a regulatory threshold standard, such as a maximum contaminant level for drinking water; a risk-based concentration level; a technology limitation; or a reference-based standard.

Activity — An all-inclusive term describing a specific set of operations or related tasks to be performed, either serially or in parallel (e.g., research and development, field sampling, analytical operations, equipment fabrication), that, in total, result in a product or service.

Aliquot — A measured portion of a sample taken for analysis.

Analyte — A property which is to be measured.

Analytical batch — A group of samples, including quality control samples, which are processed together using the same method, the same lots of reagents, and at the same time or in continuous, sequential time periods. Samples in each batch should be of similar composition and share common internal quality control standards.

Assessment — As defined in the UFP-QAPP, the evaluation process used to measure the performance or effectiveness of a system and its elements against specific criteria. Glossary of Quality Assurance and Related Terms Examples include, but are not limited to, audits, proficiency testing, management systems reviews, data quality assessments, peer reviews, inspections, or surveillance.

Audit (quality) — A systematic and independent examination to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.

Bias — The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).

Blank — A sample subjected to the usual analytical or measurement process to establish a zero baseline or background value; a sample that is intended to contain none of the analytes of interest. A blank is used to detect contamination during sample handling preparation and/or analysis.

Calibration — A comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustments.

Calibration standard — A substance or reference material used for calibration. *See also Calibration.*

Certification — The process of testing and evaluation against specifications designed to document, verify, and recognize the competence of a person, organization, or other entity to perform a function or service, usually for a specified time.

Chain of custody — An unbroken trail of accountability that ensures the physical security of samples, data, and records.

Characteristic — Any property or attribute of a datum, item, process, or service that is distinct, describable, and/or measurable.

Coefficient of variation (CV) — A measure of precision (relative dispersion). It is equal to the standard deviation divided by the arithmetic mean. *See also Relative standard deviation.*

Co-located samples — See Field duplicates, co-located samples.

Comparability — The degree to which different methods or data agree or can be represented as similar. Comparability describes the confidence that two data sets can contribute to a common analysis and interpolation.

Completeness — A measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under correct, normal conditions.

Configuration — The functional, physical, and procedural characteristics of an item, experiment, or document.

Conformance — An affirmative indication or judgment that a product or service has met the requirements of the relevant specification, contract, or regulation; also, the state of meeting the requirements.

Contaminants of concern (COC) — The matrix-specific list of chemical compounds and analytes determined to be pertinent to a specific site or project; sometimes used interchangeably with target analytes.

Continuing calibration verification — A check of the initial calibration that is performed during the course of an analytical shift at periodic intervals using a Calibration Check Standard. Continuing calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models. The purpose is to assess the continued capability of the measurement system to generate accurate and precise data over a period of time.

Contractor — Any organization or individual contracting to furnish services or items or to perform work.

Corrective action — Any measures taken to rectify conditions adverse to quality and, where possible, to preclude their recurrence.

Data quality indicators (DQIs) — The quantitative statistics and qualitative descriptors that are used to interpret the degree of acceptability or utility of data to the user. The principal data quality indicators are precision, accuracy/bias, comparability, completeness, representativeness, and sensitivity. Also referred to as data quality attributes.

Data quality objectives (DQOs) — Qualitative and quantitative statements derived from the data quality objectives (DQO) process, as defined by EPA QA/G-4. DQOs can be used as the basis for establishing the quality and quantity of data needed to support decisions.

Data quality objective (DQO) process — A systematic planning tool based on the scientific method that clarifies study objectives, defines the appropriate type, quantity and quality of data and specifies tolerable levels of potential decision errors needed to answer specific environmental questions and to support proper environmental decisions. The DQO process is one type of systematic planning process. *See also Systematic planning process.*

Data reduction — The process of transforming the number of data items by arithmetic or statistical calculations, standard curves, and concentration factors, and collating them into a more useful form. Data reduction is irreversible and generally results in a reduced data set and an associated loss of detail.

Data review — The process of examining and/or evaluating data to varying levels of detail and specificity by a variety of personnel who have different responsibilities within the data management process. It includes verification, validation, and usability assessment.

Data user — Technical and other personnel responsible for engineering, scientific, and legal evaluations that are the basis for site decisions. Data users are responsible for determining data needs required to satisfy project objectives from their perspective (remedy, risk, compliance, etc.).

Decision-maker — Project manager, stakeholder, regulator, etc., who has specific interests in the outcome of site-related activities and will use the collected data to make decisions regarding the ultimate disposition of the site or whether to proceed to the next study phase.

Definitive data — Analytical data of known quality, concentration, and level of uncertainty. The levels of quality and uncertainty of the analytical data are consistent with the requirements for the decision to be made. Suitable for final decision-making. *See also Screening data.*

Design — The specifications, drawings, design criteria, and performance requirement; also, the result of deliberate planning, analysis, mathematical manipulations, and design processes.

Detection limit — A measure of the capability of an analytical method to distinguish samples that do not contain a specific analyte from samples that contain low concentrations of the analyte; the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability. Detection limits are analyte- and matrix-specific and may be laboratory-dependent. *See also Method detection limit, Quantitation limit, and Sample quantitation limit.*

Distribution — (1) The appointment of an environmental contaminant at a point over time, over an area, or within a volume; (2) a probability function (density function, mass function, or distribution function) used to describe a set of observations (statistical sample) or a population from which the observations are generated.

Document — Written text such as a report, standard operating procedure, plan. Once written, documents can be revised or amended, unlike records which are not revised once written.

Document control — The policies and procedures used by an organization to ensure that its documents and their revisions are proposed, reviewed, approved for release, inventoried, distributed, archived, stored, and retrieved in accordance with the organization's requirements.

Environmental conditions — The description of a physical matrix (e.g., air, water, soil, sediment) or a biological system expressed in terms of its physical, chemical, radiological, or biological characteristics.

Environmental data — Any parameters or pieces of information collected or produced from measurements, analyses, or models of environmental processes, conditions, and effects of pollutants on human health and the ecology, including results from laboratory analyses or from experimental systems representing such processes and conditions. It also includes information collected directly from measurements, produced from models, and compiled from other sources such as databases or the literature.

Environmental data operations — Any work performed to obtain, use, or report information pertaining to environmental processes and conditions.

Environmental monitoring — The process of measuring or collecting environmental data.

Environmental processes — Any manufactured or natural processes that produce discharges to, or that impact, the ambient environment.

Environmental programs — An all-inclusive term pertaining to any work or activities involving the environment, including but not limited to characterization of environmental processes and conditions; environmental monitoring; environmental research and development; the design, construction, and operation of environmental technologies; and laboratory operations on environmental samples.

Equipment blank — A sample of water free of measurable contaminants poured over or through decontaminated field sampling equipment that is considered ready to collect or process an additional sample. The purpose of this blank is to assess the adequacy of the decontamination process. Also called rinse blank or rinsate blank.

Estimate — A characteristic from the sample from which inferences on parameters can be made.

Field blank — A blank used to provide information about contaminants that may be introduced during sample collection, storage, and transport; also a clean sample exposed to sampling conditions, transported to the laboratory, and treated as an environmental sample.

Field duplicate (replicate) samples — 1) A generic term for two (or more) field samples taken at the same time in the same location. They are intended to represent the same population and are taken through all steps of the analytical procedure in an identical manner and provide precision information for the data collection activity. 2) The UFP-QAPP recognizes two categories of Field Duplicate Samples defined by the collection method, field duplicate, co-located samples and field duplicate, subsamples. *See also Field duplicate, co-located samples and Field duplicate, subsamples.*

Field duplicate, co-located samples — Two or more independent samples collected from side-by-side locations at the same point in time and space so as to be considered identical. These separate samples are said to represent the same population and are carried through all steps of the sampling and analytical procedures in an identical manner. These samples are used to assess precision of the total method, including sampling, analysis, and site heterogeneity. Examples of co-located samples include ambient air monitoring samples, surface water grab samples, and side-by-side sample core soil samples.

Field duplicate (replicate), subsamples — Duplicate (replicate) samples resulting from one sample collection at one sample location. For example, duplicate (replicate) subsamples may be taken from one soil boring or sediment core.

Finding — An assessment conclusion that identifies a condition having a significant effect on an item or activity. An assessment finding may be positive or negative and is normally accompanied by specific examples of the observed condition.

Graded approach — The objective process of establishing the project requirements and level of effort according to the intended use of the results and the degree of confidence needed in the quality of the results.

Guidance — A suggested practice that is not mandatory, intended as an aid or example in complying with a standard or requirement.

Guideline — A suggested practice that is not mandatory in programs intended to comply with a standard.

Hazardous waste — Any waste material that satisfies the definition of hazardous waste given in 40 CFR 261, "Identification and Listing of Hazardous Waste."

Holding time — The period of time a sample may be stored prior to its required analysis.

Inspection — The examination or measurement of an item or activity to verify conformance to specific requirements.

Instrument blank — An aliquot of analyte-free water or solvent processed through the instrumental steps of the measurement process to determine the presence of carryover from the previous analysis. Analysis does not include any sample preparation.

Instrument performance check sample — A sample of known composition analyzed concurrently with environmental samples to verify the performance of one or more components of the analytical measurement process. Those components can include retention time, resolution, recovery, degradation, etc.

Interference — A positive or negative effect on a measurement caused by a analyte other than the one being investigated or other factors.

Internal standard — A standard added to a test portion of a sample in a known amount and carried through the entire determination procedure as a reference for calibrating and controlling the precision and bias of the applied analytical method.

Investigative organization — An entity contracted by the lead organization for one or more phases of a data collection operation.

Laboratory control sample — A sample of known composition prepared using contaminant-free water or in inert solid that is spiked with analytes of interest at the midpoint of the calibration curve or at the level of concern. It is analyzed using the same sample preparation, reagents, and analytical methods employed for regular samples.

Laboratory duplicates/replicates — Two or more representative portions taken from one homogeneous sample by the laboratory and analyzed in the same laboratory. Laboratory duplicate/replicate samples are quality control samples that are used to assess intralaboratory preparatory and analytical precision.

Laboratory fortified blank — A low-level laboratory control sample (e.g., at the quantitation limit) used to evaluate laboratory preparatory and analytical sensitivity and bias for specific compounds.

Lead organization — An entity responsible for all phases of the data collection operation.

Management — Those individuals directly responsible and accountable for planning, implementing, and assessing work.

Management system — A structured, nontechnical system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for conducting work and producing items and services.

Matrix — The material of which the sample is composed, such as water, soil/sediment, or other environmental medium.

Matrix spike — A sample prepared by adding a known concentration of a target analyte to an aliquot of a specific homogenized environmental sample for which an independent estimate of the target analyte concentration is available. The matrix spike is accompanied by an independent analysis of the unspiked aliquot of the environmental sample. Spiked samples are used to determine the effect of the matrix on a method's recovery efficiency.

Matrix spike duplicate — A homogeneous sample used to determine the precision of the intralaboratory analytical process for specific analytes (organics only) in a sample matrix. The duplicate sample is prepared simultaneously as a split with the matrix spike sample, and each is spiked with identical, known concentrations of targeted analyte(s).

Mean (arithmetic) — The sum of all the values of a set of measurements divided by the number of values in the set; a measure of central tendency.

Measurement performance criteria — Acceptance limits selected for project-specific sampling and analytical systems that will be used to judge whether project quality objectives are met. *See also data quality indicators.*

Method — A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification), systematically presented in the order in which they are to be executed.

Method blank — A sample of a matrix similar to the batch of associated samples (when available) in which no target analytes or interferences are present at concentrations that impact the analytical results. It is processed and analyzed simultaneously with samples of similar matrix and under the same conditions as the samples.

Method detection limit — Minimum concentration of a substance that can be reported with 99 percent confidence that the analyte concentration is greater than zero. *See also Detection limit and Quantitation limit.*

Method detection limit studies — A statistical determination that defines the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero.

Must — When used in a sentence, a term denoting a requirement that has to be met.

Nonconformance — A deficiency in a characteristic, documentation, or a procedure that renders the quality of an item or activity unacceptable or indeterminate; nonfulfillment of a specified requirement.

Objective evidence — Any documented statement of fact, other information, or record, either quantitative or qualitative, pertaining to the quality of an item or activity, based on observations, measurements, or tests that can be verified.

Observation — An assessment conclusion that identifies a condition (either positive or negative) that does not represent a significant effect on an item or activity. An observation may identify a condition that has not yet caused a degradation of quality.

Organization — A public or private company, corporation, firm, enterprise, or institution, or part thereof, whether incorporated or not, that has its own functions and administration.

Outlier — A data point that is shown to have a low probability of belonging to a specified data population.

Parameter — A quantity, usually unknown, such as a mean or a standard deviation characterizing a population. *Parameter* is commonly misused for *variable*, *characteristic*, or *property*.

Precision — The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. Precision is usually expressed as standard deviation, variance, or range, in either absolute or relative terms. Examples of QC measures for precision include field duplicates, laboratory duplicates, analytical replicates, and internal standards.

Procedure — A specified way to perform an activity.

Process — A set of interrelated resources and activities that transforms inputs into outputs. Examples of processes include analysis, design, data collection, operation, fabrication, and calculation.

Proficiency testing (PT) sample — A sample, the composition of which is unknown to the laboratory or analyst, which is provided to that laboratory or analyst to assess capability to produce results within acceptable criteria. PT samples can fall into three categories: (1) prequalification, conducted prior to a laboratory beginning project work, to establish initial proficiency; (2) periodic (e.g., quarterly, monthly, or episodic), to establish ongoing laboratory proficiency; and (3) batch-specific, which is conducted simultaneously with analysis of a sample batch. A PT sample is sometimes called a performance evaluation sample.

Proficiency testing sample, ampulated — A PT sample that is received as a concentrate and must be diluted to volume before being treated as an analytical sample. It can only be single blind.

Proficiency testing sample, full volume — A PT sample that is received by the laboratory ready to be treated as an analytical sample. It does not require dilution and therefore can be single or double blind.

Proficiency testing sample, site-specific — A PT sample created using a well-characterized contaminated matrix and treated as an analytical sample by the laboratory to test its capabilities.

Project — An organized set of activities within a program.

Project quality objectives (PQOs) — Qualitative and quantitative statements derived from a Systematic Planning Process (e.g., EPA QA/G-4 DQO process) that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors. PQOs will be used as the basis for establishing the quality and quantity of data needed to support decisions.

Project quantitation limit — The lowest concentration or amount of the target analyte required to be reported from a data collection project.

Preliminary Remediation Goals — Specific project action limits for target analytes .

Quality — The totality of features and characteristics of a product or service that bears on its ability to meet the stated or implied needs and expectations of the user.

Quality assurance — An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.

Quality assurance project plan (QAPP) — A formal document describing in comprehensive detail the necessary quality assurance (QA), quality control (QC), and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria.

Quality control — The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against “out of control” conditions and ensuring that the results are of acceptable quality.

Quality control sample — One of any number of samples, such as a PT sample, intended to demonstrate that a measurement system or activity is in control.

Quality management — That aspect of the overall management system of the organization that determines and implements the quality policy. Quality management includes strategic planning, allocation of resources, and other systematic activities (e.g., planning, implementation, and assessment) pertaining to the quality system.

Quality Management Plan — A formal document that describes the quality system in terms of the organization’s structure, the functional responsibilities of management and staff, the lines of authority, and the required interfaces for those planning, implementing, and assessing all activities conducted.

Quality system — A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance (QA) and quality control (QC) activities.

Quantitation limit — The minimum concentration of an analyte or category of analytes in a specific matrix that can be identified and quantified above the method detection limit and within specified limits of precision and bias during routine analytical operating conditions.

Raw data — The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, hard copies of electronic data, magnetic tapes, untabulated sample results, QC sample results, printouts of chromatograms, instrument outputs, and handwritten notes.

Readiness review — A systematic, documented review of the readiness for the start-up or continued use of a facility, process, or activity. Readiness reviews are typically conducted before proceeding beyond project milestones and prior to initiation of a major phase of work.

Reagent blank — An aliquot of water or solvent free of measurable contaminants analyzed with the analytical batch and containing all the reagents in the same volume as used in the processing of the samples. The method blank goes through preparatory steps; the reagent blank does not.

Record (quality) — A document that furnishes objective evidence of the quality of products, services, or activities and that has been verified and authenticated as technically complete and correct. Records may include photographs, drawings, magnetic tape, and other data recording media.

Recovery — A measure of bias. Typically, a known concentration of analyte is spiked into an aliquot of sample. Both the spiked aliquot and an unspiked aliquot of sample are analyzed and the percent recovery is calculated.

Regional Screening Levels (RSLs) — Regional Screening Levels established by the EPA and used for guidance in developing action levels.

Relative percent difference (RPD) — A unit-free measure of precision between duplicate analyses.

Relative standard deviation (RSD) — A unit-free measure of precision or variability. The RSD is also known as the Coefficient of Variation (CV) which is the standard deviation expressed as a percentage of the mean.

Remediation — The process of reducing the concentration of a contaminant (or contaminants) in air, water, or soil matrices to a level that poses an acceptable risk to human health.

Replicate samples — Multiple duplicate samples.

Representativeness — A measure of the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition.

Reproducibility — The precision, usually expressed as variance, that measures the variability among the results of measurements of the same sample at different laboratories.

Requirement — A formal statement of a need and the expected manner in which it is to be met; documented statements that specify activities that must be done; the mandated activities.

Sample quantitation limit (SQL)— Quantitation limit adjusted for dilutions, for changes in sample volume or size, and extract and digestate volumes, percent solids, and cleanup procedures.

Scientific method — The principles and processes regarded as necessary for scientific investigation, including rules for formulation of a concept or hypothesis, conduct of experiments, and validation of hypotheses by analysis of observations.

Screening data — Analytical data of known quality, concentration, and level of uncertainty. The levels of quality and uncertainty of the analytical data are consistent with the requirements for the decision to be made. Screening data are of sufficient quality to support an intermediate or preliminary decision but must eventually be supported by definitive data before a project is complete.

Secondary Data — Data not originally collected for the purpose for which they are now being used. In addition, the level of QA/QC provided at the time of the original data collection may be unknown.

Self-assessment — The assessments of work conducted by individuals, groups, or organizations directly responsible for overseeing or performing the work.

Sensitivity — The capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Examples of QC measures for determining sensitivity include laboratory-fortified blanks, a method detection limit study, and initial calibration low standards at the quantitation limit.

Service — The result generated by activities at the interface between the supplier and the customer; the supplier's internal activities to meet customer needs. Such activities in environmental programs include design, inspection, laboratory and/or field analysis, repair, and installation.

Shipping container temperature blank — A container of water designed to evaluate whether or not samples were adequately cooled during sample shipment.

Specification — A document stating requirements and referring to or including drawings or other relevant documents. Specifications should indicate the means and criteria for determining conformance.

Spike — A substance that is added to an environmental sample to increase the concentration of target analytes by known amounts. A spike is used to assess measurement accuracy (spike recovery). Spike duplicates are used to assess measurement precision.

Split sample — Two or more representative portions taken from a sample in the field or laboratory, analyzed by at least two different laboratories and/or methods. Prior to splitting, a sample is mixed (except volatiles, oil and grease, or when otherwise directed) to minimize sample heterogeneity. These are quality control samples used to assess precision, variability, and data comparability between different laboratories. (Split samples should be used when accompanied by a PT sample.)

Standard deviation — A measure of the dispersion or imprecision of a sample or population distribution; expressed as the positive square root of the variance, with the same unit of measurement as the mean.

Standard Operating Procedures (SOPs) — A written document that details the method for an operation, analysis, or action, with thoroughly prescribed techniques and steps. SOPs are officially approved as the methods for performing certain routine or repetitive tasks.

Storage blank — A sample composed of water free of measurable contaminants and stored with a sample set in the same kind of sample container. Storage begins upon receipt of sample shipment at the laboratory. The storage blank is analyzed at the end of the sample storage period to assess cross-contamination occurring during sample storage (typically analyzed only for volatile organic compounds).

Supplier — Any individual or organization furnishing items or services or performing work according to a procurement document or a financial assistance agreement. *Supplier* is an all-inclusive term used in place of any of the following: vendor, seller, contractor, subcontractor, fabricator, or consultant.

Surrogate spike or analyte — A pure substance with properties that mimic the analyte of interest (organics only). Surrogates are brominated, fluorinated, or isotopically labeled compounds unlikely to be found in environmental samples. These analytes are added to samples to evaluate analytical efficiency by measuring recovery.

Systematic planning process — Systematic planning is a process that is based on the scientific method and includes concepts such as objectivity of approach and acceptability of results. Systematic planning is based on a common sense, graded approach to ensure that the level of detail in planning is commensurate with the importance and intended use of the work and the available resources. This framework promotes communication among all organizations and individuals involved in an environmental program. Through a systematic planning process, a team can develop acceptance or performance criteria for the quality of the data collected and for the quality of the decision.

Target analytes — The project-specific list of analytes for which laboratory analysis is required; sometimes used interchangeably with contaminants of concern.

Technical Systems Audit (TSA) — A thorough, systematic, on-site qualitative audit of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system.

Traceability — The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.

Trip blank — A clean sample of water free of measurable contaminants that is taken to the sampling site and transported to the laboratory for analysis without having been exposed to sampling procedures. Trip blanks are analyzed to assess whether contamination was introduced during sample shipment (typically analyzed for volatile organic compounds only).

Usability assessment — Evaluation of data based upon the results of data validation and verification for the decisions being made. In the usability step, reviewers assess whether the process execution and resulting data meet quality objectives based on criteria established in the QAPP.

Validation — Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. Data validation is a sampling and analytical process evaluation that includes evaluating compliance with methods, procedures, or contracts, and comparison with criteria based upon the quality objectives developed in the project QAPP. The purpose of data validation is to assess the performance associated with the sampling and analysis to determine the quality of specified data.

Variance (statistical) — A measure or dispersion of a sample or population distribution.

Verification — Confirmation by examination and provision of objective evidence that the specified requirements (sampling and analytical) have been completed. This is to be a completeness check.

APPENDIX A
Shaw and Accutest
Key Personnel Resumes

Contract No. N62470-02-D-3260
Contract Task Order No. 0113

REMOVAL ACTION AT SITE 11
NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Shaw Project Number 128068

Shaw and Accutest Key Personnel Resumes have not been included due to their personal nature.

APPENDIX B
Shaw Sampling Standard Operating Procedures
Contract No. N62470-02-D-3260
Contract Task Order No. 0113

REMOVAL ACTION AT SITE 11
NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Shaw Project Number 128068

STANDARD OPERATING PROCEDURE

Subject: Chain of Custody Documentation - Paper

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion of written Chain of Custody (COC) documentation and to provide a suggested Chain of Custody Form for project use.

2. SCOPE

This procedure is applicable to all Shaw E & I efforts where samples are transferred among parties, including to off-site testing facilities. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, e.g. sampling and then field-screening in a mobile laboratory.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3.
- Shaw E & I, 2002, *Sampler's Training Course Handout*.

4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in an individual's custody when it is in actual physical possession of the person, is in view of the person, is locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Chain of Custody Form**—A form used to document and track the custody and transfers of a sample from collection to analysis or placement in a designated secure area within the testing facility.
- **COC Continuation Page**—Additional page(s) that may be included with a Chain of Custody form. The continuation page(s) contain the information on additional samples contained within the *same* cooler/shipping container associated with the cooler/shipping container Chain of Custody form.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Documentation

All Chain of Custody documentation must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.

6.2 Continuation Pages

Continuation pages may be utilized for shipping containers/coolers with sufficient samples/sample containers that all of the lines of the Chain of Custody form are used before the documentation of the cooler/shipping container is complete. The number of pages in total must be filled out. *All samples entered onto a Continuation Page must be included in the same cooler/shipping container as those on the Chain of Custody form itself.*

6.3 Header Information

- Each Chain of Custody form must be assigned a unique Reference Document Number—use the Project/proposal number followed by a unique numeric sequence or current date (if only one cooler sent per day). Continuation Pages should contain the same Document Reference Number as the Chain of Custody form that they are associated with. The project team should maintain a log of Chain of Custody Reference Document Numbers.
- The page identifier and total page count section must be completed. Total pages include the Chain of Custody form and any attached Continuation Pages.
- Project number, name, and location information must be completed for all forms.
- If available, the laboratory Purchase Order Number should be included on the appropriate line.
- The name and phone number of the *Project Contact* should be included; the Project Contact should be a responsible individual that the laboratory may access to address analytical issues. This person is usually the analytical lead for the project.
- The *Shipment Date* should be provided on the applicable lines.
- If shipping by carrier, the *Waybill/Airbill Number* must be included. Note: couriers will not sign custody documents. Therefore, inclusion of the waybill/airbill number on the Chain of Custody is the *only* means of documenting the transfer to the carrier.
- Laboratory Destination and Contact information should be provided.

- The Sampler(s) names should be provided on the appropriate line. This line should include all persons whose initials appear on any of the sample containers, to provide the laboratory a means of cross-referencing containers.
- The “Send Report To” information should be completed. If multiple reports/locations are needed, the information should be provided on a separate page included with the Chain of Custody documents.

6.4 Sample Information Section—Including on Continuation Page(s)

During actual sampling, each sample must be entered on the COC form at the time of collection in order to document possession. The sampler must not wait until sampling is completed before entering samples on the COC.

- Complete the *Sample ID Number* for each line. If there are multiple container types for a sample, use additional lines to indicate the needed information.
- Ensure that the *Sample Description* matches the description on the sample label—the laboratory will use this information for cross-referencing.
- Provide the *Collection Date* and *Time*. These must match those on the sample label and Field Logbook/Logsheets.
- Indicate whether the sample is a Grab or Composite sample.
- Indicate the *Matrix* of the sample. Use the Matrix Codes listed on the Chain of Custody form.
- Indicate the *Number of Containers* and the *Container Type*. If a sample has multiple container types, use multiple lines and cross-out the information spaces to the left of the container blocks. *Failure to do this may cause the laboratory to log-in each container type as a separate sample/lab-ID, resulting in a confused report and invoice.*
 - Alternatively, if each sample has the same number/type container types, use “various” in the *Container Type* block and provide detail in the *Special Instructions* section, e.g., “Each sample consists of one 16-oz jar, two pre-weighed VOC w/DI water, and one pre-weighed VOC w/Methanol.”
- Check the appropriate *Preservative* box for each line/container type.
- Write in and check the *Analyses Requested* boxes for each line/container type. The appropriate method number (e.g., EPA Method 8260C) must be written as well as the method name.
- Indicate the *Turn-around Time Requested* for each sample.
- Use the *Special Instructions* section to provide important information to the laboratory, e.g., samples that may require dilution or samples that will need to be composited by the laboratory. This section may also be used to inform the laboratory of additional information contained in attachments to the Chain of Custody package.
- Circle the appropriate *QC/Data Package Level* requested.

6.5 Custody Transfer Section

- The first *Relinquished By* space must be completed by the individual who will either transfer the samples or seal the shipping container.

- If the samples will be transferred to a courier, write the courier/carrier company in the *Received By* box and enter the Date and Time that the shipping container was closed.
- All other transfers must be performed in person, and the Relinquisher must witness the signing by the Receiver.
- A copy of the Chain of Custody form and all associated Continuation Pages should be maintained in the project files.

7. ATTACHMENTS

None.

8. FORMS

- Shaw E & I Chain of Custody Form
- Shaw E & I COC Continuation Page

STANDARD OPERATING PROCEDURE

Subject: Custody Seals

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion and attachment of Custody Seals on environmental samples and shipping containers.

2. SCOPE

This procedure is applicable to all Shaw E & I efforts where sample legal defensibility and custody integrity is desired. Adherence to this procedure is not required whenever the same individual/team is performing the sampling and testing within the same workday, and transfer to the testing process is being documented by other means, i.e. sampling and then field-screening in a mobile laboratory.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846*, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3*
- Shaw E & I, 2002, Sampler's Training Course Handout.

4. DEFINITIONS

- **Custody**—The legal term used to define the control and evidence traceability of an environmental sample. A sample is considered to be in one's custody if it is in actual physical possession of the person, is in view of the person, has been locked in a container controlled by the person, or has been placed into a designated secure area by the person.
- **Custody Seal**—Commercially available thin strips of adhesive paper with write-in lines for the date/time and identification of the using party. Custody seals are placed over the caps of sample containers and along the cover seals of shipping containers as a means to detect tampering before arrival at the testing facility. All Shaw E & I strategic alliance laboratories provide Custody Seals in their sample container supply kits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Completing the Custody Seal Information

- All Custody Seals must be completed in indelible ink. All corrections must be made using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.
- Each Custody Seal attached must be completed by writing the *Date*, at a minimum, and signing with *full signature* by the person responsible for the sealing of the sample.
- If a space is provided, the *Time* should also be added.

6.2 Attaching the Custody Seals

Whenever possible, custody seals should be attached over the sample container lids during actual sampling and not when the samples are packaged for shipment. This will provide confidence in legal custody and will demonstrate non-tampering during the sample collection process.

Do not attach custody seals to VOC sample containers, as contamination may occur. For these samples, the custody seal should be used to seal the folded plastic zip bag that holds the sample containers.

- For sample jars, the completed Custody Seal should be placed across the top of the lid with the edges below the lid/jar interface and attached to the jar material. This will require the visible breaking of the seal in order to open the container.
- Sample coolers and shipping containers should have Custody Seals attached in such a manner that the seal extends lengthwise from the top edge of the lid to the side of the cooler/container.

7. ATTACHMENTS

None.

8. FORMS

None.

STANDARD OPERATING PROCEDURE

Subject: Sample Labeling

1. PURPOSE

The purpose of this procedure is to provide the requirements for completion and attachment of sample labels on environmental sample containers.

2. SCOPE

This procedure is applicable to all Shaw E & I projects/proposals where samples will be collected.

3. REFERENCES

- U.S. Environmental Protection Agency, 1986, *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods*, SW-846, Third Edition.
- U.S. Army Corps of Engineers, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3
- Shaw E & I, 2002, Sampler's Training Course Handout.

4. DEFINITIONS

- **Sample Label**—Any writing surface with an adhesive backing that can be used to document sample identification information. The sample label is attached to the sample container as a means of identification and, in some commercially available or laboratory-supplied containers, may be pre-attached. All Shaw E & I strategic alliance laboratories provide sample labels or pre-labeled containers in their sample container supply kits.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

- All sample labels must be completed in indelible ink. All corrections must be performed using standard single-line cross-out methods, and the initials of the individual making the change must be included beside the corrected entry.
- Sample labels should be completed and attached as samples are collected. Do not wait until final packaging to attach and/or complete the sample labels.
- Sample labels must be attached to the non-sealing portion of the container. Do not place labels on or across sample container caps.
- If the laboratory has provided pre-labeled containers, make sure to fill one for each parameter set needed. Laboratory pre-labeled containers are often bar-coded and it is important to provide a complete container set for each sample.
- The following information must be recorded on the Sample Label:
 - Sample Identification Number
 - Date and Time collected
 - Initials of person(s) responsible for collection
- If a space is provided, the *Analysis Requested* should also be added.
- If a *Description* is provided, remember it must match that on the Chain of Custody form for cross-referencing purposes.
- Cover the completed and attached label with clear plastic tape to prevent bleeding of the ink if it becomes wetted. *Do **not** perform this step for pre-weighed VOC vials, as the final weight values will be influenced by the mass of the tape. Protect these containers by enclosing the rack/holder in a plastic bag within the cooler.*

7. ATTACHMENTS

None.

8. FORMS

None.

STANDARD OPERATING PROCEDURE

Subject: Sample Homogenization

1. PURPOSE

The purpose of this procedure is to establish the method for homogenizing samples prior to containerization. Proper homogenization is very important because it helps ensure that sample aliquots are representative of the whole collected sample and helps minimize sampling error so that other errors included in the measurement process, such as laboratory sample preparation and test measurement, can be better assessed.

2. SCOPE

This procedure applies to Shaw Environmental & Infrastructure (Shaw E & I) personnel responsible for the collection of environmental samples. The sample matrix must be amenable to mixing. This SOP applies to the collection of samples that are to be tested for all analytes except volatile analytes.

3. REFERENCES

- American Society for Testing and Materials (ASTM), 1998, Reducing Samples of Aggregate to Testing Size, C702.
- U.S. Army Corps of Engineers, Requirements for the Preparation of Sampling and Analysis Plans, EM 200-1-3, Section E-2, Homogenizing Techniques.

4. DEFINITIONS

- **Homogenize**—The use of physical mixing motions to make a uniform sample matrix.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Sampling equipment materials shall be selected so as to minimize contamination of samples. Sampling equipment shall be either new (never used previously), documented to have been decontaminated, or dedicated to each specific sampling point. Samples for organic constituent/compound analysis should be collected and mixed using non-reactive material such as glass or stainless steel bowls, trowels, and/or spoons. Samples for metals analysis should be collected and mixed using equipment made of stainless steel, glass, or Teflon®.

Certain types of solid matrices may not be amenable to mixing using conventional techniques. For example, certain solids may require grinding and thorough mixing to ensure that the analytes of interest within the sample are homogeneously distributed. It is extremely important that soil and sediment samples be homogenized to ensure that the entire sample is as representative as possible of the media being sampled.

6.1 Solid Samples

The following two methods are examples for homogenizing solid samples. Other homogenization techniques may be employed using approved standard methods such as ASTM C702, Reducing Samples of Aggregate to Testing Size.

6.1.1 Quartering

- Place the sample on a hard, clean, level surface such as a pan. If such a surface is too small for the desired quantity, a clean sheet of plastic may be used.
- Mix the solid material by turning the entire quantity over three times with a trowel or shovel. For the third time, shovel the material into a cone-shaped pile.
- Carefully press down on the apex of the pile to create a soil layer of uniform thickness and diameter.
- Divide the material in the sample pan or on the plastic into quarters

Option 1

- Mix each quarter individually
- Then mix two quarters to form halves
- Mix each formed half and then fill the appropriate sample jars/containers

Option 2

- Remove two diagonally opposite quarters including any fine material
- Mix the remaining material, build it into a cone, and press down to flatten as before
- Divide the flattened material into quarters, discard two diagonally opposing sections, and repeat
- Repeat the process until only enough sample remains to fill the required containers and proceed to fill the sample jars.

6.1.2 Mixing in a Bowl

- Place the sample in a bowl. Samples for organic constituent/compound analysis should be mixed using bowls and stirrers made of glass or stainless steel, while samples for metals analysis should be mixed using equipment made of glass, stainless steel, or hard plastic. Make sure the bowl is large enough to accommodate the sample, with extra volume to allow for mixing the sample.

- Mix the sample with the stirrer. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion, reversing direction, and occasionally turning the material over. High moisture samples are more difficult to homogenize. Use an adequate mixing motion for as long as needed to determine by visual observation that the sample media has taken on a uniform appearance.

6.2 Liquid Samples

Most aqueous samples do not require homogenization since water is well mixed due to diffusion and bulk convection. If the sample matrix is a viscous liquid, semi-solid, or an aqueous one with suspended solids, the sample will require mixing.

Do **not** shake the sample and do not agitate the sample in **any** way if collecting for volatile parameters. Volatile sample containers should be either filled directly from the sample source or if transferring from a large container, such as an automatic sampler reservoir, filled first and **without agitation**.

For non-volatile parameters, mix either using an appropriate stirrer or by gentle swirling and then immediately transfer the material into the appropriate containers. The sample should be mixed frequently during the container-filling step, in particular if there are a large number of containers, so that the condition of the bulk sampled fluid will be approximately the same when each parameter-specific sample container is filled.

7. ATTACHMENTS

None.

8. FORMS

None.

STANDARD OPERATING PROCEDURE

Subject: Compositing

1. PURPOSE

This procedure is intended to provide guidelines for the compositing of samples collected in the course of environmental program activities. Composites represent the average distribution of properties and can be used to reduce analytical costs or represent well-defined decision boundaries.

2. SCOPE

This procedure applies to the compositing of solid and liquid samples where no project-specific process is in place. Field composite methods are not appropriate for Volatile Organic Compounds (VOC) analysis of solids. Composites for these methods must be laboratory derived using either individual grab extracts or other laboratory methods.

3. REFERENCES

- U.S. Environmental Protection Agency, 1987, *Compendium of Superfund Field Operations Methods*, EPA 540/P-87/001a, OSWER 9355.0-14, Washington, DC.
- Shaw E & I Standard Operating Procedure FS010, *Sample Mixing/Homogenization*.

4. DEFINITIONS

- **Composite Sample**—A sample that is comprised of roughly equal amounts of discrete grabs from a set of sample locations or time/flow increments known as a *sample group*.
- **Sample Group**—A predetermined number or time/area span of discrete samples, which is composited into one sample for analytical purposes.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager or designee is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

The discrete samples that are used to prepare a composite sample must be of equal volume and must each be collected in an identical manner. Field documentation must clearly indicate the composite elements on either a map or a composite logsheet. There are several types of composite samples.

Flow-proportioned composite—Flow-proportioned composite samples are collected proportional to the flow rate during the sampling period by either a time-varying/constant-volume or time-constant/varying-volume method. Flow-proportioned composite samples are typically collected using automatic samplers paced by a flow meter. This sampling method is commonly used for wastewaters.

Time composite—A time composite sample is composed of a discrete number of grab samples collected at equal time intervals during the sampling period. Time composite sampling is often used to sample wastewater discharges or streams.

Volume/mass composite—A volume/mass composite is composed of a discrete number of grab samples collected at defined volume or mass intervals. Volume/mass composite sampling is often used to sample the output of a process system such as a Thermal Destruction Unit or pug mill.

Area composite—Area composite samples are samples collected from individual grab samples located on a regularly spaced grid or along a pile at defined locations and depths. Each of the grab samples must be collected in an identical fashion and must be of equal volume.

Vertical or Depth composite—Vertical composites are composed of individual grab samples collected across a vertical cross section. Like area composites, the grab samples must be collected in an identical fashion and must be of equal volume. Soils and sediments can be used to create vertical composites.

6.1 Solid Composites

- To ensure the integrity of the composite, all discrete grab samples must be collected in an identical manner.
- Composite samples can be created by combining discrete grab samples into the same mixing/holding container as they are collected or by combining and mixing equal aliquots of containerized and homogenized discrete grab samples.
- Remove coarse fragments and organic material from the mixing bowl. Homogenize the sample as specified in SOP FS010, Sample Mixing/Homogenization.
- Remove sample aliquots and place into the appropriate sample containers for shipment to the laboratory.
- Label the sample and document the sampling event according to the project procedures.
- Package/ship the composite sample as required.

6.2 Liquid Composites

- Liquid composite samples should be created by combining equal aliquots of discrete samples.
- Assemble the containers that will comprise a given composite.
- Swirl or stir the individual containers to homogenize the contents just prior to removing the measured aliquots.

- Using clean glass pipets, deliver equal volumes from each grab container to the composite sample container that is to be shipped to the lab. For example, if there are five grab samples, and the composite sample requires 100 mL for the parameter of interest, pipet 20 mL from each of the grab samples into the composite sample container.
- Alternatively, measured volumes can be determined via a graduated cylinder/beaker and combined. The measuring container should be decontaminated between composites.
- Cap/seal the composite container and swirl to agitate. Stirring should be avoided as it increases the risk of introducing contamination to the sample.
- Label the sample(s), document the event, and package/ship the sample(s) as required.

7. ATTACHMENTS

None.

8. FORMS

None.

STANDARD OPERATING PROCEDURE

Subject: Shipping and Packaging of Non Hazardous Samples

1. PURPOSE

The purpose of this procedure is to provide general instructions in the packaging and shipping of non-hazardous samples. The primary use of this procedure is for the transportation of samples collected on site to be sent off site for physical, chemical, and/or radiological analysis.

2. SCOPE

This procedure applies to the shipping and packaging of all non-hazardous samples. Non-hazardous samples are those that do not meet any hazard class definitions found in 49 CFR 107-178, including materials designated as Class 9 materials and materials that represent Reportable Quantities (hazardous substances) and/or materials that are not classified as *Dangerous Goods* under current IATA regulations.

In general most soil, air, and aqueous samples, including those that are acid or caustic preserved do **not** qualify as *hazardous materials* or *dangerous goods*. An exception is methanolic soil VOC vials: these containers are flammable in any quantity and **must** be packaged, shipped, and declared as *Dangerous Goods* whenever transported by air.

The Class 9 “Environmentally Hazardous” designation should only be applied to samples if they are known or suspected (via screening) to contain a sufficient concentration of contaminant to pose a health and/ or environmental risk if spilled in transport. Samples for which screening has shown a potential hazard (i.e. flammability) or those that are derived from a known hazard, including a site/facility with confirmed contamination by an *infectious substance* must also be shipped in accordance with the applicable DOT/IATA requirements. Refer to Shaw E & I SOP FS013.

Improper shipment of hazardous materials, especially willful misrepresentation and shipment as non-hazardous materials, is a violation of federal law and is punishable by fines and possible imprisonment of the guilty parties. It is also a violation of Shaw E & I policy and can result in disciplinary action up to and including termination of employment.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3, Washington, D.C.
- U.S. Department of Transportation Regulations, 49 CFR Parts 108-178
- International Air Transport Association (IATA), *Dangerous Goods Regulations*, current edition.

4. DEFINITIONS

- **Cooler/Shipping Container**—Any hard-sided insulated container meeting DOT’s or IATA’s general packaging requirements.
- **Bubble Wrap**—Plastic sheeting with entrained air bubbles for protective packaging purposes.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Packaging

- Use tape and seal off the cooler drain on the inside and outside to prevent leakage.
- Place packing material on the bottom on the shipping container (cooler) to provide a soft impact surface.
- Place a large (30-55 gallon or equivalent) plastic bag into the cooler (to minimize possibility of leakage during transit).
- Starting with the largest glass containers, wrap each container with sufficient bubble wrap to ensure the best chance to prevent breakage of the container.
- Pack the largest glass containers in the bottom of the cooler, placing packing material between each of the containers to avoid breakage from bumping.
- Double-bag the ice (chips or cubes) in gallon- or quart-sized resealable plastic freezer bags and wedge the ice bags between the sample bottles.
- Add bagged ice across the top of the samples.
- When sufficiently full, seal the inner protective plastic bag, and place additional packing material on top of the bag to minimize shifting of containers during shipment.
- Tape a gallon-sized resealable plastic bag to the inside of the cooler lid, place the completed chain of custody document inside, and seal the bag shut.
- Tape the shipping container (cooler) shut using packing tape, duct tape, or other tear-resistant adhesive strips. Taping should be performed to ensure the lid cannot open during transport.
- Place a custody seal on two separate portions of the cooler, to provide evidence that the lid has not been opened prior to receipt by the intended recipient.

6.2 Labeling

- A “This Side Up” arrow should be adhered to all sides of the cooler, especially ones without obvious handles.
- The name and address of the receiver and the shipper must be on the top of the cooler.
- The airbill must be attached to the top of the cooler.

6.3 Shipping Documentation

- A Cooler Shipment Checklist (Attachment 1) should be completed and kept in the project file.

7. ATTACHMENTS

- Attachment 1, Shaw E & I Cooler Shipment Checklist

8. FORMS

None.

STANDARD OPERATING PROCEDURE

Subject: Packaging and Shipping of DOT/IATA-Hazardous Samples

1. PURPOSE

The purpose of this procedure is to provide general instructions for packaging and shipping of hazardous samples, as defined by DOT and/or IATA, including Class 9 “Environmentally hazardous substances.” The primary use of this procedure is for the transportation of samples collected on site to be sent off site for physical, chemical, biological (*infectious substance*), and/or radiological analysis in accordance with applicable laws and regulations and without destroying sample integrity.

2. SCOPE

This procedure applies to the packaging and shipping of all DOT/IATA-hazardous samples. Samples must be packaged and shipped as hazardous materials if they meet any of the hazard class definitions in 49 CFR 107-178, including Reportable Quantities, and/or if they can be classified as a *Dangerous Good* under IATA. All IATA classified materials designated for air transport, even in Limited Quantities, **must** be declared, packaged, and shipped as *Dangerous Goods*. Examples include methanolic VOC soil samples and any samples from a project/facility known to be impacted by an *infectious substance*.

Improper shipment of hazardous materials, especially willful misrepresentation and shipment as non-hazardous materials, is a violation of federal law and is punishable by fines and possible imprisonment of guilty parties. It is also a violation of Shaw E & I policy and can result in disciplinary action up to and including termination of employment.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, EM200-1-3, Washington, D.C.
- U.S. Department of Transportation Regulations, 49 CFR Part 107-178
- *Dangerous Goods Regulations*, current edition, International Air Transport Association (IATA)

4. DEFINITIONS

- **Dangerous Goods Airbill**—Form required when offering *Dangerous Goods* as defined in IATA regulations for air transport. The “*Dangerous Goods Airbill*” must be completed and signed by a responsible and qualified person. Some carriers require a typed or computer-generated form.
- **Inner packaging**—Packaging in immediate contact with the hazardous materials to be shipped, such as a sample jar or vial.
- **Limited Quantity**—In the IATA Tables, the maximum total amount of a *Dangerous Good* that can be transported without using UN-specification containers, such as a non-UN tested cooler.

- **Outer packaging**—Packaging into which one or more inner packages can be placed, such as a sturdy plastic cooler meeting general packaging requirements or a 5-gallon UN-specification plastic pail.
- **Performance-Oriented Packaging**—Packaging designed for and tested to be used for shipment of DOT-hazardous materials. Also known as “UN-specification” packaging.
- **Qualified person**—An individual with appropriate DOT/IATA Hazardous Materials training, including General Awareness, Function-Specific, and Safety training, necessary to properly classify samples as hazardous materials and to complete all subsequent shipping steps.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for the maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw E & I employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw E & I employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for recording information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

A Qualified Person **must** perform or oversee the classification, packaging, and completion of all related declaration and shipping papers. *It is a violation of federal law to pre-complete these documents and provide them to an unqualified person without providing minimal training to that person.* This training **must** be documented and may take the form of a verbal discussion, hands-on demonstration, or detailed written instructions, including a task-specific SOP, with review provided by the Qualified Person.

The basic packaging and shipping procedures are as follows:

- Determine the traits of the material to be shipped and compare them to the specific hazard class definitions in the appropriate regulations. If the material falls within one or more hazard class definitions, it is deemed “hazardous”. Select the most accurate proper shipping name and packing group combination, and prepare the package according to the prescribed requirements for quantity limitations, authorized packaging, marking, labeling, and documentation.
- Check the current IATA regulations to make sure the carrier accepts the material(s) and/or does not have its own special requirements for shipment.
- If shipping multiple inner packages that each meet a separate hazard class definition, consult the “Separation and Segregation” table in the appropriate regulations for guidance on

packaging and prepare as an over-pack with individual marking and labeling on the outer packaging.

- If shipping multiple inner packages that meet the same hazard class(es) but represent both solid and liquid matrices, prepare as an over-pack with individual marking and labeling on the outer packaging.
- If shipping hazardous material that meets more than one hazard class definition, check the hazard precedence table in the appropriate regulations to determine primary and subsidiary classes.

6.1 Additional Inner Packaging Requirements

- Place each sample container into a resealable plastic baggie.
- Fold over and tape the bag seal onto the sample jar to prevent the closure from unsealing.
- Several IATA packing instructions require containerizing of glass/plastic sample jars into a sealed primary receptacle such as a metal can before placing them into outer-packaging, i.e. the cooler.
 - Wrap the bagged sample container with bubble-wrap or other packing material to prevent breakage against the sides of the primary receptacle, and place it into the primary receptacle.
 - Seal the primary receptacle and label it with the Sample ID and any hazard information and place it into a plastic bag to protect the label.

6.2 Additional Outer Packaging Requirements

- Samples that in total qualify as Excepted Quantities or Limited Quantities do not require the use of UN-specification packaging and may be shipped in sturdy coolers, pails, or any packaging that meets general packaging requirements.
- Samples that do not qualify as Excepted Quantities or Limited Quantities require UN-specification packaging. For such samples that also require cooling to meet sample preservation requirements, UN-specification coolers are available from several Haz-Mat packaging vendors.
- If using a cooler of any kind, seal off the cooler drain on the inside and outside with tape to prevent leakage.
- Place cushioning and/or absorbent material on the bottom of the outer packaging to provide a soft impact surface.
- Place a plastic bag into the container (to minimize the possibility of leakage during transit).
- Wrap glass inner packagings with sufficient bubble wrap to ensure the best chance to prevent breakage of the container.
- For methanolic soil VOC vials, place vials into the supplied rack/holder or box and then place it into a tied off plastic bag to keep out moisture.
- Pack the largest inner packagings in the bottom of the container with cushioning material between each to avoid breakage from bumping.
- If cooling is required, double-bag the ice (chips or cubes) in gallon- or quart-size freezer Ziploc-type resealable plastic bags, and wedge the ice bags between the inner packages and/or primary receptacles. Also add bagged ice across the top of the samples/receptacles.

- When sufficiently full, seal the plastic bag that lines the outer packaging, and place additional cushioning material on top of the bag to minimize shifting of contents during shipment.
- Tape a gallon Ziploc-type bag to the inside of the container lid, place the completed chain of custody document inside, and seal the bag shut.
- Tape the outer packaging closed using packing tape, duct tape, or other tear-resistant adhesive strips.
- Place a custody seal on two separate portions of the outer packaging to provide evidence that the lid remains sealed during transit.

6.3 Marking and Labeling

- If the package contains any liquids, orientation arrows must be applied to two opposite faces of the package (front and back or both ends).
- The proper shipping name, UN number, and all other required markings, as well as the appropriate hazard class label, must be placed on the same face of the package in close proximity to each other.
- Consignor and consignee information should appear on some face of the package in addition to appearing on the shipping papers that are enclosed in a pouch attached to the package.

6.4 Shipping Documentation

- If a sturdy cooler is used, whether UN-specification or not, complete a Cooler Shipment Checklist (see Attachment 1) and keep it in the project file.
- A Dangerous Goods Airbill must be completed, inserted into an adhesive pouch, and attached to the package in close proximity to the proper shipping name and hazard class label.
- Many carriers require a typed or computer-generated Dangerous Goods Airbill.
- If the Dangerous Goods Airbill has an area specifically designated for a “24-Hour Emergency Response” telephone number, insert “800-424-9300” into that space. If it does not, write “24-Hour Emergency Response Telephone Number: 800-424-9300” in the “Additional Handling Information” section of the airbill. Immediately following the telephone number, write “ERG-xxx,” where xxx is the 3-digit Emergency Response Guidebook page number that corresponds to the hazardous material being shipped.
- The shipper must sign the certification on the airbill.
- Prior to carrier pickup, a copy of the Dangerous Goods Airbill must be faxed to CHEMTREC at 703-741-6037 with a Shaw coversheet addressed to “ITCR.”

7. ATTACHMENTS

- Attachment 1, Shaw E & I Cooler Shipment Checklist

8. FORMS

None.

STANDARD OPERATING PROCEDURE

Subject: Decontamination of Contact Sampling Equipment

1. PURPOSE

This procedure is intended to provide minimal guidelines for the decontamination of contact sampling equipment. Contact sampling equipment is equipment that comes in direct contact with the sample or the portion of a sample that will undergo chemical analyses or physical testing.

2. SCOPE

This procedure applies to all instances where non-disposable direct contact sampling equipment is utilized for sample collection and no project-specific procedure is in place. This procedure is not intended to address decontamination of peristaltic or other sampling pumps and tubing. The steps outlined in this procedure must be executed between each distinct sample data point.

3. REFERENCES

- U.S. Environmental Protection Agency, Region 4, 2001, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, 980 College Station Road, Athens, Georgia. November.
- US Army Corp of Engineers, Washington, D.C., 2001, Requirements for the Preparation of Sampling and Analysis Plans (EM-200-1-3), February.

4. DEFINITIONS

- **Soap**—A standard brand of phosphate-free laboratory detergent, such as Liquinox®.
- **Organic Desorbing Agent**—A solvent used for removing organic compounds. The specific solvent would depend upon the type of organic compound to be removed. See Attachment 1 for recommendations.
- **Inorganic Desorbing Agent**—An acid solution for use in removing trace metal compounds. The specific acid solution would depend upon the type of inorganic compound to be removed. See Attachment 1 for recommendations.
- **Tap water**—Water obtained from any municipal water treatment system. An untreated potable water supply can be used as a substitute for tap water if the water does not contain the constituents of concern.
- **Distilled Water**—Water that has been purified via distillation. Distilled water can be purchased in most stores and is acceptable as a final rinse in non-trace analytical decontamination processes. Examples would include disposal profiling, HazCat, and other gross screening applications.
- **Analyte-free water**—Water that has been treated by passing through a standard deionizing resin column, and for organics either distillation or activated carbon units. At a minimum, the finished water should contain no detectable heavy metals or other inorganic compounds, and/or no detectable organic compounds (i.e., at or above analytical detection limits). Type I and Type II Reagent Grade Water meet this definition as does most laboratory-supplied blank water.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

Wear appropriate eye protection including safety goggles when working with corrosive liquids, especially when diluting concentrated materials to create low-percentage solutions and follow all project Health and Safety requirements. Decontamination wastes are to be recovered and handled as impacted project waste materials and must be disposed of in accordance with regulatory requirements.

A decontamination area should be established. Implements can either be immersed in a 5-gallon bucket containing each solution/rinse or the solutions can be contained in hand-held units made of an inert and compatible material; such as a Teflon™ wash bottle. The analyte-free water needs to be placed in a container that will be free of any compounds of concern.

Consult Attachment 1 for the decontamination solutions/solvents appropriate to the task. The minimum steps for decontamination are as follows:

1. Remove particulate matter and other surface debris by brushing and/or dipping in the soap solution.
2. Rinse thoroughly with tap water.
3. If necessary, rinse with other applicable solutions/solvents. If hexane is used, be sure to follow it with isopropyl alcohol to allow for the final water rinses to properly mix and contact the surface.
4. Final rinse three times to make sure all residual solutions/solvents are removed.
5. Place decontaminated equipment on a clean surface appropriate for the compounds of concern and allow to air dry.

7. ATTACHMENTS

- Attachment 1, Recommended Decontamination Procedures.

8. FORMS

None.

**Attachment 1
Recommended Decontamination Procedures**

Compound	Detergent Wash	Tap Water	Inorganic Desorbing Agent	Tap Water	Organic Desorbing Agent ¹	Final Water Rinse ⁴	Air Dry
Organic Constituents							
Volatile Organic Compounds	✓	✓			Methanol Purge & Trap grade	✓	✓
Base Neutrals/Acid Extractables/PCBs/Pesticides	✓	✓			Hexane followed by Isopropyl Alcohol	✓	✓
Organic Bases ²	✓	✓	1% nitric acid	✓	Isopropyl Alcohol	✓	✓
Organic Acids ³	✓	✓	1% nitric acid		Isopropyl Alcohol	✓	✓
Inorganic Constituents							
Trace Metals and Radio Isotopes	✓	✓	10% Nitric acid -Trace metals grade	✓		✓	✓
Cations/Anions	✓	✓				✓	✓
Acidic Compounds	✓	✓				✓	✓
Basic Compounds (caustic)	✓	✓	1% nitric acid	✓		✓	✓

1 – All organic solvents must be Pesticide Grade or better. The selection of appropriate solvent rinses should first consider if a *known or suspected* contaminant requires removal from sampling equipment. Secondly, identify whether the subsequent analytical protocol would be impacted by the proposed solvent or an impurity thereof (e.g., residual acetone present in isopropyl alcohol would be measured with certain volatile organics analysis).

2 - Organic bases include amines, hydrazines.

3 - Organic acids include phenols, thiols, nitro and sulfonic compounds.

4- Use a grade of water appropriate to the application. For trace level analysis this must be Analyte Free Water. For non-trace applications store-bought distilled water is sufficient

Adapted from: Appendix E, Requirements for the Preparation of Sampling and Analysis Plans (EM-200-1-3), February 2001. US Army Corp of Engineers, Washington, D.C.

Revision 1- 3/2006

STANDARD OPERATING PROCEDURE

Subject: Trowel/Spoon Surface Soil Sampling

1. PURPOSE

The purpose of this document is to provide the methods and procedure for sampling of surface soils using trowels or spoons. Trowels or spoons can be used when matrices are composed of relatively soft and non-cemented formations and to depths of up to 12 inches into the ground surface, dependent on site conditions. Samples for Volatile Organic Compound (VOC) analysis should not be collected via trowel or spoon method. However, a trowel or spoon may be utilized to penetrate to and expose the undisturbed material at the desired depth for sampling by more applicable methods.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where surface soil samples will be collected via trowel or spoon methods.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.6, EM200-1-3, Washington, D.C.

4. DEFINITIONS

- **Trowel**—A sample collection device with a curved and pointed metal blade attached to a handle. All trace environmental samples should be collected using stainless steel blades.
- **Spoon**—A sample collection device with a round metal blade attached to a handle.
- **Surface Soil**—Soil that is removed from the surface no greater than 6 inches below grade after removing vegetation, rocks, twigs, etc.
- **Weathered Soil**—The top 1/8 to 1/4 inch of soil impacted by heat from sun, rain, or foot traffic that could evaporate, dilute, or otherwise deposit contaminants from an adjacent location, thereby misrepresenting the actual soil characteristic.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for the maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be directed to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Equipment

- Decontaminated trowel or spoon, stainless steel construction for trace environmental sampling. If samples will be collected at depth (0-6 inches), the trowel or spoon will require decontamination prior to collection of the targeted-depth sample. Alternatively, a different trowel or spoon can be used to remove the material to the targeted depth and the sample collected using a clean dedicated trowel or spoon.
- Engineers rule or stiff measuring tape
- Decontaminated stainless steel mixing bowl

6.2 Sampling

1. Don a pair of clean gloves.
2. If desired, place plastic sheeting around the targeted location to keep sampled material in place. Use a knife to cut an access hole for the sample location.
3. Remove any surficial debris (e.g. vegetation, rocks, twigs) from the sample location and surrounding area until the soil is exposed. Once exposed, the soil surface is designated as "at grade," or 0 inches.
4. Use a trowel to scrape and remove the top 1/8 to 1/4 inch of weathered soil. (A spoon can be interchanged with trowel).
5. If collecting a sample that includes VOC analysis, collect the VOC sample aliquot first following more applicable methods.
6. With a new trowel, place the point of the blade on the ground. While holding the handle of the trowel, partially rotate the blade in a clockwise/counter-clockwise motion while pushing at a downward angle until the blade is inserted to the required depth or the blade is nearly covered. Be certain that the trowel is not inserted to a depth where the soil will touch the handle or other non-stainless steel portion of the trowel or the sampler's hand.
7. With a prying motion lift up the trowel with soil on the blade and place soil into the stainless steel mixing bowl.
8. Repeat steps 6 and 7 until the required depth of soil is placed into the mixing bowl.
9. Measure the depth of the sample location with a rule or tape to verify the sampling depth and record in the field logbook.
10. Homogenize the non-VOC sample and transfer the sample directly into the sample container(s). Cap the sample container(s), label the containers, complete the documentation, and place the containers into the sample cooler.

7. ATTACHMENTS

None.

8. FORMS

None.

STANDARD OPERATING PROCEDURE

Subject: Sampling for VOCs in Soil—Sealed-Cap (EnCore®) Sampler

1. PURPOSE

The purpose of this procedure is to provide general information about the procedure for using the Disposable EnCore® Sampler or other similar sealed-cap soil VOC samplers. These samplers are used to obtain and ship soil and clay samples for volatile organic compound (VOC) analysis, including GRO, in accordance with SW-846 Method 5035A and other related protocols.

2. SCOPE

This procedure applies to all instances where soils require sampling and shipment for VOC analysis using no headspace methods, including samples collected from drilling cores.

This procedure should not be used if collecting samples for pre-weighed vial VOC methods.

This procedure and these types of samplers are not applicable to non-elastic soils and non-compactable materials, such as loose sand, rocky soils, and gravel. Such materials should be sampled using alternative methods.

3. REFERENCES

- 3.1 U.S. Environmental Protection Agency, 1996, Method 5035A “Closed-System Purge and Trap for Volatile Organics in Soil and Waste,” *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, Revised December, Update IV.
- 3.2 En Novative Technologies, Inc., “Disposable EnCore® Sampler Sampling Procedures—Using the EnCore® T-Handle,” guide supplied with each case of samplers.

4. DEFINITIONS

- 4.1 **Sealed-Cap VOC Sampler**—A single-use volumetric sampling system designed to collect, store, and deliver soil samples for VOC methods that require no headspace.
- 4.2 **EnCore® Sampler**—A form of Sealed-Cap VOC Sampler designed and marketed by En Novative Technologies, Inc., of Green Bay, WI. The cartridges come in two sizes for sample volumes of approximately 25 or 5 grams.
- 4.3 **EnCore® T-Handle**—The specially machined holder for the EnCore® sampler sold separately by En Novative Technologies, Inc. The T-Handle provides the leverage needed to push the sampler into the soil, and should be used along with the sampler. In cases where a T-Handle is not available, it is possible though not recommended to grip the sampler by the sides, away from its sealing surfaces, with a pair of pliers or similar implement and push it into the soil.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for documenting information in sufficient detail to provide objective documentation (i.e. checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

For each sample location collected and for each applicable field or laboratory QC sample, a total of three samples will need to be obtained, as follows:

1. Open the sealed bag containing the sampler and, if using an EnCore®, push the plunger down until the small O-ring rests against the tabs.
2. If using an EnCore®, the locking lever on the T-Handle must be depressed as the cartridge is inserted. Line up the slots on the cartridge with the locking pins in the T-Handle. Plunger end first, insert cartridge into T-Handle with locking tabs aligned and twist the cartridge clockwise locking it in place.
3. Prepare the surface by removing grass, sticks, and other matter to allow the sampler to penetrate the intended location.
 - For hard pan soils and clays or excavations, scrape away the top few inches of the material to expose virgin and penetrable soil/clay for sampling.
 - When sampling subsurface cores, split the core cover lengthwise or push the core from the coring tube to expose the core and sample from points along the core.
4. Insert the cartridge device into the material being sampled with a downward twisting motion until full. If using the EnCore® system, observe the appropriate hole in the T-Handle and continue to push the sampler into the material being sampled until the small O-ring on the plunger is visible in the viewing hole (5g-bottom hole, 25g-top hole).
5. Withdraw sampling device from medium and use a fresh tissue to wipe off excess material from the outside of the cartridge body and especially the O-rings. If soil is protruding from the tube, carefully slice it off even with the open end using a clean knife or spatula.
6. For the EnCore® system, while the cartridge is still on the T-Handle, turn the T-Handle until the cartridge is facing upward and place the cap over the cartridge with the locking arms aligned with the flat surfaces of the locking ridge. Then gently push the cap onto the cartridge with even pressure, and twist the cap maintaining downward pressure until the arms lock against the ridge. Non-EnCore® systems must be sealed according to the manufacturer's instructions.

7. Inspect the cap and seal making sure that the cap is seated over the cartridge squarely and evenly. For the EnCore® system, both arms must be locked over the ridge or an imperfect seal will result, compromising the data.
8. Remove the capped sampler from its holder
9. For the EnCore® system, lock the plunger by rotating the plunger rod counterclockwise until the wings rest against the tabs
10. Complete and attach the label and seal the cartridge in the provided sampler bag.
11. Repeat steps 1-10 for the other two cartridges needed for the sample location, collecting each cartridge from undisturbed material as close as possible to the original location.
12. Place all three cartridges in the same bag and then label the outside of the bag per the project requirements
13. Place the labeled bag into a cooler with the project-required coolant (ice or dry ice).
14. Complete all required documentation and ship to the laboratory per the project plans

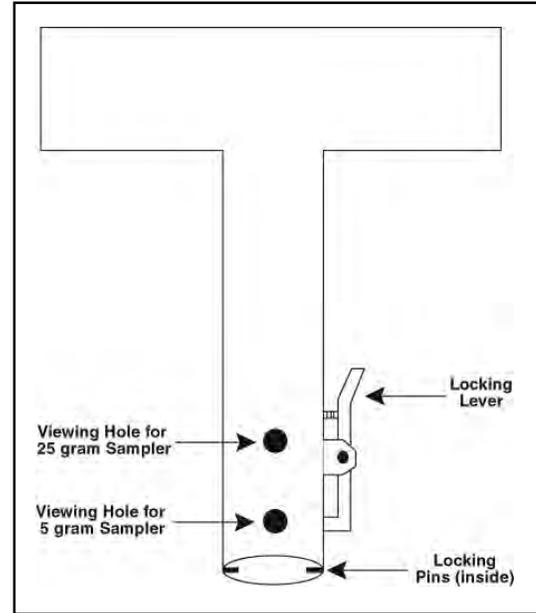
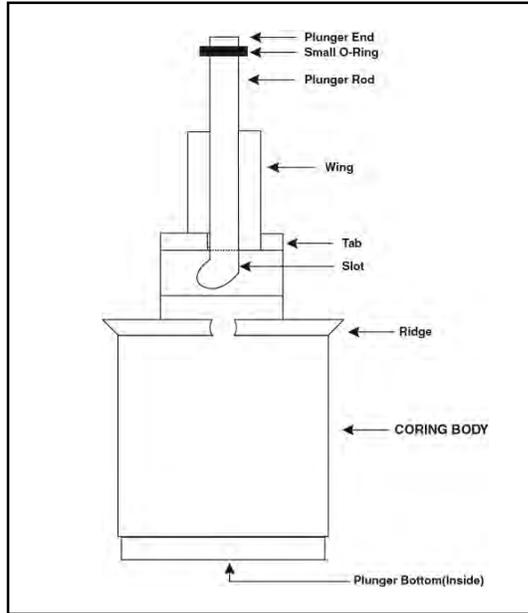
7. ATTACHMENTS

- **Attachment 1**—EnCore® Sampler Figures (from En Novative Technologies, Inc. web-site: <http://www.ennovativetech.com>).

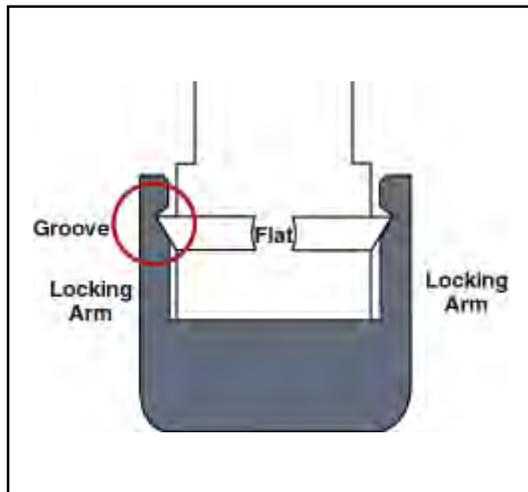
8. FORMS

None.

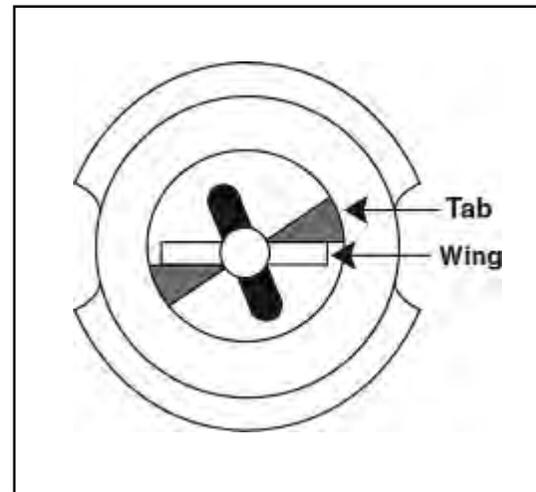
ATTACHMENT 1
ENCORE® SAMPLER FIGURES



T-Handle



Sampler Properly Capped



Plunger Top view

STANDARD OPERATING PROCEDURE

Subject: Hand Auger Sampling

1. PURPOSE

The purpose of this document is to provide the methods and procedure for sampling of soils and other solids using hand auger techniques. Hand auger sampling can be used when matrices are composed of relatively soft and non-cemented formations, to reach depths of up to 5 feet below ground surface, dependent on site conditions. Samples for Volatile Organic Compound (VOC) analysis should not be collected via hand auger methods. However, a hand auger may be utilized to penetrate to and expose the undisturbed material at the desired depth for sampling by more applicable methods.

2. SCOPE

This procedure is applicable to all Shaw E & I projects where soil samples will be collected via hand auger methods and no project-specific procedure exists.

3. REFERENCES

- U.S. Army Corps of Engineers, 2001, *Requirements for the Preparation of Sampling and Analysis Plans*, Appendix C, Section C.6, EM200-1-3, Washington, D.C.
- American Society of Testing and Materials, D1452-80 (re-approved 2000), *Standard Practice for Soil Investigation and Sampling by Auger Borings*, West Conshohocken, PA.

4. DEFINITIONS

- **Hand Auger**—A sample collection device consisting of metal rods with a T-bar handle and a detachable metal head. The auger head is a hollow metal tube with two cutting edges at the bottom curved into each other to hold the material pushed up into the tube as the auger is forced deeper. All trace environmental samples should be collected using stainless steel auger heads. See ASTM D1452 for a description of various types of augers available for use.
- **Sand Auger**—A type of auger with the cutting edges bent toward and touching each other. The design allows for the trapping of loosed materials in the auger tube.
- **Mud Auger**—A type of auger head with the top several inches open at the sides to allow for reduction of suction during removal from wetted and highly plastic materials, such as mud and lagoon solids.

5. RESPONSIBILITIES

5.1 Procedure Responsibility

The Field Sampling Discipline Lead is responsible for maintenance, management, and revision of this procedure. Questions, comments, or suggestions regarding this technical SOP should be sent to the Field Sampling Discipline Lead.

5.2 Project Responsibility

Shaw employees performing this task, or any portion thereof, are responsible for meeting the requirements of this procedure. Shaw employees conducting technical review of task performance are also responsible for following appropriate portions of this SOP.

For those projects where the activities of this SOP are conducted, the Project Manager, or designee, is responsible for ensuring that those activities are conducted in accordance with this and other appropriate procedures. Project participants are responsible for recording information in sufficient detail to provide objective documentation (checkprints, calculations, reports, etc.) that the requirements of this SOP have been met. Such documentation shall be retained as project records.

6. PROCEDURE

6.1 Equipment

The following equipment should be used when conducting hand auger sampling:

- Decontaminated commercial hand auger, stainless steel construction for trace environmental sampling (any of those mentioned in ASTM D1452 are acceptable). If samples will be collected at depth, the auger head will require decontamination prior to collection of the targeted-depth sample. Alternatively, one auger can be used to remove the material to the targeted depth, and the sample can be collected using a different, clean dedicated auger.
- Engineers rule or stiff measuring tape
- Stainless steel spoons or scoops—decontaminated or dedicated
- Decontaminated or dedicated stainless steel bowl

6.2 Sampling

The following procedure should be used for hand auger sampling:

1. Don a pair of clean gloves.
2. If desired, place plastic sheeting around the targeted location to keep sampled material in place. Use a knife to cut an access hole for the sample location.
3. Remove any surficial debris (e.g. vegetation, rocks, twigs) from the sample location and surrounding area.
4. Place the bucket of the hand auger on the ground with the teeth down, and, while holding the T-handle, rotate it in a clockwise direction while pushing straight downward until the bucket is full.
5. Extract the auger by pulling upward with a slight rocking or rotating motion (counter-clockwise) until the head is fully out of the hole.
6. Measure the depth of the sample bottom with the rule or tape and compare to the desired sampling depth.
7. Remove the soil with a spoon or scoop. If the material represents the desired sample, place it into the bowl. If it is not the material to be sampled, empty the auger bucket onto the ground or plastic and repeat steps 4 through 6 until the desired sample aliquot is collected, placing it into the sample bowl. Remember to either decontaminate the auger head or use a fresh one to collect the actual sample aliquot.

8. If collecting a sample for VOC analysis, expose the desired depth by following steps 4 through 6 and then collect the sample from undisturbed material, using a corer or syringe-type sampling device.
9. Homogenize the non-VOC sample and transfer the sample directly into the sample container(s). Cap the sample container(s), label, complete documentation, and place into the sample cooler.
10. Measure the depth from which the sample was taken and record it in the field logbook or sheet.
11. Repeat steps 4 through 10 for deeper samples from the same hole.

7. ATTACHMENTS

None.

8. FORMS

None.

APPENDIX C
Accutest Quality System Manual
Volume IX, Revision I: February 2008

Effective Date: March 07, 2008
Contract No. N62470-02-D-3260
Contract Task Order No. 0113

REMOVAL ACTION AT SITE 11
NAVAL WEAPONS STATION
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Shaw Project Number 128068

Quality Systems Manual has not been included. It is provided upon request at the discretion of the Project Manager.

APPENDIX D
Accutest
Standard Operating Procedures

Contract No. N62470-02-D-3260

Contract Task Order No. 0113

REMOVAL ACTION AT SITE 11
NAVAL WEAPONS STATION
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Shaw Project Number 128068

Laboratory SOPs are proprietary and confidential. They are provided upon request at the discretion of the Project Manager.

APPENDIX E
Accutest
NELAC Certifications and Navy Validation Letter

Contract No. N62470-02-D-3260

Contract Task Order No. 0113

REMOVAL ACTION AT SITE 11
NAVAL WEAPONS STATION YORKTOWN
CHEATHAM ANNEX
WILLIAMSBURG, VIRGINIA

Shaw Project Number 128068



DEPARTMENT OF THE NAVY

NAVAL SEA SYSTEMS COMMAND
1333 ISAAC HULL AVE SE
WASHINGTON NAVY YARD DC 20376-0001

IN REPLY TO

5090
Ser 04XQ (LABS)/061A
March 24, 2008

Ms. Svetlana Izosimova
Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, Florida 32811

Subj: COMPLETION LETTER REPORT, ACCUTEST LABORATORIES SOUTHEAST,
INC. – ORLANDO, FLORIDA

NAVSEA Laboratory Quality and Accreditation Office (LQAO) has concluded the assessment of Accutest Laboratories Southeast Inc., located in Orlando, Florida.

The assessment was intended as a general review of analytical capability to support remediation projects and the laboratory's ability to meet quality assurance requirements of the Navy Environmental Restoration (ER) program. The specific methods reviewed under the assessment are summarized in the attached table. This letter presents the outcome of our assessment documented in the following reports:

LQAO ltr 5090 Ser 04XQ(LABS)/042 of 19 Feb 08

LQAO ltr 5090 Ser 04XQ(LABS)/057 of 6 Mar 08

LQAO ltr 5090 Ser 04XQ(LABS)/060 of 10 Mar 08

- **Desk Assessment:** A review of laboratory supplied documentation was conducted. Documentation included the laboratory's quality assurance (QA) manual, selected standard operating procedures (SOPs) and SOP master list, list of major analytical instrumentation, and historical PT information. The documentation was reflective of a laboratory that was in a position to meet Navy requirements; however findings that required resolution were identified.
- **Proficiency Testing (PT) Samples:** Accutest Laboratories Southeast, Inc., participates in a number of external certification and PT programs, and provided results for the past two years. The laboratory has provided documentation that demonstrates that they have successfully completed two PT samples for all analyses within the scope of the assessment.

5090
Ser 04XQ (LABS)/061A
March 24, 2008

- **On-site Assessment:** Existing on-site assessment documentation is available and was applied to this assessment. The State of Florida Environmental Laboratory Accreditation Program (FL ELAP) conducted an on-site assessment of the laboratory on April 30 – May 4, 2007. FL ELAP is a National Environmental Laboratory Accreditation Conference (NELAC) recognized accreditation body. The State of Florida accepted the corrective actions and accredited the laboratory effective August 11, 2007, expiring June 30, 2008. The nature of the findings did not raise a level of concern that would require a Navy follow-up on-site assessment.
- **Corrective Actions:** The laboratory successfully remedied all of the Navy findings associated with the desk assessment.

The laboratory has provided documentation that demonstrates their capability to support environmental restoration projects (for the tests reviewed under this assessment, and summarized in the following table), and conformance to the DoD Quality Systems Manual. If you have questions concerning your standing in the Navy ER QA Program, please contact Pati Moreno at (805)982-1659.

Sincerely,

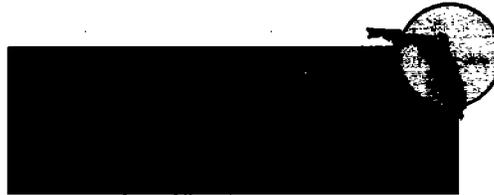


E. B. HARTZOG, JR.
Director, Laboratory Quality
and Accreditation Office

Copy To: NFESC (P. Moreno, Code '13)

Accutest Laboratories Southeast, Inc. - Methods Reviewed
(including parameters and matrices)

METHOD	PARAMETER	MATRIX
9014	Total Cyanide	Water/Solid
9056	Anions by Ion Chromatography	Water/Solid
8151A	Organochlorine Herbicides	Water/Solid
8260B	Volatile Organic Compounds	Water/Solid
8270C	Semivolatile Organic Compounds	Water/Solid
8310	Poly-Aromatic Hydrocarbons (PAHs)	Water/Solid
8081A	Organochlorine Pesticides	Water/Solid
8141A	Pesticides	Water/Solid
8015B	Gasoline Range Organics/Diesel Range Organics	Water/Solid
8082	Polychlorinated Biphenyls (PCBs)	Water/Solid
6010B/7000 Series	TAL Metals: Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, and Zinc	Water/Solid
8330	Explosives by HPLC	Water/Solid
8332	Nitroglycerin by HPLC	Water/Solid



**State of Florida
Department of Health, Bureau of Laboratories**

This is to certify that

**E83510
ACCUTEST LABORATORIES SOUTHEAST, INC.
4405 VINELAND ROAD, SUITE C-15
ORLANDO, FL 32811**

**has complied with Florida Administrative Code 64E-1,
for the examination of Environmental samples in the following categories**

DRINKING WATER - PRIMARY INORGANIC CONTAMINANTS, DRINKING WATER - SECONDARY INORGANIC CONTAMINANTS, DRINKING WATER - SYNTHETIC ORGANIC CONTAMINANTS, NON-POTABLE WATER - EXTRACTABLE ORGANICS, NON-POTABLE WATER - GENERAL CHEMISTRY, NON-POTABLE WATER - METALS, NON-POTABLE WATER - PESTICIDES-HERBICIDES-PCB'S, NON-POTABLE WATER - VOLATILE ORGANICS, SOLID AND CHEMICAL MATERIALS - EXTRACTABLE ORGANICS, SOLID AND CHEMICAL MATERIALS - GENERAL CHEMISTRY, SOLID AND CHEMICAL MATERIALS - METALS, SOLID AND CHEMICAL MATERIALS - PESTICIDES-HERBICIDES-PCB'S, SOLID AND CHEMICAL MATERIALS - VOLATILE ORGANICS, AIR AND EMISSIONS - VOLATILE ORGANICS

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

EFFECTIVE August 11, 2007 THROUGH June 30, 2008



A handwritten signature in black ink, appearing to read "Max Saifinger".

**Max Saifinger, M.D.
Chief, Bureau of Laboratories
Florida Department of Health
DH Form 1697, 7/04**

**NON-TRANSFERABLE E83510-10-8/11/2007
Supersedes all previously issued certificates**



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1	Synthetic Organic Contaminants	NELAP	9/6/2002
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 504.1	Synthetic Organic Contaminants	NELAP	9/6/2002
Arsenic	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Barium	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Cadmium	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Chromium	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Copper	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Mercury	EPA 245.1	Primary Inorganic Contaminants	NELAP	4/1/2003
Nickel	EPA 200.7	Primary Inorganic Contaminants	NELAP	4/1/2003
Perchlorate	EPA 314.0	Secondary Inorganic Contaminants	NELAP	2/3/2003



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,1-Trichloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,2,2-Tetrachloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,2-Trichloro-1,2,2-trifluoroethane	ALS MS 005.2	Volatile Organics	NELAP	7/23/2004
1,1,2-Trichloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloroethylene	EPA 624	Volatile Organics	NELAP	4/10/2002
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,4-Trichlorobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504	Volatile Organics	NELAP	4/10/2002
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1	Volatile Organics	NELAP	6/20/2007
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011	Volatile Organics	NELAP	7/1/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 504	Volatile Organics	NELAP	4/10/2002
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 504.1	Volatile Organics	NELAP	6/20/2007
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8011	Volatile Organics	NELAP	7/1/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 602	Volatile Organics	NELAP	4/10/2002
1,2-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	4/10/2002
1,2-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
1,2-Dichlorobenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2-Dichloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichloropropane	EPA 624	Volatile Organics	NELAP	4/10/2002

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Issue Date: 8/11/2007

Expiration Date: 6/30/2008



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.

4405 Vineland Road, Suite C-15

Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 602	Volatile Organics	NELAP	4/10/2002
1,3-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	4/10/2002
1,3-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
1,3-Dichlorobenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 602	Volatile Organics	NELAP	4/10/2002
1,4-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	4/10/2002
1,4-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
1,4-Dichlorobenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,4-Dioxane (1,4-Diethyleneoxide)	ALS MS-006	Extractable Organics	NELAP	8/25/2005
1-Chlorohexane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1-Methylnaphthalene	EPA 610	Extractable Organics	NELAP	6/20/2007
1-Methylnaphthalene	EPA 625	Extractable Organics	NELAP	6/20/2007
1-Methylnaphthalene	EPA 8310	Extractable Organics	NELAP	6/20/2007
1-Methylnaphthalene (added to method at FDEP request)	EPA 8270	Extractable Organics	NELAP	6/20/2007
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trichlorophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4-Dichlorophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dimethylphenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Issue Date: 8/11/2007

Expiration Date: 6/30/2008



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E83510**

EPA Lab Code: **FL00946**

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
2,4-Dinitrophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 625	Extractable Organics	NELAP	4/10/2002
2,4-Dinitrotoluene (2,4-DNT)	EPA 8091	Extractable Organics	NELAP	3/1/2005
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	3/1/2005
2,6-Dinitrotoluene (2,6-DNT)	EPA 625	Extractable Organics	NELAP	4/10/2002
2,6-Dinitrotoluene (2,6-DNT)	EPA 8091	Extractable Organics	NELAP	3/1/2005
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	3/1/2005
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Chloroethyl vinyl ether	EPA 624	Volatile Organics	NELAP	4/10/2002
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Chloronaphthalene	EPA 625	Extractable Organics	NELAP	4/10/2002
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Hexanone	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Methyl-4,6-dinitrophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylnaphthalene	EPA 610	Extractable Organics	NELAP	6/20/2007
2-Methylnaphthalene	EPA 625	Extractable Organics	NELAP	6/20/2007
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylnaphthalene	EPA 8310	Extractable Organics	NELAP	6/20/2007
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitrophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
3,3'-Dichlorobenzidine	EPA 625	Extractable Organics	NELAP	4/10/2002
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Issue Date: 8/11/2007

Expiration Date: 6/30/2008



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: **E83510**

EPA Lab Code: **FL00946**

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
4,4'-DDD	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDE	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDT	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
4-Bromophenyl phenyl ether	EPA 625	Extractable Organics	NELAP	4/10/2002
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloro-3-methylphenol	EPA 625	Extractable Organics	NELAP	4/10/2002
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorophenyl phenylether	EPA 625	Extractable Organics	NELAP	4/10/2002
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	7/1/2003
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
Acenaphthene	EPA 610	Extractable Organics	NELAP	4/10/2002
Acenaphthene	EPA 625	Extractable Organics	NELAP	4/10/2002
Acenaphthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 610	Extractable Organics	NELAP	4/10/2002
Acenaphthylene	EPA 625	Extractable Organics	NELAP	4/10/2002
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Acetone	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acetonitrile	EPA 8260	Volatile Organics	NELAP	4/1/2005
Acetophenone	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acrolein (Propenal)	EPA 624	Volatile Organics	NELAP	2/3/2003
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acrylonitrile	EPA 624	Volatile Organics	NELAP	2/3/2003
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	7/1/2003

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Issue Date: 8/11/2007

Expiration Date: 6/30/2008



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Aldrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Alkalinity as CaCO3	EPA 310.1	General Chemistry	NELAP	4/10/2002
Alkalinity as CaCO3	SM 2320 B	General Chemistry	NELAP	6/20/2007
Allyl chloride (3-Chloropropene)	EPA 8260	Volatile Organics	NELAP	4/1/2005
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/1/2005
Aluminum	EPA 200.7	Metals	NELAP	4/10/2002
Aluminum	EPA 6010	Metals	NELAP	7/1/2003
Ammonia as N	EPA 350.1	General Chemistry	NELAP	6/20/2007
Aniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 610	Extractable Organics	NELAP	4/10/2002
Anthracene	EPA 625	Extractable Organics	NELAP	4/10/2002
Anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Antimony	EPA 200.7	Metals	NELAP	4/10/2002
Antimony	EPA 6010	Metals	NELAP	7/1/2003
Aroclor-1016 (PCB-1016)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1221 (PCB-1221)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1232 (PCB-1232)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1242 (PCB-1242)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1248 (PCB-1248)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1254 (PCB-1254)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1260 (PCB-1260)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Arsenic	EPA 200.7	Metals	NELAP	4/10/2002
Arsenic	EPA 6010	Metals	NELAP	4/10/2002
Azinphos-methyl (Guthion)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Barium	EPA 200.7	Metals	NELAP	4/10/2002

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Issue Date: 8/11/2007

Expiration Date: 6/30/2008



Laboratory Scope of Accreditation

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State Laboratory ID: **E83510**

EPA Lab Code: **FL00946**

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Barium	EPA 6010	Metals	NELAP	7/1/2003
Benzene	EPA 602	Volatile Organics	NELAP	4/10/2002
Benzene	EPA 624	Volatile Organics	NELAP	4/10/2002
Benzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Benzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Benzidine	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)anthracene	EPA 610	Extractable Organics	NELAP	4/10/2002
Benzo(a)anthracene	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 610	Extractable Organics	NELAP	4/10/2002
Benzo(a)pyrene	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 610	Extractable Organics	NELAP	4/10/2002
Benzo(b)fluoranthene	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 610	Extractable Organics	NELAP	4/10/2002
Benzo(g,h,i)perylene	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 610	Extractable Organics	NELAP	4/10/2002
Benzo(k)fluoranthene	EPA 625	Extractable Organics	NELAP	4/10/2002
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzoic acid	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Beryllium	EPA 200.7	Metals	NELAP	4/10/2002
Beryllium	EPA 6010	Metals	NELAP	7/1/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Biochemical oxygen demand	EPA 405.1	General Chemistry	NELAP	4/10/2002
Biochemical oxygen demand	SM 5210 B	General Chemistry	NELAP	6/20/2007
bis(2-Chloroethoxy)methane	EPA 625	Extractable Organics	NELAP	4/10/2002

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E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroethyl) ether	EPA 625	Extractable Organics	NELAP	4/10/2002
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 625	Extractable Organics	NELAP	4/10/2002
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 625	Extractable Organics	NELAP	4/10/2002
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	7/1/2003
Bolstar (Sulprofos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Bromide	EPA 300.0	General Chemistry	NELAP	4/10/2002
Bromide	EPA 9056	General Chemistry	NELAP	7/1/2003
Bromobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromodichloromethane	EPA 624	Volatile Organics	NELAP	4/10/2002
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromoform	EPA 624	Volatile Organics	NELAP	4/10/2002
Bromoform	EPA 8260	Volatile Organics	NELAP	7/1/2003
Butyl benzyl phthalate	EPA 625	Extractable Organics	NELAP	4/10/2002
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Cadmium	EPA 200.7	Metals	NELAP	4/10/2002
Cadmium	EPA 6010	Metals	NELAP	4/10/2002
Calcium	EPA 200.7	Metals	NELAP	4/10/2002
Calcium	EPA 6010	Metals	NELAP	7/1/2003
Carbazole	EPA 8270	Extractable Organics	NELAP	7/1/2003
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	7/1/2003
Carbon tetrachloride	EPA 624	Volatile Organics	NELAP	4/10/2002
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Carbonaceous BOD (CBOD)	SM 5210 B	General Chemistry	NELAP	4/10/2002
Chemical oxygen demand	EPA 410.1	General Chemistry	NELAP	4/10/2002
Chemical oxygen demand	SM 5220 C	General Chemistry	NELAP	6/20/2007
Chlordane (tech.)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Chloride	EPA 300.0	General Chemistry	NELAP	4/10/2002
Chloride	EPA 9056	General Chemistry	NELAP	7/1/2003
Chlorobenzene	EPA 602	Volatile Organics	NELAP	4/10/2002
Chlorobenzene	EPA 624	Volatile Organics	NELAP	4/10/2002

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EPA Lab Code:

FL00946

(407) 425-6700

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Accutest Laboratories Southeast, Inc.

4405 Vineland Road, Suite C-15

Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Chlorobenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chloroethane	EPA 624	Volatile Organics	NELAP	4/10/2002
Chloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chloroform	EPA 624	Volatile Organics	NELAP	4/10/2002
Chloroform	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chloroprene	EPA 8260	Volatile Organics	NELAP	4/1/2005
Chlorothalonil	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Chlorpyrifos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Chromium	EPA 200.7	Metals	NELAP	4/10/2002
Chromium	EPA 6010	Metals	NELAP	4/10/2002
Chromium VI	EPA 7196	Metals	NELAP	7/1/2003
Chrysene	EPA 610	Extractable Organics	NELAP	4/10/2002
Chrysene	EPA 625	Extractable Organics	NELAP	4/10/2002
Chrysene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Chrysene	EPA 8310	Extractable Organics	NELAP	7/1/2003
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
cis-1,3-Dichloropropene	EPA 624	Volatile Organics	NELAP	4/10/2002
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Cobalt	EPA 200.7	Metals	NELAP	4/10/2002
Cobalt	EPA 6010	Metals	NELAP	7/1/2003
Color	EPA 110.2	General Chemistry	NELAP	4/10/2002
Color	SM 2120 B	General Chemistry	NELAP	6/20/2007
Conductivity	EPA 120.1	General Chemistry	NELAP	5/2/2005
Copper	EPA 200.7	Metals	NELAP	4/10/2002
Copper	EPA 6010	Metals	NELAP	4/10/2002
Coumaphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
delta-BHC	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Demeton-o	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Demeton-s	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Diazinon	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dibenz(a,h) anthracene	EPA 610	Extractable Organics	NELAP	4/10/2002
Dibenz(a,h) anthracene	EPA 625	Extractable Organics	NELAP	4/10/2002
Dibenz(a,h) anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003

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E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Dibenz(a,h) anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibromochloromethane	EPA 624	Volatile Organics	NELAP	4/10/2002
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dibromomethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dichloroprop (Dichlorprop)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dichlorovos (DDVP, Dichlorvos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dieldrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Diesel range organics (DRO)	EPA 8015	Extractable Organics	NELAP	7/1/2003
Diesel range organics (DRO)	MA-EPH	Extractable Organics	NELAP	7/1/2003
Diesel range organics (DRO)	OA-2	Extractable Organics	NELAP	4/1/2005
Diesel range organics (DRO)	TN-EPH	Extractable Organics	NELAP	6/20/2007
Diesel range organics (DRO)	WI-DRO	Extractable Organics	NELAP	4/1/2005
Diethyl ether	EPA 8260	Volatile Organics	NELAP	6/20/2007
Diethyl phthalate	EPA 625	Extractable Organics	NELAP	4/10/2002
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-isopropylether (DIPE)	EPA 8260	Volatile Organics	NELAP	6/20/2007
Dimethoate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dimethyl phthalate	EPA 625	Extractable Organics	NELAP	4/10/2002
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-butyl phthalate	EPA 625	Extractable Organics	NELAP	4/10/2002
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-octyl phthalate	EPA 625	Extractable Organics	NELAP	4/10/2002
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Disulfoton	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Endosulfan I	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan II	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan sulfate	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002

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Laboratory Scope of Accreditation

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State Laboratory ID: E83510 EPA Lab Code: FL00946 (407) 425-6700

**E83510
Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin aldehyde	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
EPN	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Ethane	RSK-175	Volatile Organics	NELAP	4/1/2005
Ethanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
Ethanol	EPA 8260	Volatile Organics	NELAP	6/20/2007
Ethoprop	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Ethyl acetate	EPA 8260	Volatile Organics	NELAP	6/20/2007
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	4/1/2005
Ethylbenzene	EPA 602	Volatile Organics	NELAP	4/10/2002
Ethylbenzene	EPA 624	Volatile Organics	NELAP	4/10/2002
Ethylbenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Ethylene	RSK-175	Volatile Organics	NELAP	4/1/2005
Ethyl-t-butylether (ETBE)	EPA 8260	Volatile Organics	NELAP	6/20/2007
Fensulfothion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Fenthion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Fluoranthene	EPA 610	Extractable Organics	NELAP	4/10/2002
Fluoranthene	EPA 625	Extractable Organics	NELAP	4/10/2002
Fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 610	Extractable Organics	NELAP	4/10/2002
Fluorene	EPA 625	Extractable Organics	NELAP	4/10/2002
Fluorene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Fluoride	EPA 300.0	General Chemistry	NELAP	4/10/2002
Fluoride	EPA 9056	General Chemistry	NELAP	7/1/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/1/2005
Gasoline range organics (GRO)	EPA 8015	Extractable Organics	NELAP	7/1/2003
Gasoline range organics (GRO)	MA-VPH	Extractable Organics	NELAP	7/1/2003
Gasoline range organics (GRO)	OA-1	Extractable Organics	NELAP	4/1/2005

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(407) 425-6700

E83510

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4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Gasoline range organics (GRO)	TN-GRO	Extractable Organics	NELAP	4/1/2005
Hardness	SM 2340 B	Metals	NELAP	1/24/2003
Heptachlor	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Heptachlor epoxide	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Hexachlorobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 625	Extractable Organics	NELAP	4/10/2002
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorocyclopentadiene	EPA 625	Extractable Organics	NELAP	4/10/2002
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachloroethane	EPA 625	Extractable Organics	NELAP	4/10/2002
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	7/1/2003
Ignitability	EPA 1010	General Chemistry	NELAP	7/1/2003
Indeno(1,2,3-cd)pyrene	EPA 610	Extractable Organics	NELAP	4/10/2002
Indeno(1,2,3-cd)pyrene	EPA 625	Extractable Organics	NELAP	4/10/2002
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Iron	EPA 200.7	Metals	NELAP	4/10/2002
Iron	EPA 6010	Metals	NELAP	7/1/2003
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8015	Volatile Organics	NELAP	4/1/2005
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	Volatile Organics	NELAP	4/1/2005
Isophorone	EPA 625	Extractable Organics	NELAP	4/10/2002
Isophorone	EPA 8270	Extractable Organics	NELAP	7/1/2003
Isopropyl alcohol (2-Propanol)	EPA 8015	Volatile Organics	NELAP	4/1/2005
Isopropyl ether	ALS MS 005	Volatile Organics	NELAP	8/25/2005
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Kjeldahl nitrogen - total	EPA 351.2	General Chemistry	NELAP	6/20/2007
Lead	EPA 200.7	Metals	NELAP	4/10/2002
Lead	EPA 6010	Metals	NELAP	4/10/2002
Magnesium	EPA 200.7	Metals	NELAP	4/10/2002
Magnesium	EPA 6010	Metals	NELAP	7/1/2003
Malathion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007

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Issue Date: 8/11/2007

Expiration Date: 6/30/2008



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Manganese	EPA 200.7	Metals	NELAP	4/10/2002
Manganese	EPA 6010	Metals	NELAP	5/21/2007
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Mercury	EPA 245.1	Metals	NELAP	4/10/2002
Mercury	EPA 7470	Metals	NELAP	4/10/2002
Merphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	4/1/2005
Methane	RSK-175	Volatile Organics	NELAP	4/1/2005
Methanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Methyl bromide (Bromomethane)	EPA 624	Volatile Organics	NELAP	4/10/2002
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl chloride (Chloromethane)	EPA 624	Volatile Organics	NELAP	4/10/2002
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	4/1/2005
Methyl parathion (Parathion, methyl)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Methyl tert-butyl ether (MTBE)	EPA 602	Volatile Organics	NELAP	6/20/2007
Methyl tert-butyl ether (MTBE)	EPA 624	Volatile Organics	NELAP	6/20/2007
Methyl tert-butyl ether (MTBE)	EPA 8021	Volatile Organics	NELAP	7/1/2003
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methylene chloride	EPA 624	Volatile Organics	NELAP	4/10/2002
Methylene chloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Mevinphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Molybdenum	EPA 200.7	Metals	NELAP	4/10/2002
Molybdenum	EPA 6010	Metals	NELAP	4/10/2002
Monocrotophos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Naled	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Naphthalene	EPA 610	Extractable Organics	NELAP	4/10/2002
Naphthalene	EPA 625	Extractable Organics	NELAP	4/10/2002
Naphthalene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Naphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Naphthalene	EPA 8310	Extractable Organics	NELAP	7/1/2003
n-Butyl alcohol	EPA 8015	Volatile Organics	NELAP	4/1/2005
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Nickel	EPA 200.7	Metals	NELAP	4/10/2002

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Charlie Crist
Governor



Ana M. Viamonte Ros, M.D., M.P.H.
State Surgeon General

Laboratory Scope of Accreditation

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Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

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EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Nickel	EPA 6010	Metals	NELAP	4/10/2002
Nitrate	EPA 9056	General Chemistry	NELAP	7/1/2003
Nitrate as N	EPA 300.0	General Chemistry	NELAP	4/10/2002
Nitrate-nitrite	EPA 300.0	General Chemistry	NELAP	4/10/2002
Nitrite	EPA 9056	General Chemistry	NELAP	7/1/2003
Nitrite as N	EPA 300.0	General Chemistry	NELAP	4/10/2002
Nitrobenzene	EPA 625	Extractable Organics	NELAP	4/10/2002
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	7/1/2003
Nitroglycerin	EPA 8332	Extractable Organics	NELAP	7/1/2003
n-Nitrosodimethylamine	EPA 625	Extractable Organics	NELAP	4/10/2002
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodi-n-propylamine	EPA 625	Extractable Organics	NELAP	4/10/2002
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodiphenylamine	EPA 625	Extractable Organics	NELAP	4/10/2002
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Propanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Oil & Grease	EPA 1664	General Chemistry	NELAP	9/8/2003
Oil & Grease	EPA 9070	General Chemistry	NELAP	7/1/2003
Organic nitrogen	EPA 351.2 - EPA 350.1	General Chemistry	NELAP	6/20/2007
Orthophosphate as P	EPA 365.3	General Chemistry	NELAP	4/10/2002
Parathion, ethyl	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
p-Dioxane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Pentachloroethane	EPA 8260	Volatile Organics	NELAP	4/1/2005
Pentachlorophenol	EPA 625	Extractable Organics	NELAP	4/10/2002
Pentachlorophenol	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pentaerythritoltetranitrate	ALS GC-020	Extractable Organics	NELAP	8/25/2005
Perchlorate	EPA 314.0	General Chemistry	NELAP	4/9/2003
pH	EPA 150.1	General Chemistry	NELAP	4/10/2002
pH	EPA 9040	General Chemistry	NELAP	7/1/2003
pH	SM 4500-H+-B	General Chemistry	NELAP	6/20/2007
Phenanthrene	EPA 610	Extractable Organics	NELAP	4/10/2002
Phenanthrene	EPA 625	Extractable Organics	NELAP	4/10/2002

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Ana M. Viamonte Ros, M.D., M.P.H.
State Surgeon General

Laboratory Scope of Accreditation

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Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Phenanthrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenanthrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Phenol	EPA 625	Extractable Organics	NELAP	4/10/2002
Phenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phorate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Phosphorus, total	EPA 365.3	General Chemistry	NELAP	5/21/2007
p-Isopropyltoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Potassium	EPA 200.7	Metals	NELAP	4/10/2002
Potassium	EPA 6010	Metals	NELAP	7/1/2003
Propionitrile (Ethyl cyanide)	EPA 8260	Volatile Organics	NELAP	4/1/2005
Pyrene	EPA 610	Extractable Organics	NELAP	4/10/2002
Pyrene	EPA 625	Extractable Organics	NELAP	4/10/2002
Pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Pyridine	EPA 8270	Extractable Organics	NELAP	7/1/2003
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Reactive cyanide	Sec. 7.3 SW-846	General Chemistry	NELAP	7/1/2003
Reactive sulfide	Sec. 7.3 SW-846	General Chemistry	NELAP	7/1/2003
Residue-filterable (TDS)	EPA 160.1	General Chemistry	NELAP	4/10/2002
Residue-filterable (TDS)	SM 2540 C	General Chemistry	NELAP	6/20/2007
Residue-nonfilterable (TSS)	EPA 160.2	General Chemistry	NELAP	4/10/2002
Residue-nonfilterable (TSS)	SM 2540 D	General Chemistry	NELAP	6/20/2007
Residue-total	EPA 160.3	General Chemistry	NELAP	1/24/2003
Residue-total	SM 2540 B	General Chemistry	NELAP	6/20/2007
Ronnel	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Selenium	EPA 200.7	Metals	NELAP	4/10/2002
Selenium	EPA 6010	Metals	NELAP	4/10/2002
Silver	EPA 200.7	Metals	NELAP	4/10/2002
Silver	EPA 6010	Metals	NELAP	7/1/2003
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Sodium	EPA 200.7	Metals	NELAP	4/10/2002
Sodium	EPA 6010	Metals	NELAP	7/1/2003
Stirofos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Styrene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Sulfate	EPA 300.0	General Chemistry	NELAP	4/10/2002

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**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Sulfate	EPA 9056	General Chemistry	NELAP	7/1/2003
Sulfide	EPA 376.1	General Chemistry	NELAP	4/10/2002
Sulfide	SM 4500-S F (20th Ed.)	General Chemistry	NELAP	6/20/2007
Sulfotep	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Surfactants - MBAS	EPA 425.1	General Chemistry	NELAP	4/10/2002
Surfactants - MBAS	SM 5540 C	General Chemistry	NELAP	6/20/2007
T-amylmethylether (TAME)	EPA 8260	Volatile Organics	NELAP	6/20/2007
tert-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	6/20/2007
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Tetrachloroethylene (Perchloroethylene)	EPA 624	Volatile Organics	NELAP	4/10/2002
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Tetraethyl pyrophosphate (TEPP)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Thallium	EPA 200.7	Metals	NELAP	4/10/2002
Thallium	EPA 6010	Metals	NELAP	7/1/2003
Tin	EPA 200.7	Metals	NELAP	4/1/2005
Tin	EPA 6010	Metals	NELAP	7/1/2003
Tokuthion (Prothiophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Toluene	EPA 602	Volatile Organics	NELAP	4/10/2002
Toluene	EPA 624	Volatile Organics	NELAP	4/10/2002
Toluene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Toluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Total cyanide	EPA 335.4	General Chemistry	NELAP	6/20/2007
Total cyanide	EPA 9012	General Chemistry	NELAP	6/20/2007
Total nitrate-nitrite	EPA 9056	General Chemistry	NELAP	7/1/2003
Total organic carbon	EPA 415.1	General Chemistry	NELAP	2/3/2003
Total organic carbon	EPA 9060	General Chemistry	NELAP	6/20/2007
Total organic carbon	SM 5310B	General Chemistry	NELAP	6/20/2007
Total organic carbon	SM 5310C	General Chemistry	NELAP	9/11/2002
Total Petroleum Hydrocarbons (TPH)	FL-PRO	Extractable Organics	NELAP	7/1/2003
Total phenolics	EPA 420.4	General Chemistry	NELAP	6/20/2007
Toxaphene (Chlorinated camphene)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
trans-1,2-Dichloroethylene	EPA 624	Volatile Organics	NELAP	4/10/2002
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
trans-1,3-Dichloropropylene	EPA 624	Volatile Organics	NELAP	4/10/2002

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Charlie Crist
Governor



Ana M. Viamonte Ros, M.D., M.P.H.
State Surgeon General

Laboratory Scope of Accreditation

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Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
trans-1,3-Dichloropropylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	4/1/2005
Trichloroethene (Trichloroethylene)	EPA 624	Volatile Organics	NELAP	4/10/2002
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichlorofluoromethane	EPA 624	Volatile Organics	NELAP	4/10/2002
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichloronate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Turbidity	EPA 180.1	General Chemistry	NELAP	4/10/2002
Un-ionized Ammonia	DEP SOP 10/03/83	General Chemistry	NELAP	2/3/2003
Vanadium	EPA 200.7	Metals	NELAP	4/10/2002
Vanadium	EPA 6010	Metals	NELAP	7/1/2003
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	7/1/2003
Vinyl chloride	EPA 624	Volatile Organics	NELAP	4/10/2002
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Xylene (total)	EPA 602	Volatile Organics	NELAP	2/3/2003
Xylene (total)	EPA 624	Volatile Organics	NELAP	9/8/2003
Xylene (total)	EPA 8021	Volatile Organics	NELAP	7/1/2003
Xylene (total)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Zinc	EPA 200.7	Metals	NELAP	4/10/2002
Zinc	EPA 6010	Metals	NELAP	4/10/2002

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EPA Lab Code: FL00946

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011	Volatile Organics	NELAP	4/10/2002
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8011	Volatile Organics	NELAP	4/10/2002
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	4/10/2002
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	4/10/2002
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	4/10/2002
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
1,4-Dioxane (1,4-Diethyleneoxide)	ALS MS-006	Extractable Organics	NELAP	8/25/2005
1-Chlorohexane	EPA 8260	Volatile Organics	NELAP	4/10/2002
1-Methylnaphthalene	EPA 8310	Extractable Organics	NELAP	6/20/2007
1-Methylnaphthalene (added to method at FDEP request)	EPA 8270	Extractable Organics	NELAP	6/20/2007
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	4/10/2002
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007

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Issue Date: 8/11/2007

Expiration Date: 6/30/2008

Charlie Crist
Governor



Ana M. Viamonte Ros, M.D., M.P.H.
State Surgeon General

Laboratory Scope of Accreditation

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Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

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Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	4/10/2002
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	3/7/2005
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	4/10/2002
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	3/7/2005
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	4/10/2002
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	4/10/2002
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	4/10/2002
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	4/10/2002
2-Hexanone	EPA 8260	Volatile Organics	NELAP	4/10/2002
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Methylnaphthalene	EPA 8310	Extractable Organics	NELAP	6/20/2007
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
2-Nitropropane	EPA 8260	Volatile Organics	NELAP	4/10/2002
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	4/10/2002
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	4/10/2002
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	4/10/2002
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	4/10/2002
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	4/10/2002
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	4/10/2002

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

Issue Date: 8/11/2007

Expiration Date: 6/30/2008



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	4/10/2002
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	4/10/2002
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	4/10/2002
Acenaphthene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Acenaphthene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Acetone	EPA 8260	Volatile Organics	NELAP	4/10/2002
Acetonitrile	EPA 8260	Volatile Organics	NELAP	4/1/2005
Acetophenone	EPA 8270	Extractable Organics	NELAP	2/3/2003
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	4/10/2002
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Allyl chloride (3-Chloropropene)	EPA 8260	Volatile Organics	NELAP	4/1/2005
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aluminum	EPA 6010	Metals	NELAP	4/10/2002
Ammonia as N	EPA 350.1	General Chemistry	NELAP	6/20/2007
Aniline	EPA 8270	Extractable Organics	NELAP	4/10/2002
Anthracene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Anthracene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Antimony	EPA 6010	Metals	NELAP	4/10/2002
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Arsenic	EPA 6010	Metals	NELAP	4/10/2002
Azinphos-methyl (Guthion)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007

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Laboratory Scope of Accreditation

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State Laboratory ID: **E83510**

EPA Lab Code: **FL00946**

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Barium	EPA 6010	Metals	NELAP	4/10/2002
Benzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Benzidine	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzo(k)fluoranthene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Benzoic acid	EPA 8270	Extractable Organics	NELAP	4/10/2002
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	4/10/2002
Beryllium	EPA 6010	Metals	NELAP	4/10/2002
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	4/10/2002
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	4/10/2002
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	4/10/2002
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	4/10/2002
Bolstar (Sulprofos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Bromide	EPA 9056	General Chemistry	NELAP	4/10/2002
Bromobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Bromoform	EPA 8260	Volatile Organics	NELAP	4/10/2002
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	4/10/2002
Cadmium	EPA 6010	Metals	NELAP	4/10/2002
Calcium	EPA 6010	Metals	NELAP	4/10/2002
Carbazole	EPA 8270	Extractable Organics	NELAP	4/10/2002
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	4/10/2002
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	4/10/2002
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Chloride	EPA 9056	General Chemistry	NELAP	4/10/2002
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002

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Issue Date: 8/11/2007

Expiration Date: 6/30/2008

Charlie Crist
Governor



Ana M. Viamonte Ros, M.D., M.P.H.
State Surgeon General

Laboratory Scope of Accreditation

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Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

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Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Chloroethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Chloroform	EPA 8260	Volatile Organics	NELAP	4/10/2002
Chloroprene	EPA 8260	Volatile Organics	NELAP	4/1/2005
Chlorothalonil	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Chlorpyrifos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Chromium	EPA 6010	Metals	NELAP	4/10/2002
Chromium VI	EPA 7196	General Chemistry	NELAP	1/24/2003
Chrysene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Chrysene	EPA 8310	Extractable Organics	NELAP	4/10/2002
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	4/10/2002
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Cobalt	EPA 6010	Metals	NELAP	4/10/2002
Copper	EPA 6010	Metals	NELAP	4/10/2002
Corrosivity (pH)	EPA 1110	General Chemistry	NELAP	4/10/2002
Coumaphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Demeton-o	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Demeton-s	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Diazinon	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dibenz(a,h) anthracene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Dibenz(a,h) anthracene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	4/10/2002
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Dibromomethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Dichloroprop (Dichlorprop)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dichlorovos (DDVP, Dichlorvos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Diesel range organics (DRO)	EPA 8015	Extractable Organics	NELAP	4/10/2002
Diesel range organics (DRO)	MA-EPH	Extractable Organics	NELAP	2/3/2003
Diesel range organics (DRO)	OA-2	Extractable Organics	NELAP	4/1/2005
Diesel range organics (DRO)	TN-EPH	Extractable Organics	NELAP	6/20/2007
Diethyl ether	EPA 8260	Volatile Organics	NELAP	6/20/2007
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	4/10/2002

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Laboratory Scope of Accreditation

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State Laboratory ID: E83510

EPA Lab Code: FL00946

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Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Dimethoate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	4/10/2002
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	4/10/2002
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	4/10/2002
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Disulfoton	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
EPN	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Ethanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
Ethoprop	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Ethyl acetate	EPA 8260	Volatile Organics	NELAP	6/20/2007
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	4/1/2005
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Ethyl-t-butylether (ETBE)	EPA 8260	Volatile Organics	NELAP	6/20/2007
Fensulfothion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Fenthion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Fluoranthene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Fluoranthene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Fluorene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Fluorene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Fluoride	EPA 9056	General Chemistry	NELAP	4/10/2002
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Gasoline range organics (GRO)	EPA 8015	Extractable Organics	NELAP	4/10/2002
Gasoline range organics (GRO)	MA-VPH	Extractable Organics	NELAP	2/3/2003
Gasoline range organics (GRO)	OA-1	Extractable Organics	NELAP	4/1/2005
Gasoline range organics (GRO)	TN-GRO	Extractable Organics	NELAP	4/1/2005
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	4/10/2002

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Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

**Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811**

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	4/10/2002
Ignitability	EPA 1010	General Chemistry	NELAP	4/10/2002
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	2/3/2003
Iron	EPA 6010	Metals	NELAP	4/10/2002
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8015	Volatile Organics	NELAP	4/1/2005
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	Volatile Organics	NELAP	4/1/2005
Isophorone	EPA 8270	Extractable Organics	NELAP	4/10/2002
Isopropyl alcohol (2-Propanol)	EPA 8015	Volatile Organics	NELAP	4/1/2005
Isopropyl ether	EPA 8260	Volatile Organics	NELAP	4/10/2002
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Kjeldahl nitrogen - total	EPA 351.2	General Chemistry	NELAP	6/20/2007
Lead	EPA 6010	Metals	NELAP	4/10/2002
Magnesium	EPA 6010	Metals	NELAP	4/10/2002
Malathion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Manganese	EPA 6010	Metals	NELAP	4/10/2002
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Mercury	EPA 7471	Metals	NELAP	4/10/2002
Merphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	4/1/2005
Methanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	4/1/2005
Methyl parathion (Parathion, methyl)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Methylene chloride	EPA 8260	Volatile Organics	NELAP	4/10/2002
Mevinphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Molybdenum	EPA 6010	Metals	NELAP	4/10/2002
Monocrotophos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Naled	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007

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Issue Date: 8/11/2007

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Charlie Crist
Governor



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State Surgeon General

Laboratory Scope of Accreditation

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Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

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Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Naphthalene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Naphthalene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Naphthalene	EPA 8310	Extractable Organics	NELAP	4/10/2002
n-Butyl alcohol	EPA 8015	Volatile Organics	NELAP	4/1/2005
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Nickel	EPA 6010	Metals	NELAP	4/10/2002
Nitrate	EPA 9056	General Chemistry	NELAP	4/10/2002
Nitrite	EPA 9056	General Chemistry	NELAP	4/10/2002
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	2/3/2003
Nitroglycerin	EPA 8332	Extractable Organics	NELAP	2/3/2003
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	4/10/2002
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	4/10/2002
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	4/10/2002
n-Propanol	EPA 8015	Volatile Organics	NELAP	4/1/2005
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	4/10/2002
Oil & Grease	EPA 9071	General Chemistry	NELAP	4/10/2002
Parathion, ethyl	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
p-Dioxane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Pentachloroethane	EPA 8260	Volatile Organics	NELAP	4/1/2005
Pentachlorophenol	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
Pentaerythritoltetranitrate	ALS GC-020	Extractable Organics	NELAP	8/25/2005
pH	EPA 9045	General Chemistry	NELAP	4/10/2002
Phenanthrene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Phenanthrene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Phenol	EPA 8270	Extractable Organics	NELAP	4/10/2002
Phorate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Phosphorus, total	EPA 365.3	General Chemistry	NELAP	6/20/2007
p-Isopropyltoluene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Potassium	EPA 6010	Metals	NELAP	4/10/2002
Propionitrile (Ethyl cyanide)	EPA 8260	Volatile Organics	NELAP	4/1/2005
Pyrene	EPA 8270	Extractable Organics	NELAP	4/10/2002
Pyrene	EPA 8310	Extractable Organics	NELAP	4/10/2002
Pyridine	EPA 8270	Extractable Organics	NELAP	4/10/2002

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Issue Date: 8/11/2007

Expiration Date: 6/30/2008



Laboratory Scope of Accreditation

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	4/10/2002
Reactive cyanide	Sec. 7.3 SW-846	General Chemistry	NELAP	4/10/2002
Reactive sulfide	Sec. 7.3 SW-846	General Chemistry	NELAP	4/10/2002
Ronnel	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Selenium	EPA 6010	Metals	NELAP	4/10/2002
Silver	EPA 6010	Metals	NELAP	4/10/2002
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Sodium	EPA 6010	Metals	NELAP	5/21/2007
Stirofos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Styrene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Sulfate	EPA 9056	General Chemistry	NELAP	4/10/2002
Sulfotep	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Synthetic Precipitation Leaching Procedure	EPA 1312	General Chemistry	NELAP	4/10/2002
T-amylmethylether (TAME)	EPA 8260	Volatile Organics	NELAP	6/20/2007
tert-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	6/20/2007
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Tetraethyl pyrophosphate (TEPP)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	4/10/2002
Thallium	EPA 6010	Metals	NELAP	4/10/2002
Tin	EPA 6010	Metals	NELAP	1/24/2003
Tokuthion (Prothiophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007
Toluene	EPA 8260	Volatile Organics	NELAP	4/10/2002
Total cyanide	EPA 9012	General Chemistry	NELAP	6/20/2007
Total nitrate-nitrite	EPA 9056	General Chemistry	NELAP	4/10/2002
Total organic carbon	EPA 9060	General Chemistry	NELAP	6/20/2007
Total Petroleum Hydrocarbons (TPH)	FL-PRO	Extractable Organics	NELAP	4/10/2002
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	4/10/2002
Toxicity Characteristic Leaching Procedure	EPA 1311	General Chemistry	NELAP	4/10/2002
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	4/10/2002
trans-1,3-Dichloropropylene	EPA 8260	Volatile Organics	NELAP	4/10/2002
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	4/1/2005
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	4/10/2002
Trichloronate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	6/20/2007

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Issue Date: 8/11/2007

Expiration Date: 6/30/2008

Charlie Crist
Governor



Ana M. Viamonte Ros, M.D., M.P.H.
State Surgeon General

Laboratory Scope of Accreditation

Page 27 of 28

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Vanadium	EPA 6010	Metals	NELAP	4/10/2002
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	4/10/2002
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	4/10/2002
Xylene (total)	EPA 8260	Volatile Organics	NELAP	4/10/2002
Zinc	EPA 6010	Metals	NELAP	4/10/2002

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Issue Date: 8/11/2007

Expiration Date: 6/30/2008

Charlie Crist
Governor



Ana M. Viamonte Ros, M.D., M.P.H.
State Surgeon General

Laboratory Scope of Accreditation

Page 28 of 28

Attachment to Certificate #: E83510-10, expiration date June 30, 2008. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E83510

EPA Lab Code: FL00946

(407) 425-6700

E83510

Accutest Laboratories Southeast, Inc.
4405 Vineland Road, Suite C-15
Orlando, FL 32811

Matrix: Air and Emissions

Analyte	Method/Tech	Category	Certification Type	Effective Date
Benzene	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Ethylbenzene	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Gasoline range organics (GRO)	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Isopropylbenzene	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Methyl tert-butyl ether (MTBE)	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Toluene	EPA TO-3	Volatile Organics	NELAP	7/1/2007
Xylene (total)	EPA TO-3	Volatile Organics	NELAP	7/1/2007

Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.

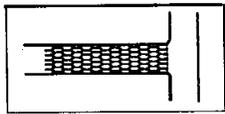
Issue Date: 8/11/2007

Expiration Date: 6/30/2008

APPENDIX F

VIRGINIA EROSION AND SEDIMENT CONTROL STANDARDS AND SPECIFICATIONS

STD & SPEC 3.02

TEMPORARY STONE
CONSTRUCTION ENTRANCEDefinition

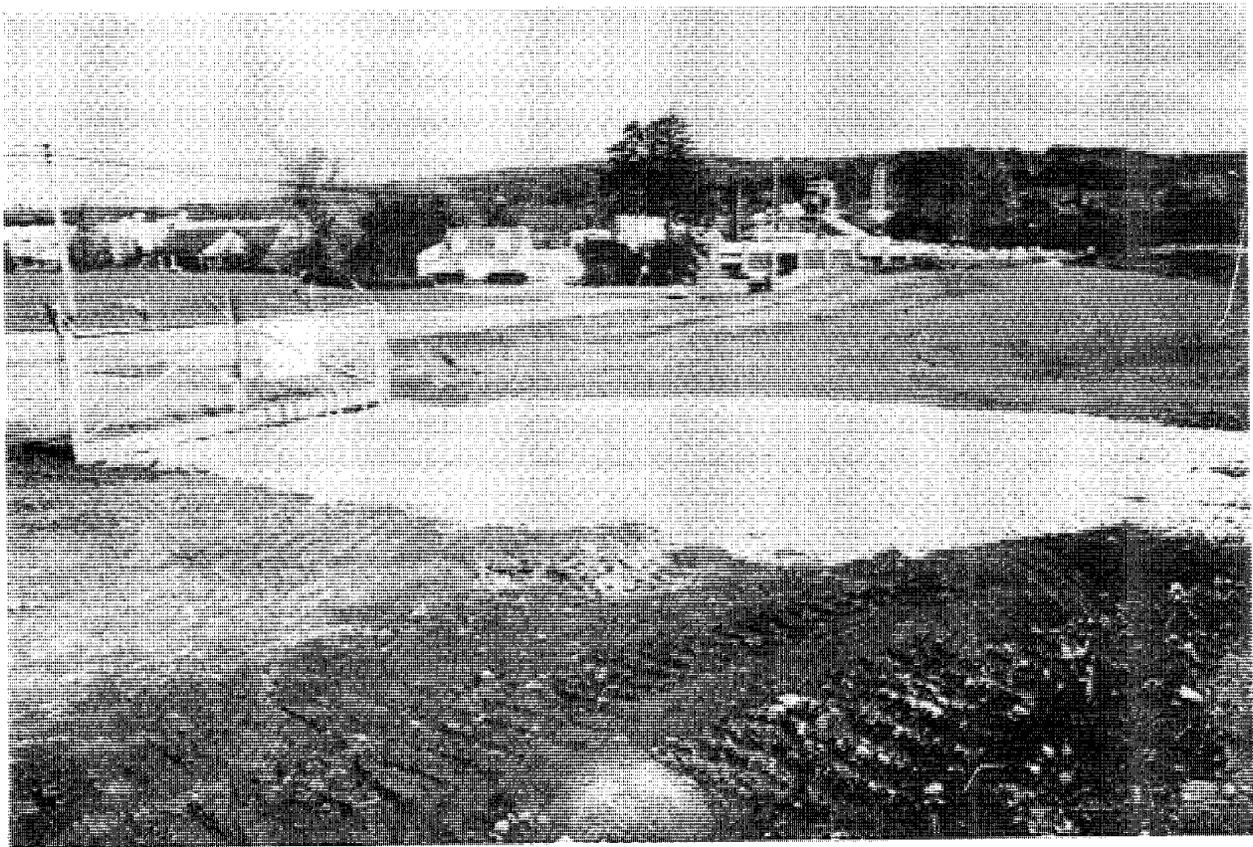
A stabilized stone pad with a filter fabric underliner located at points of vehicular ingress and egress on a construction site.

Purpose

To reduce the amount of mud transported onto paved public roads by motor vehicles or runoff.

Conditions Where Practice Applies

Wherever traffic will be leaving a construction site and move directly onto a public road or other paved area.



Planning Considerations

Minimum Standard #17 (MS #17) requires that provisions be made to minimize the transport of sediment by vehicular traffic onto a paved surface. Construction entrances provide an area where a significant amount of mud can be removed from construction vehicle tires before they enter a public road and, just as important, the soil adjacent to the paved surface can be kept intact. A filter fabric liner is used as a "separator" to minimize the dissipation of aggregate into the underlying soil due to construction traffic loads. If the action of the vehicles traveling over the gravel pad is not sufficient to remove the majority of the mud or there exists an especially sensitive traffic situation on the adjacent paved road, the tires must be washed before the vehicle enters the public road. If washing is necessary, provisions must be made to intercept the wash water and trap the sediment so it can be collected and stabilized. Construction entrances should be used in conjunction with the stabilization of construction roads (see Std. & Spec. 3.03, CONSTRUCTION ROAD STABILIZATION) to reduce the amount of mud picked up by construction vehicles and to do a better job of mud removal. Other innovative techniques for accomplishing the same purpose (such as a bituminous entrance) can be utilized, but only after specific plans and details are submitted to and approved by the appropriate Plan-Approving Authority.

Design Criteria

Aggregate Size

VDOT #1 Coarse Aggregate (2- to 3-inch stone) should be used.

Entrance Dimensions

The aggregate layer must be at least 6 inches thick; a minimum three inches of aggregate should be placed in a cut section to give the entrance added stability and to help secure filter cloth separator. It must extend the full width of the vehicular ingress and egress area and have a minimum 12-foot width. The length of the entrance must be at least 70 feet (see Plate 3.02-1).

Washing

If conditions on the site are such that the majority of the mud is not removed by the vehicles traveling over the stone, then the tires of the vehicles must be washed before entering the public road. Wash water must be carried away from the entrance to a approved settling area to remove sediment. All sediment shall be prevented from entering storm drains, ditches, or watercourses. A wash rack may also be used to make washing more convenient and effective (see Plate 3.02-1).

Location

The entrance should be located to provide for maximum utilization by all construction vehicles.

Construction Specifications

The area of the entrance must be excavated a minimum of 3 inches and must be cleared of all vegetation, roots, and other objectionable material. The filter fabric underliner will then be placed the full width and length of the entrance.

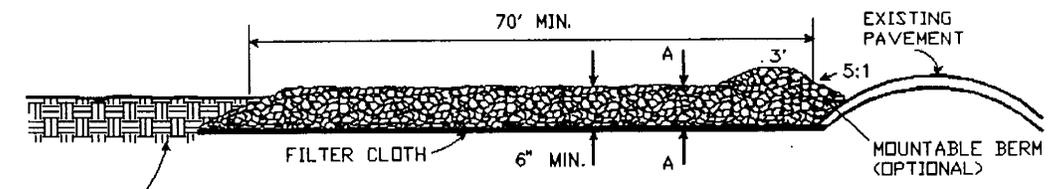
Following the installation of the filter cloth, the stone shall be placed to the specified dimensions. If wash racks are used, they should be installed according to manufacturer's specifications. Any drainage facilities required because of washing should be constructed according to specifications. Conveyance of surface water under entrance, through culverts, shall be provided as required. If such conveyance is impossible, the construction of a "mountable" berm with 5:1 slopes will be permitted.

The filter cloth utilized shall be a woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals and hydrocarbons, be mildew and rot resistant, and conform to the physical properties noted in Table 3.02-A.

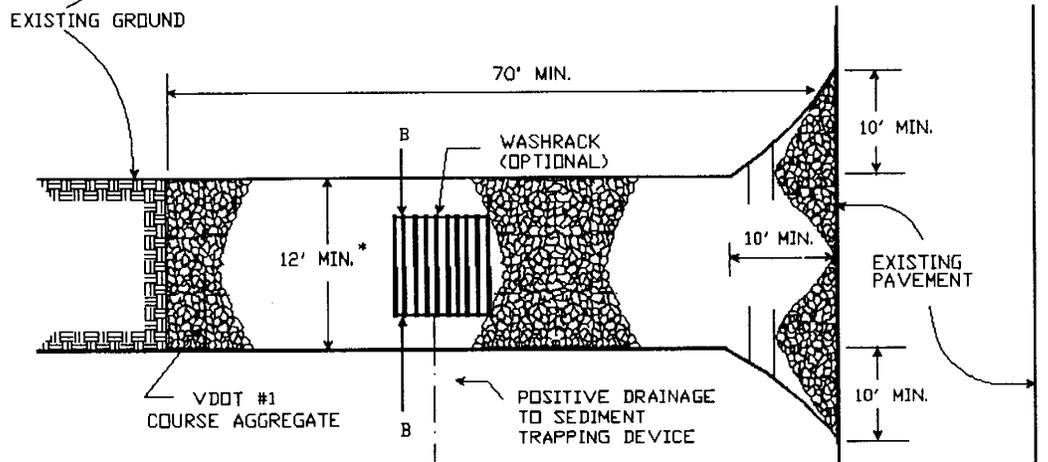
Maintenance

The entrance shall be maintained in a condition which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with additional stone or the washing and reworking of existing stone as conditions demand and repair and/or cleanout of any structures used to trap sediment. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately. The use of water trucks to remove materials dropped, washed, or tracked onto roadways will not be permitted under any circumstances.

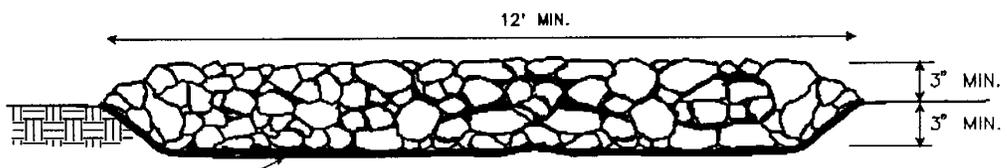
STONE CONSTRUCTION ENTRANCE



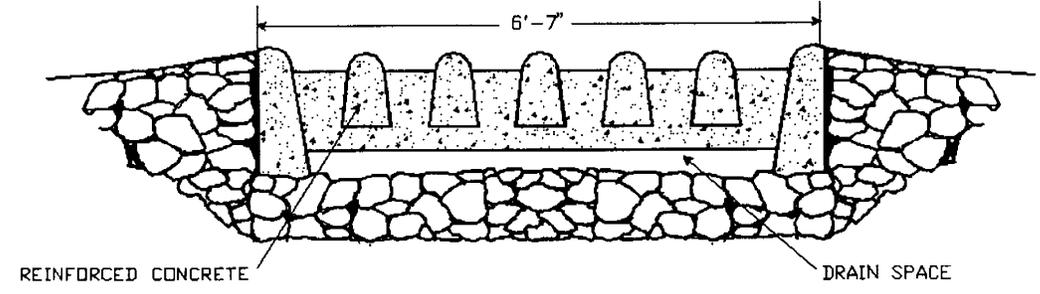
SIDE ELEVATION



PLAN VIEW



SECTION A-A



SECTION B-B

Source: Adapted from 1983 Maryland Standards for Soil Erosion and Sediment Control, and Va. DSWC

Plate 3.02-1

TABLE 3.02-A

**CONSTRUCTION SPECIFICATIONS
FOR FILTER CLOTH UNDERLINER**

<u>Fabric Properties¹</u>	<u>Light-Duty Entrance² (Graded Subgrade)</u>	<u>Heavy-Duty Entrance³ (Rough Graded)</u>	<u>Test Method</u>
Grab Tensile Strength (lbs.)	200	220	ASTM D1682
Elongation at Failure (%)	50	220	ASTM D1682
Mullen Burst Strength (lbs.)	190	430	ASTM D3786
Puncture Strength (lbs.)	40	125	ASTM D751 (modified)
Equivalent Opening Size (mm)	40-80	40-80	U.S. Standard Sieve CW-02215

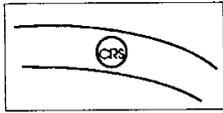
¹ Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

² Light Duty Entrance: Sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Examples of fabrics which can be used are: Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

³ Heavy Duty Entrance: Sites with only rough grading and where most travel would be multi-axle vehicles. Examples of fabrics which can be used are: Trevira Spunbond 1135, Mirafi 600X, or equivalent.

Source: Virginia Highway and Transportation Research Council (VHTRC)

STD & SPEC 3.03

**CONSTRUCTION ROAD
STABILIZATION**Definition

The temporary stabilization of access roads, subdivision roads, parking areas, and other on-site vehicle transportation routes with stone immediately after grading.

Purposes

1. To reduce the erosion of temporary roadbeds by construction traffic during wet weather.
2. To reduce the erosion and subsequent regrading of permanent roadbeds between the time of initial grading and final stabilization.

Conditions Where Practice Applies

Wherever stone-base roads or parking areas are constructed, whether permanent or temporary, for use by construction traffic.



Planning Considerations

Areas which are graded for construction vehicle transport and parking purposes are especially susceptible to erosion. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires which generate significant quantities of sediment that may pollute nearby streams or be transported off site on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Immediate stabilization of such areas with stone may cost money at the outset, but it may actually save money in the long run by increasing the usefulness of the road during wet weather.

Permanent roads and parking areas should be paved as soon as possible after grading. However, it is understandable that weather conditions or the potential for damage may not make paving feasible in the early phases of the development project. As an alternative, the early application of stone may solve potential erosion and stability problems and eliminate later regrading costs. Some of the stone will also probably remain in place for use as part of the final base course in the construction of the road.

Specifications

Temporary Access Roads and Parking Areas

1. Temporary roads shall follow the contour of the natural terrain to the extent possible. Slopes should not exceed 10 percent.
2. Temporary parking areas should be located on naturally flat areas to minimize grading. Grades should be sufficient to provide drainage but should not exceed 4 percent.
3. Roadbeds shall be at least 14 feet wide for one-way traffic and 20 feet wide for two-way traffic.
4. All cuts and fills shall be 2:1 or flatter to the extent possible.
5. Drainage ditches shall be provided as needed and shall be designed and constructed in accordance with STORMWATER CONVEYANCE CHANNEL, Std. & Spec. 3.17.
6. The roadbed or parking surface shall be cleared of all vegetation, roots and other objectionable material.

7. A 6-inch course of VDOT #1 Coarse Aggregate shall be applied immediately after grading or the completion of utility installation within the right-of-way. Filter fabric may be applied to the roadbed for additional stability. Design specifications for filter fabric can be found within Std. & Spec. 3.02, TEMPORARY STONE CONSTRUCTION ENTRANCE. In "heavy duty" traffic situations (see Table 3.02-A), stone should be placed at an 8- to 10-inch depth to avoid excessive dissipation or maintenance needs.

Permanent Roads and Parking Areas

Permanent roads and parking areas shall be designed and constructed in accordance with applicable VDOT or local criteria except that an initial base course of gravel of at least 6 inches shall be applied immediately following grading.

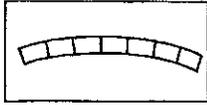
Vegetation

All roadside ditches, cuts, fills and disturbed areas adjacent to parking areas and roads shall be stabilized with appropriate temporary or permanent vegetation according to the applicable standards and specifications contained in this handbook.

Maintenance

Both temporary and permanent roads and parking areas may require periodic top dressing with new gravel. Seeded areas adjacent to the roads and parking areas should be checked periodically to ensure that a vigorous stand of vegetation is maintained. Roadside ditches and other drainage structures should be checked regularly to ensure that they do not become clogged with silt or other debris.

STD & SPEC 3.04



STRAW BALE BARRIER

Definition

A temporary sediment barrier consisting of a row of entrenched and anchored straw bales.

Purposes

1. To intercept and detain small amounts of sediment from disturbed areas of limited extent in order to prevent sediment from leaving the construction site.
2. To decrease the velocity of sheet flows.



Conditions Where Practice Applies

1. Below disturbed areas subject to sheet and rill erosion.
2. Where the size of the drainage area is no greater than one-fourth of an acre per 100 feet of barrier length; the maximum slope length behind the barrier is 100 feet; and the maximum slope gradient behind the barrier is 50 percent (2:1).
3. Where effectiveness is required for less than 3 months.
4. Under no circumstances should straw bale barriers be constructed in live streams or in swales where there is the possibility of a washout.
5. The measure should not be used where water may concentrate in defined ditches and minor swales.
6. Straw bale barriers shall not be used on areas where rock or another hard surface prevents the full and uniform anchoring of the barrier.

Planning Considerations

Based on observations made in Virginia, Pennsylvania, Maryland and other parts of the nation, straw bale barriers have not been as effective as many users had hoped they would be - especially when used to slow down and filter concentrated flows. They should be used judiciously and with caution as erosion control measures. There are three major reasons for such ineffectiveness.

First, improper utilization of straw bale barriers has been a major problem. Straw bale barriers have been used in streams and drainageways where high water depth and velocities have destroyed or damaged the control. Secondly, improper placement and installation of the barriers, such as staking the bales directly to the ground with no soil seal or entrenchment, has allowed undercutting and end flow. This has resulted in additions of, rather than removal of, sediment from runoff waters. Finally, inadequate maintenance lowers the effectiveness of these barriers. Trapping efficiencies of carefully installed straw bale barriers on one project in Virginia dropped from 57% to 16% in one month due to lack of maintenance.

There are serious questions about the continued use of straw bale barriers as they are presently installed and maintained. Averaging from \$3 to \$6 per linear foot, the thousands of straw bale barriers used annually in Virginia represent such a considerable expense that optimum installation procedures should be emphasized.

Design Criteria

A formal design is not required. However, an effort should be made to locate the straw bale barrier, as well as other perimeter controls, at least 5 to 7 feet from the base of disturbed slopes with grades greater than 7%. This will help prevent the measure from being rendered useless following the initial movement of soil.

Construction Specifications

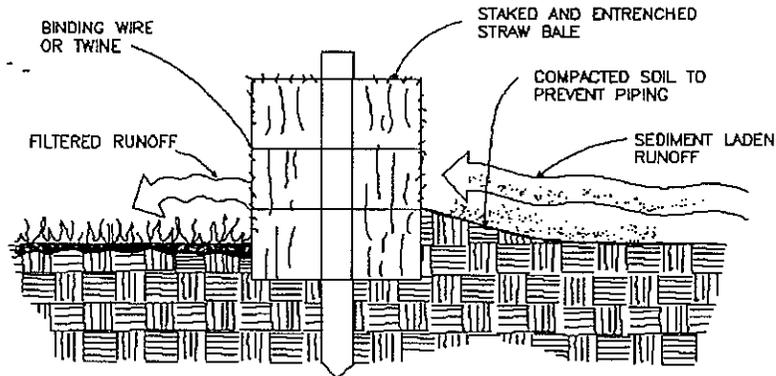
Sheet Flow Application

1. Bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another.
2. All bales shall be either wire-bound or string-tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings (see Plate 3.04-1).
3. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging), the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier (see Plate 3.04-1).
4. Each bale shall be securely anchored by at least two stakes (minimum dimensions 2 inches x 2 inches x 36 inches) or standard "T" or "U" steel posts (minimum weight of 1.33 pounds per linear foot) driven through the bale. The first stake or steel post in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or steel pickets shall be driven a minimum 18 inches deep into the ground to securely anchor the bales.
5. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency.
6. Inspection shall be frequent and repair or replacement shall be made promptly as needed.
7. Straw bale barriers shall be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

Maintenance

1. Straw bale barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.
2. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales.
3. Necessary repairs to barriers or replacement of bales shall be accomplished promptly.
4. Sediment deposits should be removed after each rainfall. They must be removed when the level of deposition reaches approximately one-half the height of the barrier.
5. Any sediment deposits remaining in place after the straw bale barrier is no longer required shall be dressed to conform to the existing grade, prepared and seeded.

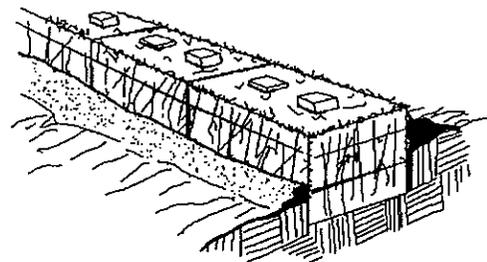
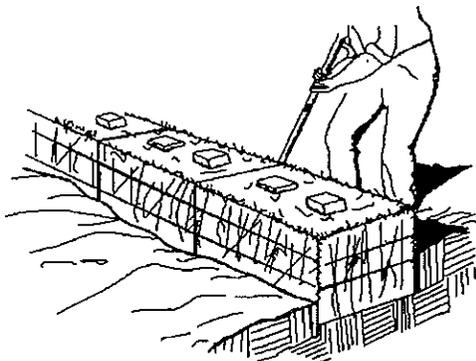
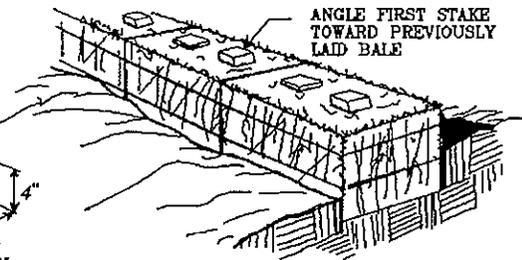
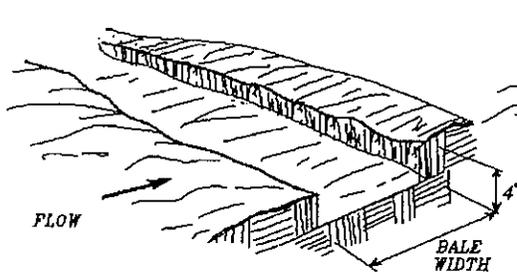
STRAW BALE BARRIER



PROPERLY INSTALLED STRAW BALE
(CROSS SECTION)

1. EXCAVATE THE TRENCH.

2. PLACE AND STAKE STRAW BALES.

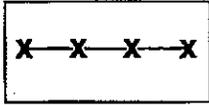


3. WEDGE LOOSE STRAW BETWEEN BALES.

4. BACKFILL AND COMPACT THE EXCAVATED SOIL.

CONSTRUCTION OF STRAW BALE BARRIER

STD & SPEC 3.05



SILT FENCE

Definition

A temporary sediment barrier consisting of a synthetic filter fabric stretched across and attached to supporting posts and entrenched.

Purposes

1. To intercept and detain small amounts of sediment from disturbed areas during construction operations in order to prevent sediment from leaving the site.
2. To decrease the velocity of sheet flows and low-to-moderate level channel flows.



Conditions Where Practice Applies

1. Below disturbed areas where erosion would occur in the form of sheet and rill erosion.
2. Where the size of the drainage area is no more than one quarter acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2:1).
3. In minor swales or ditch lines where the maximum contributing drainage area is no greater than 1 acre and flow is no greater than 1 cfs.
4. Silt fence will not be used in areas where rock or some other hard surface prevents the full and uniform depth anchoring of the barrier.

Planning Considerations

Laboratory work at the Virginia Highway and Transportation Research Council (VHTRC) has shown that silt fences can trap a much higher percentage of suspended sediments than straw bales, though silt fence passes the sediment-laden water slower. Silt fences are preferable to straw barriers in many cases because of their durability and potential cost savings. While the failure rate of silt fences is lower than that of straw barriers, many instances have been observed where silt fences are improperly installed, inviting failure and sediment loss. The installation methods outlined here can improve performance and reduce failures.

As noted, flow rate through silt fence is significantly lower than the flow rate for straw bale barriers. This creates more ponding and hence more time for sediment to fall out. Table 3.05-A demonstrates these relationships.

Both woven and non-woven synthetic fabrics are commercially available. The woven fabrics generally display higher strength than the non-woven fabrics and, in most cases, do not require any additional reinforcement. When tested under acid and alkaline water conditions, most of the woven fabrics increase in strength, while the reactions of non-woven fabrics to these conditions are variable. The same is true of testing under extensive ultraviolet radiation. Permeability rates vary regardless of fabric type. While all of the fabrics demonstrate very high filtering efficiencies for sandy sediments, there is considerable variation among both woven and non-woven fabrics when filtering the finer silt and clay particles.

Design Criteria

1. No formal design is required. As with straw bale barriers, an effort should be made to locate silt fence at least 5 feet to 7 feet beyond the base of disturbed slopes with grades greater than 7%.

TABLE 3.05-A

**TYPICAL FLOW RATES AND FILTERING
EFFICIENCIES OF PERIMETER CONTROL**

<u>Material</u>	<u>Flow Rate (gal./sq.ft./min)</u>	<u>Filter Efficiency(%)</u>
Straw	5.6	67
Synthetic Fabric	0.3	97

Source: VHTRC

2. The use of silt fences, because they have such a low permeability, is limited to situations in which only sheet or overland flows are expected and where concentrated flows originate from drainage areas of 1 acre or less.
3. Field experience has demonstrated that, in many instances, silt fence is installed too short (less than 16 inches above ground elevation). The short fence is subject to breaching during even small storm events and will require maintenance "clean outs" more often. Properly supported silt fence which stands 24 to 34 inches above the existing grade tends to promote more effective sediment control.

Construction Specifications

Materials

1. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to the requirements noted in Table 3.05-B.
2. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0° F to 120° F.
3. If wooden stakes are utilized for silt fence construction, they must have a diameter of 2 inches when oak is used and 4 inches when pine is used. Wooden stakes must have a minimum length of 5 feet.

TABLE 3.05-B
PHYSICAL PROPERTIES OF
FILTER FABRIC IN SILT FENCE

<u>Physical Property</u>	<u>Test</u>	<u>Requirements</u>
Filtering Efficiency	ASTM 5141	75% (minimum)
Tensile Strength at 20% (max.) Elongation*	VTM-52	Extra Strength - 50 lbs./linear inch (minimum) Standard Strength - 30 lbs./linear inch (minimum)
Flow Rate	ASTM 5141	0.2 gal./sq.ft./ minute (minimum)
Ultraviolet Radiation Stability %	ASTM-G-26	90% (minimum)

* Requirements reduced by 50% after six months of installation.

Source: VHTRC

4. If steel posts (standard "U" or "T" section) are utilized for silt fence construction, they must have a minimum weight of 1.33 pounds per linear foot and shall have a minimum length of 5 feet.
5. Wire fence reinforcement for silt fences using standard-strength filter cloth shall be a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.

Installation

1. The height of a silt fence shall be a minimum of 16 inches above the original ground surface and shall not exceed 34 inches above ground elevation.

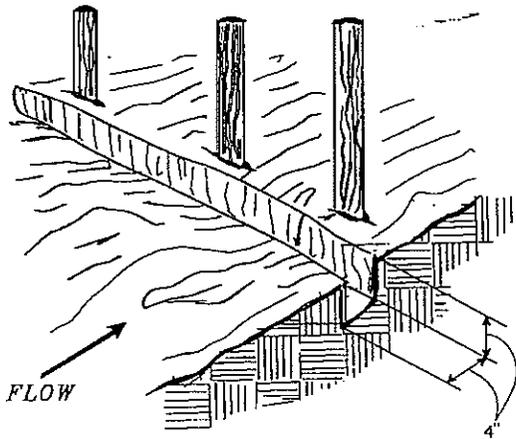
2. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and securely sealed.
3. A trench shall be excavated approximately 4-inches wide and 4-inches deep on the upslope side of the proposed location of the measure.
4. When wire support is used, standard-strength filter cloth may be used. Posts for this type of installation shall be placed a maximum of 10-feet apart (see Plate 3.05-1). The wire mesh fence must be fastened securely to the upslope side of the posts using heavy duty wire staples at least one inch long, tie wires or hog rings. The wire shall extend into the trench a minimum of two inches and shall not extend more than 34 inches above the original ground surface. The standard-strength fabric shall be stapled or wired to the wire fence, and 8 inches of the fabric shall be extended into the trench. The fabric shall not be stapled to existing trees.
5. When wire support is not used, extra-strength filter cloth shall be used. Posts for this type of fabric shall be placed a maximum of 6-feet apart (see Plate 3.05-2). The filter fabric shall be fastened securely to the upslope side of the posts using one inch long (minimum) heavy-duty wire staples or tie wires and eight inches of the fabric shall be extended into the trench. The fabric shall not be stapled to existing trees. This method of installation has been found to be more commonplace than #4.
6. If a silt fence is to be constructed across a ditch line or swale, the measure must be of sufficient length to eliminate endflow, and the plan configuration shall resemble an arc or horseshoe with the ends oriented upslope (see Plate 3.05-2). Extra-strength filter fabric shall be used for this application with a maximum 3-foot spacing of posts.

All other installation requirements noted in #5 apply.

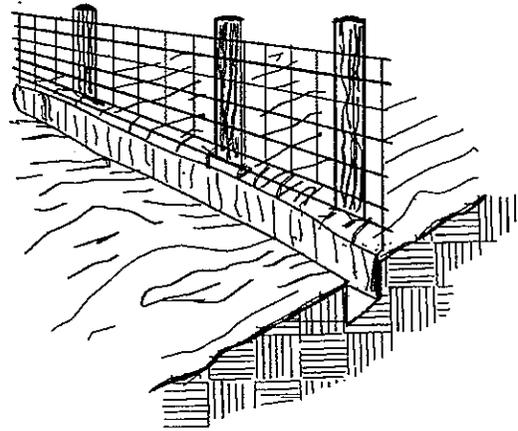
7. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric.
8. Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)

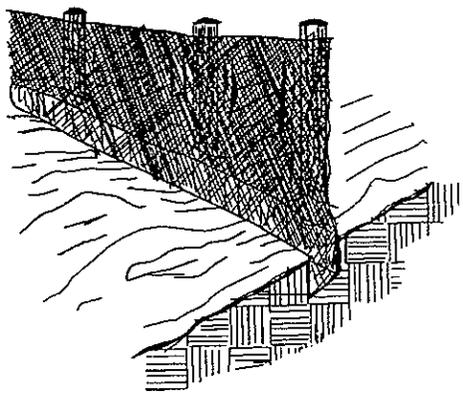
1. SET POSTS AND EXCAVATE A 4"X4" TRENCH UPSLOPE ALONG THE LINE OF POSTS.



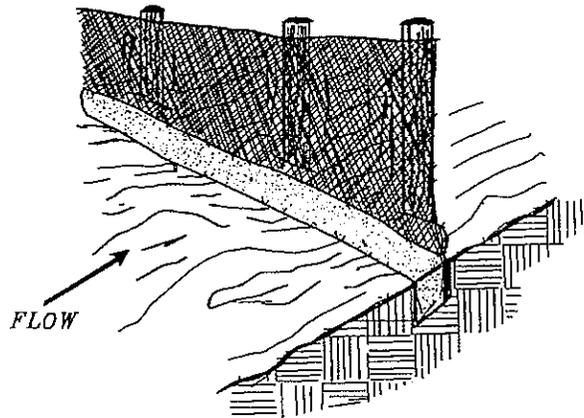
2. STAPLE WIRE FENCING TO THE POSTS.



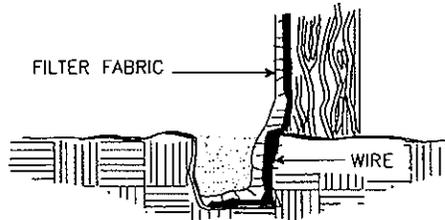
3. ATTACH THE FILTER FABRIC TO THE WIRE FENCE AND EXTEND IT INTO THE TRENCH.



4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



EXTENSION OF FABRIC AND WIRE INTO THE TRENCH.

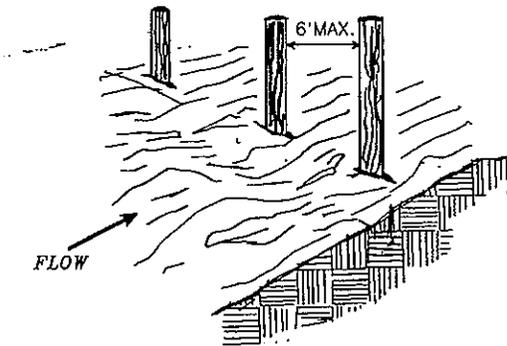


Source: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sherwood and Wyant

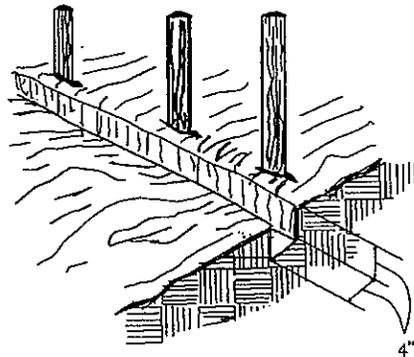
Plate 3.05-1

CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)

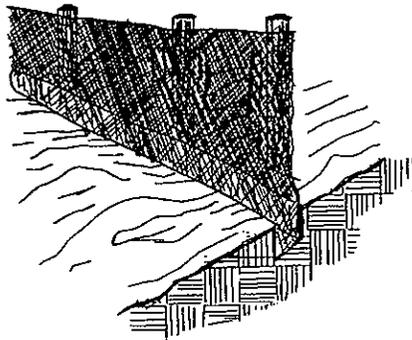
1. SET THE STAKES.



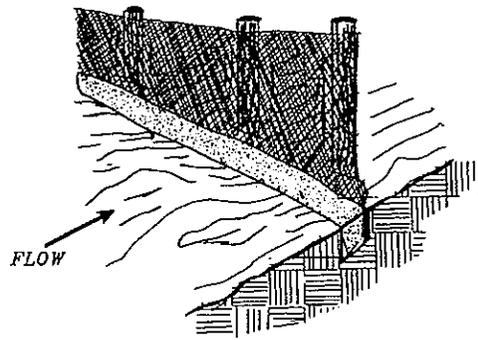
2. EXCAVATE A 4" X 4" TRENCH UPSLOPE ALONG THE LINE OF STAKES.



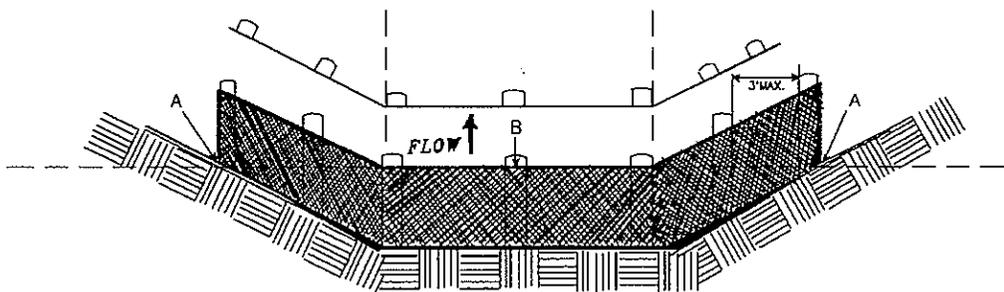
3. STAPLE FILTER MATERIAL TO STAKES AND EXTEND IT INTO THE TRENCH.



4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



SHEET FLOW INSTALLATION
(PERSPECTIVE VIEW)



POINTS A SHOULD BE HIGHER THAN POINT B.

DRAINAGEWAY INSTALLATION
(FRONT ELEVATION)

Source: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sherwood and Wyant

Plate 3.05-2

Maintenance

1. Silt fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
2. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting.
3. Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier still be necessary, the fabric shall be replaced promptly.
4. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
5. Any sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

STD & SPEC 3.09



TEMPORARY DIVERSION DIKE

Definition

A temporary ridge of compacted soil constructed at the top or base of a sloping disturbed area.

Purposes

1. To divert storm runoff from upslope drainage areas away from unprotected disturbed areas and slopes to a stabilized outlet.
2. To divert sediment-laden runoff from a disturbed area to a sediment-trapping facility such as a sediment trap or sediment basin.

Conditions Where Practice Applies

Wherever stormwater runoff must be temporarily diverted to protect disturbed areas and slopes or retain sediment on site during construction. These structures generally have a life expectancy of 18 months or less, which can be prolonged with proper maintenance.



Planning Considerations

A temporary diversion dike is intended to divert overland sheet flow to a stabilized outlet or a sediment-trapping facility during establishment of permanent stabilization on sloping disturbed areas. When used at the top of a slope, the structure protects exposed slopes by keeping upland runoff away. When used at the base of a slope, the structure protects adjacent and downstream areas by diverting sediment-laden runoff to a sediment trapping facility.

As per M.S. #5, it is very important that a temporary diversion dike be stabilized immediately following installation with temporary or permanent vegetation to prevent erosion of the dike itself. The gradient of the channel behind the dike is also an important consideration. The dike must have a positive grade to assure drainage, but if the gradient is too great, precautions must be taken to prevent erosion due to high-velocity channel flow behind the dike. The cross-section of the channel which runs behind the dike should be of a parabolic or trapezoidal shape to help inhibit a high velocity of flow which could arise in a vee ditch.

This practice is considered an economical one because it uses material available on the site and can usually be constructed with equipment needed for site grading. The useful life of the practice can be extended by stabilizing the dike with vegetation. Diversion dikes are preferable to silt fence because they are more durable, less expensive, and require much less maintenance when constructed properly. Along with a TEMPORARY SEDIMENT TRAP (Std. & Spec. 3.13), they become a logical choice for a control measure once the control limits of the silt fence or straw bale barrier have been exceeded.

Temporary diversion dikes are often used as a perimeter control in association with a sediment trap or a sediment basin, or a series of sediment-trapping facilities, on moderate to large construction sites. If installed properly and in the first phase of grading, maintenance costs are very low. Often, cleaning of sediment-trapping facilities is the only associated maintenance requirement.

As specified herein, this practice is intended to be temporary. However, with more stringent design criteria, it can be made permanent in accordance with DIVERSIONS (Std. & Spec. 3.12).

Design Criteria

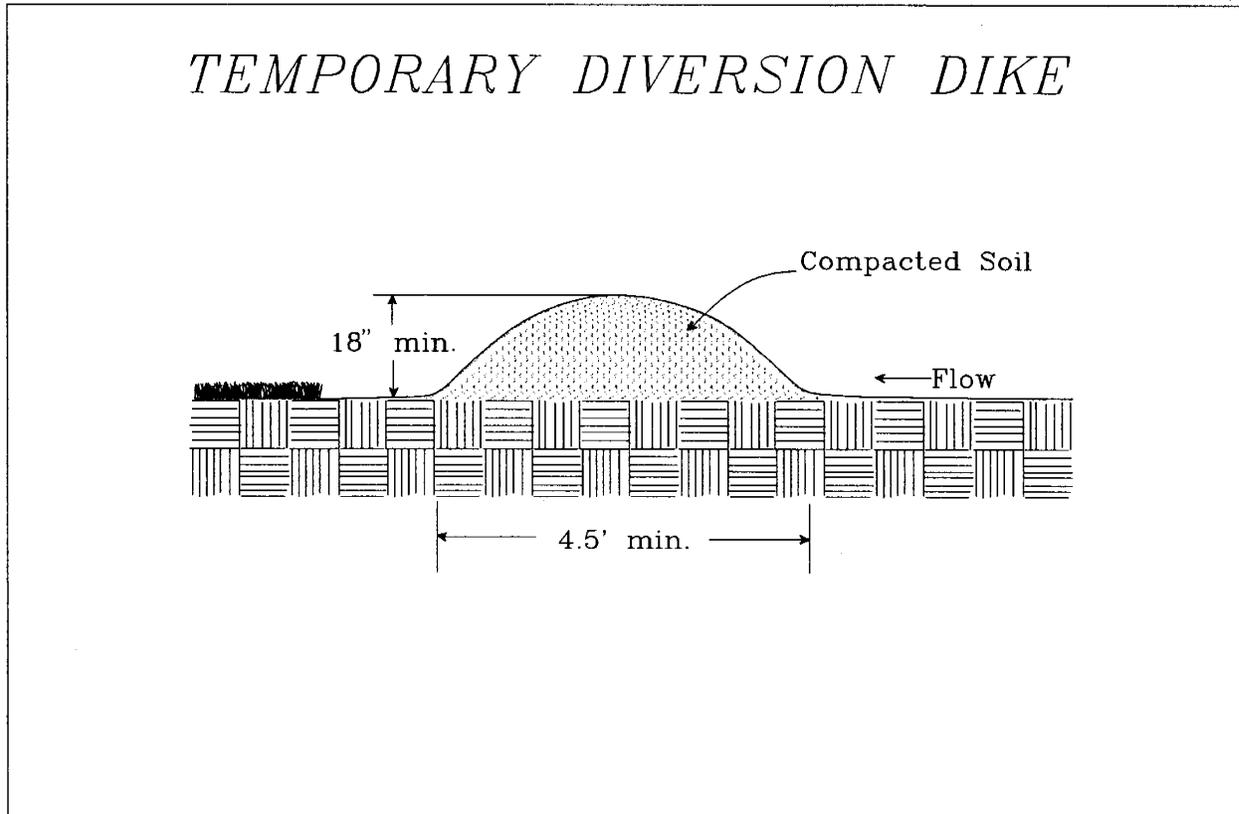
No formal design is required. The following criteria shall be met:

Drainage Area

The maximum allowable drainage area is 5 acres.

Height

The minimum allowable height measured from the upslope side of the dike is 18 inches (see Plate 3.09-1).



Source: Va. DSWC

Plate 3.09-1

Side Slopes

1½:1 or flatter, along with a minimum base width of 4.5 feet (see Plate 3.09-1).

Grade

The channel behind the dike shall have a positive grade to a stabilized outlet. If the channel slope is less than or equal to 2%, no stabilization is required. If the slope is greater than 2%, the channel shall be stabilized in accordance with Std. & Spec. 3.17, STORMWATER CONVEYANCE CHANNEL.

Outlet

1. The diverted runoff, if free of sediment, must be released through a stabilized outlet or channel.

2. Sediment-laden runoff must be diverted and released through a sediment-trapping facility such as a TEMPORARY SEDIMENT TRAP (Std. & Spec. 3.13) or TEMPORARY SEDIMENT BASIN (Std. & Spec. 3.14).

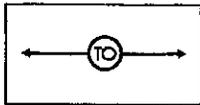
Construction Specifications

1. Temporary diversion dikes must be installed as a first step in the land-disturbing activity and must be functional prior to upslope land disturbance.
2. The dike should be adequately compacted to prevent failure.
3. Temporary or permanent seeding and mulch shall be applied to the dike immediately following its construction.
4. The dike should be located to minimize damages by construction operations and traffic.

Maintenance

The measure shall be inspected after every storm and repairs made to the dike, flow channel, outlet or sediment trapping facility, as necessary. Once every two weeks, whether a storm event has occurred or not, the measure shall be inspected and repairs made if needed. Damages caused by construction traffic or other activity must be repaired before the end of each working day.

STD & SPEC 3.30



TOPSOILING

Definition

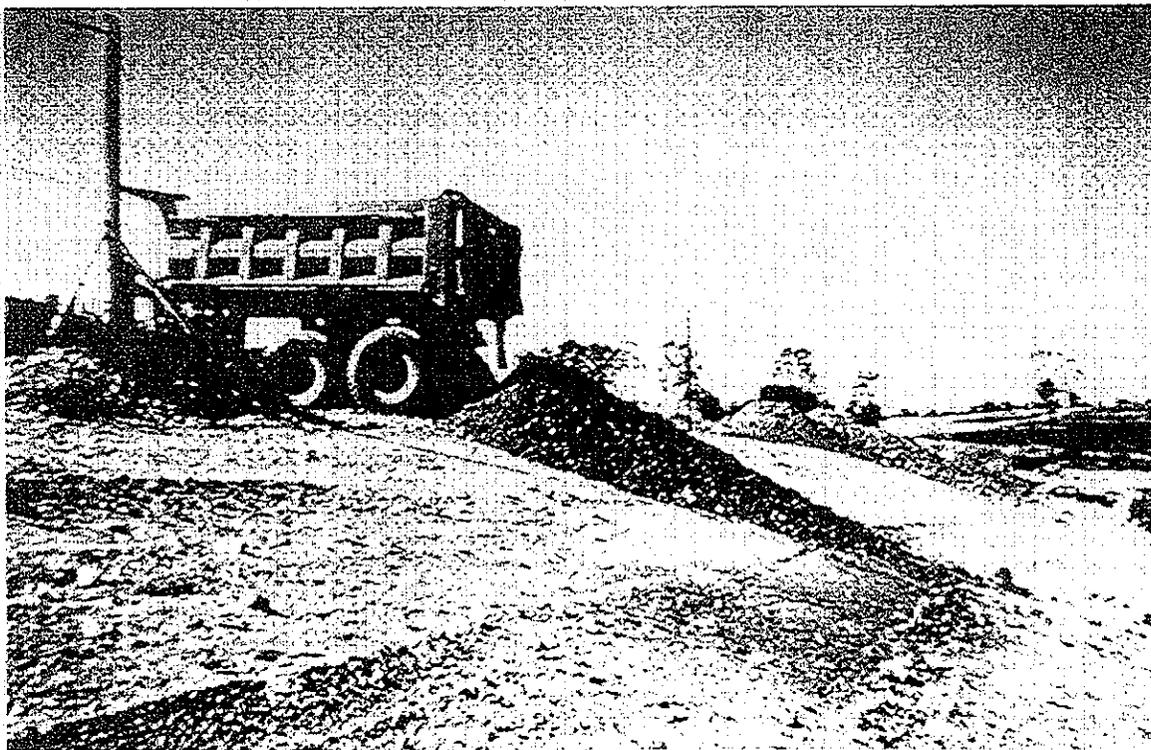
Methods of preserving and using the surface layer of undisturbed soil, often enriched in organic matter, in order to obtain a more desirable planting and growth medium.

Purpose

To provide a suitable growth medium for final site stabilization with vegetation.

Conditions Where Practice Applies

1. Where the preservation or importation of topsoil is determined to be the most effective method of providing a suitable growth medium.



2. Where the subsoil or existing soil presents the following problems:
 - a. The texture, pH, or nutrient balance of the available soil cannot be modified by reasonable means to provide an adequate growth medium.
 - b. The soil material is too shallow to provide an adequate root zone and to supply necessary moisture and nutrients for plant growth.
 - c. The soil contains substances potentially toxic to plant growth.
3. Where high-quality turf is desirable to withstand intense use or meet aesthetic requirements.
4. Where ornamental plants will be established.
5. Only on slopes that are 2:1 or flatter unless other measures are taken to prevent erosion and sloughing.

Planning Considerations

Topsoil is the surface layer of the soil profile, generally characterized as being darker than the subsoil due to the presence of organic matter. It is the major zone of root development, carrying much of the nutrients available to plants, and supplying a large share of the water used by plants.

Although topsoil provides an excellent growth medium, there are disadvantages to its use. Stripping, stockpiling, and reapplying topsoil, or importing topsoil, may not always be cost-effective. Topsoiling can delay seeding or sodding operations, increasing the exposure time of denuded areas. Most topsoil contains weed seeds, and weeds may compete with desirable species.

Advantages of topsoil include its high organic matter content and friable consistence, water-holding capacity, and nutrient content.

In site planning, the option of topsoiling should be compared with that of preparing a seedbed in subsoil. The clay content of subsoils does provide high moisture availability and deter leaching of nutrients and, when properly limed and fertilized, subsoils may provide a good growth medium which is generally free of weed seeds. In many cases topsoiling may not be required for the establishment of less demanding, lower maintenance plant material. Topsoiling is strongly recommended where ornamental plants or high-maintenance turf will be grown. Topsoiling is a required procedure when establishing vegetation on shallow soils, soils containing potentially toxic materials, and soils of critically low pH (high acid) levels.

If topsoiling is to be done, the following items should be considered:

1. Whether an adequate volume of topsoil exists on the site. Topsoil will be spread at a compacted depth of 2 to 4 inches (depths closer to 4 inches are preferred).
2. Location of the topsoil stockpile so that it meets specifications and does not interfere with work on the site.
3. Allow sufficient time in scheduling for topsoil to be spread and bonded prior to seeding, sodding, or planting.
4. Care must be taken not to apply topsoil to subsoil if the two soils have contrasting textures. Clayey topsoil over sandy subsoil is a particularly poor combination, as water may creep along the junction between the soil layers, causing the topsoil to slough. Sandy topsoil over a clay subsoil is equally as likely to fail.
5. If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. Topsoiling of steep slopes should be discouraged unless good bonding of soils can be achieved.

Specifications

Materials

Field exploration of the site shall be made to determine if there is sufficient surface soil of good quality to justify stripping. Topsoil shall be friable and loamy (loam, sandy loam, silt loam, sandy clay loam, clay loam). It shall be free of debris, trash, stumps, rocks, roots, and noxious weeds, and shall give evidence of being able to support healthy vegetation. It shall contain no substance that is potentially toxic to plant growth.

All topsoil shall be tested by a recognized laboratory for the following criteria:

Organic matter content shall be not less than 1.5% by weight.

pH range shall be from 6.0-7.5. If pH is less than 6.0, lime shall be added in accordance with soil test results or in accordance with the recommendations of the vegetative establishment practice being used.

Soluble salts shall not exceed 500 ppm.

If additional off-site topsoil is needed, it must meet the standards stated above.

Stripping

Topsoil operations should not be performed when the soil is wet or frozen. Stripping shall be confined to the immediate construction area. A 4-to 6-inch stripping depth is common,

but depth may vary depending on the particular soil. All perimeter dikes, basins, and other sediment controls shall be in place prior to stripping.

Stockpiling

Topsoil shall be stockpiled in such a manner that natural drainage is not obstructed and no off-site sediment damage shall result. Stabilize or protect stockpiles in accordance with MS #2.

Side slopes of the stockpile shall not exceed 2:1.

Perimeter controls must be placed around the stockpile immediately; seeding of stockpiles shall be completed within 7 days of the formation of the stockpile, in accordance with Std. & Spec. 3.31, TEMPORARY SEEDING if it is to remain dormant for longer than 30 days (refer to MS #1 and MS #2).

Site Preparation Prior to and Maintenance During Topsoiling

Before topsoiling, establish needed erosion and sediment control practices such as diversions, grade stabilization structures, berms, dikes, level spreaders, waterways, sediment basins, etc. These practices must be maintained during topsoiling.

Grading: Previously established grades on the areas to be topsoiled shall be maintained according to the approved plan.

Liming: Where the pH of the subsoil is 6.0 or less, or the soil is composed of heavy clays, agricultural limestone shall be spread in accordance with the soil test or the vegetative establishment practice being used.

Bonding: After the areas to be topsoiled have been brought to grade, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by discing or scarifying to a depth of at least 2 inches to ensure bonding of the topsoil and subsoil.

Applying Topsoil

Topsoil shall not be placed while in a frozen or muddy condition, when topsoil or subgrade is excessively wet, or in a condition that may otherwise be detrimental to proper grading or proposed sodding or seeding. The topsoil shall be uniformly distributed to a minimum compacted depth of 2 inches on 3:1 or steeper slopes and 4 inches on flatter slopes. (See Table 3.30-A to determine volume of topsoil required for application to various depths). Any irregularities in the surface, resulting from topsoiling or other operations, shall be corrected in order to prevent the formation of depressions or water pockets.

It is necessary to compact the topsoil enough to ensure good contact with the underlying soil and to obtain a level seedbed for the establishment of high maintenance turf. However, undue compaction is to be avoided as it increases runoff velocity and volume, and deters

seed germination. Special consideration should be given to the types of equipment used to place topsoil in areas to receive fine turf. Avoid unnecessary compaction by heavy machinery whenever possible. In areas which are not going to be mowed, the surface should be left rough in accordance with SURFACE ROUGHENING (Std. & Spec. 3.29).

Soil Sterilants

No sod or seed shall be placed on soil which has been treated with soil sterilants until sufficient time has elapsed to permit dissipation of toxic materials.

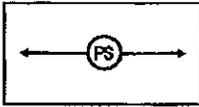
TABLE 3.30-A

**CUBIC YARDS OF TOPSOIL REQUIRED
FOR APPLICATION TO VARIOUS DEPTHS**

<u>Depth (inches)</u>	<u>Per 1,000 Square Feet</u>	<u>Per Acre</u>
1	3.1	134
2	6.2	268
3	9.3	403
4	12.4	537
5	15.5	672
6	18.6	806

Source: Va. DSWC

STD & SPEC 3.32



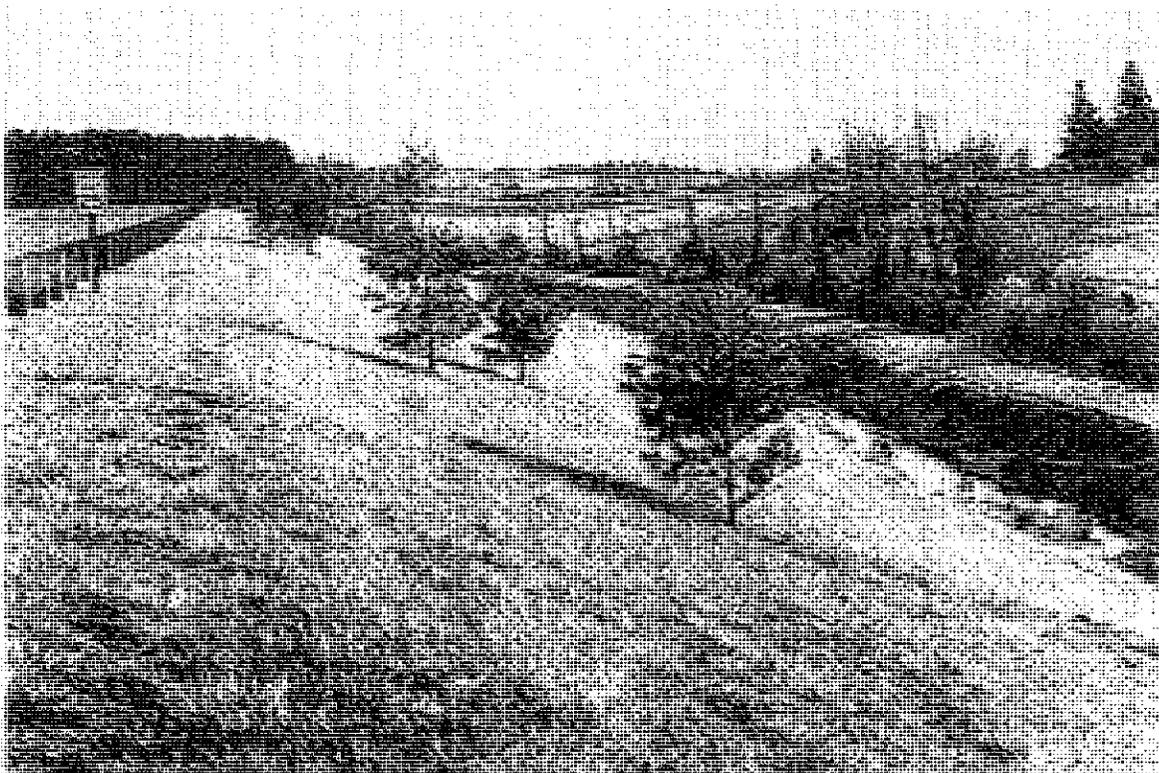
PERMANENT SEEDING

Definition

The establishment of perennial vegetative cover on disturbed areas by planting seed.

Purposes

1. To reduce erosion and decrease sediment yield from disturbed areas.
2. To permanently stabilize disturbed areas in a manner that is economical, adaptable to site conditions, and allows selection of the most appropriate plant materials.
3. To improve wildlife habitat.
4. To enhance natural beauty.



Conditions Where Practice Applies

1. Disturbed areas where permanent, long-lived vegetative cover is needed to stabilize the soil.
2. Rough-graded areas which will not be brought to final grade for a year or more.

Planning Considerations

Vegetation controls erosion by reducing the velocity and the volume of overland flow and protecting the bare soil surface from raindrop impact.

Areas which must be stabilized after the land has been disturbed require vegetative cover. The most common and economical means of establishing this cover is by seeding grasses and legumes. Permanent vegetative covers must meet the requirements of Minimum Standard #3.

Advantages of seeding over other means of establishing plants include the small initial establishment cost, the wide variety of grasses and legumes available, low labor requirement, and ease of establishment in difficult areas.

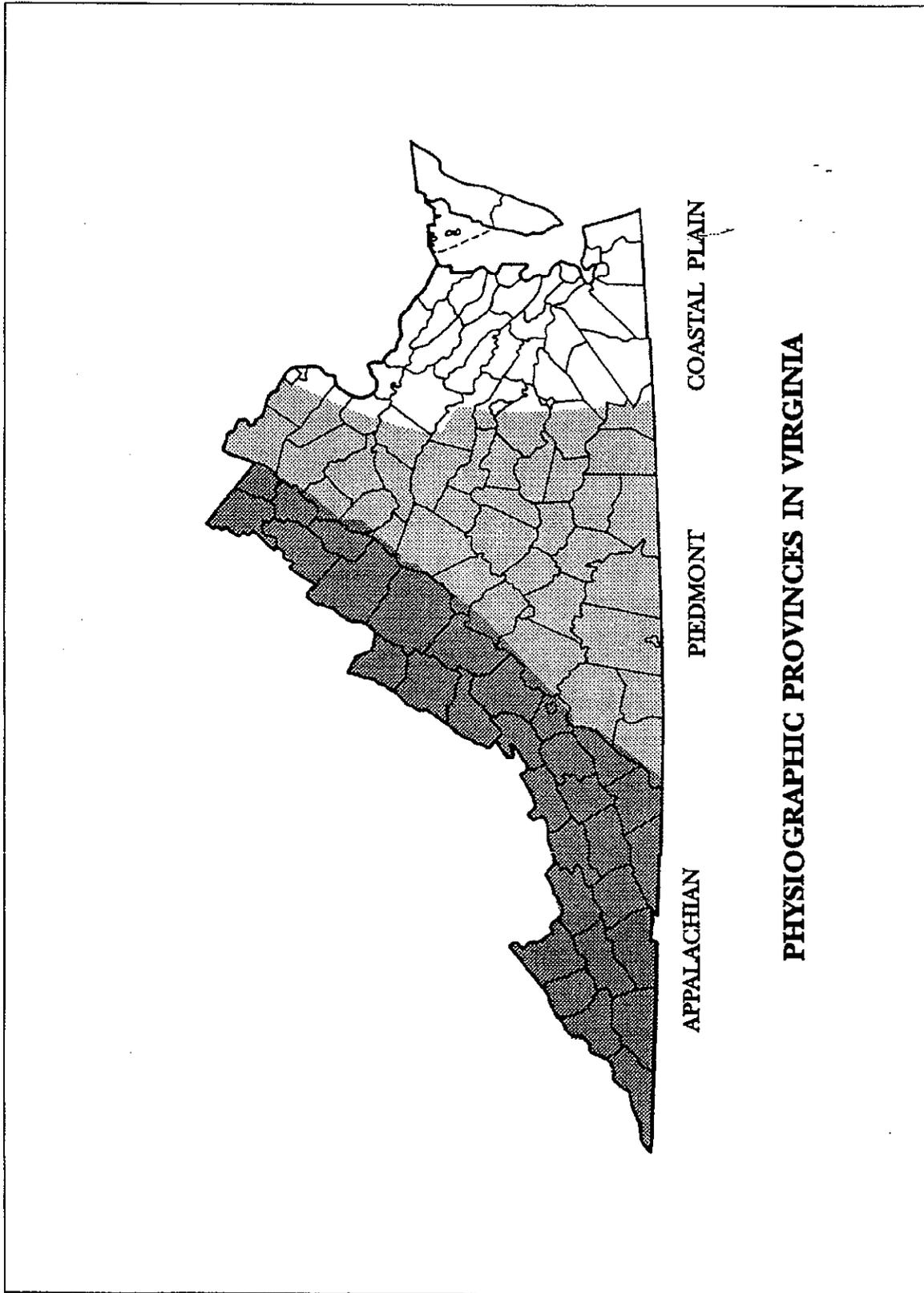
Disadvantages which must be dealt with are the potential for erosion during the establishment stage, a need to reseed areas that fail to establish, limited periods during the year suitable for seeding, the potential need for weed control during the establishment phase, and a need for water and appropriate climatic conditions during germination.

There are so many variables in plant growth that an end product cannot be guaranteed. Much can be done in the planning stages to increase the chances for successful seeding. Selection of the right plant materials for the site, good seedbed preparation, and conscientious maintenance are important.

SELECTING PLANT MATERIALS: The factors affecting plant growth are climate, soils, and topography. In Virginia, there are three major physiographic regions that reflect changes in soil and topography. In selecting appropriate plant materials, one should take into account the characteristics of the physiographic region in which the project is located (see Plate 3.32-1).

PHYSIOGRAPHIC REGIONS:

Coastal Plain - Soils on the Coastal Plain are deeply weathered, stratified deposits of sand and clay. They are generally acidic and low in plant nutrients. The sandy soils are hot and droughty in summer. This region receives more rain and is warmer than the other regions of the state. The land is fairly level, and many areas are poorly drained. Warm season grasses traditionally perform well in these areas.



Source: Va. DSWC

Plate 3.32-1

Piedmont - Soils on the Piedmont plateau are highly variable. They tend to be shallow, with clayey subsoils. Piedmont soils are low in phosphorus. Soils derived from mica schist are highly erodible. Topography is rolling and hilly. The southern Piedmont has much the same climate as the Coastal Plain. Often referred to as the "transition zone" in planting. Contains areas that will support both warm or cool season grasses.

Appalachian and Blue Ridge-Region - This region is divided into plateaus, mountains, and narrow valleys. Soils tend to be shallow and acid, and may erode rapidly on steep slopes. Shaley slopes are often unstable and droughty. This area is colder and drier than the rest of the State. The rugged topography makes plant establishment difficult. Cool season grasses are normally specified in this region.

SOILS: On the whole, soils in Virginia always require some nitrogen (N) fertilization to establish plants. Phosphorus (P) and potassium (K) are usually needed. Except for some small pockets of shallow limestone soils, lime is universally needed.

Soils can be modified with lime and fertilizer, but climate cannot be controlled. For this reason, the State has been divided into two major climatic regions, referred to as the Northern Piedmont and Mountain Region and the Southern Piedmont and Coastal Plain Region, for grass and legume selection (see map, Plate 3.32-2).

Microclimate, or localized climate conditions, can affect plant growth. A south-facing slope is drier and hotter than a north-facing slope, and may require drought-tolerant plants. Shaded areas require shade-tolerant plants; the windward side of a ridge will be drier than the leeward, etc.

LAND USE: A prime consideration in selecting which plants to establish is the intended use of the land. All of these uses - residential, industrial, commercial, recreational - can be separated into two major categories: high-maintenance and low-maintenance.

High-maintenance areas will be mowed frequently, limed and fertilized regularly, and will either receive intense use (e.g., athletics) or require maintaining to an aesthetic standard (home lawns). Grasses used for these situations must be fine-leaved and attractive in appearance, able to form tight sod, and be long-lived perennials. They must be well-adapted to the geographic area where they are planted, because constant mowing puts turf under great stress. Sites where high-maintenance vegetative cover is desirable include homes, industrial parks, schools, churches, athletic playing surfaces as well as some recreational areas.

Low-maintenance areas will be mowed infrequently or not at all; lime and fertilizer may not be applied on a regular basis; the areas will not be subjected to intense use, nor required to have a uniform appearance. These plants must be able to persist with little maintenance over long periods of time. Grass and legume mixtures are favored for these sites because legumes are capable of fixing nitrogen from the air for their own use, and the use of the plants around them. Such mixed stands are better able to withstand adverse conditions.

Sites that would be suitable for low-maintenance vegetation include steep slopes, stream or channel banks, some commercial properties, and "utility turf" areas such as roadbanks.

Seedbed Preparation - The soil on a disturbed site must be modified to provide an optimum environment for seed germination and seedling growth. The surface soil must be loose enough for water infiltration and root penetration. The pH (acidity and alkalinity) of the soil must be such that it is not toxic and nutrients are available, usually between pH 6.0-7.0. Sufficient nutrients (added as fertilizer) must be present. After seed is in place, it must be protected with a mulch to hold moisture and modify temperature extremes, and to prevent erosion while seedlings are growing.

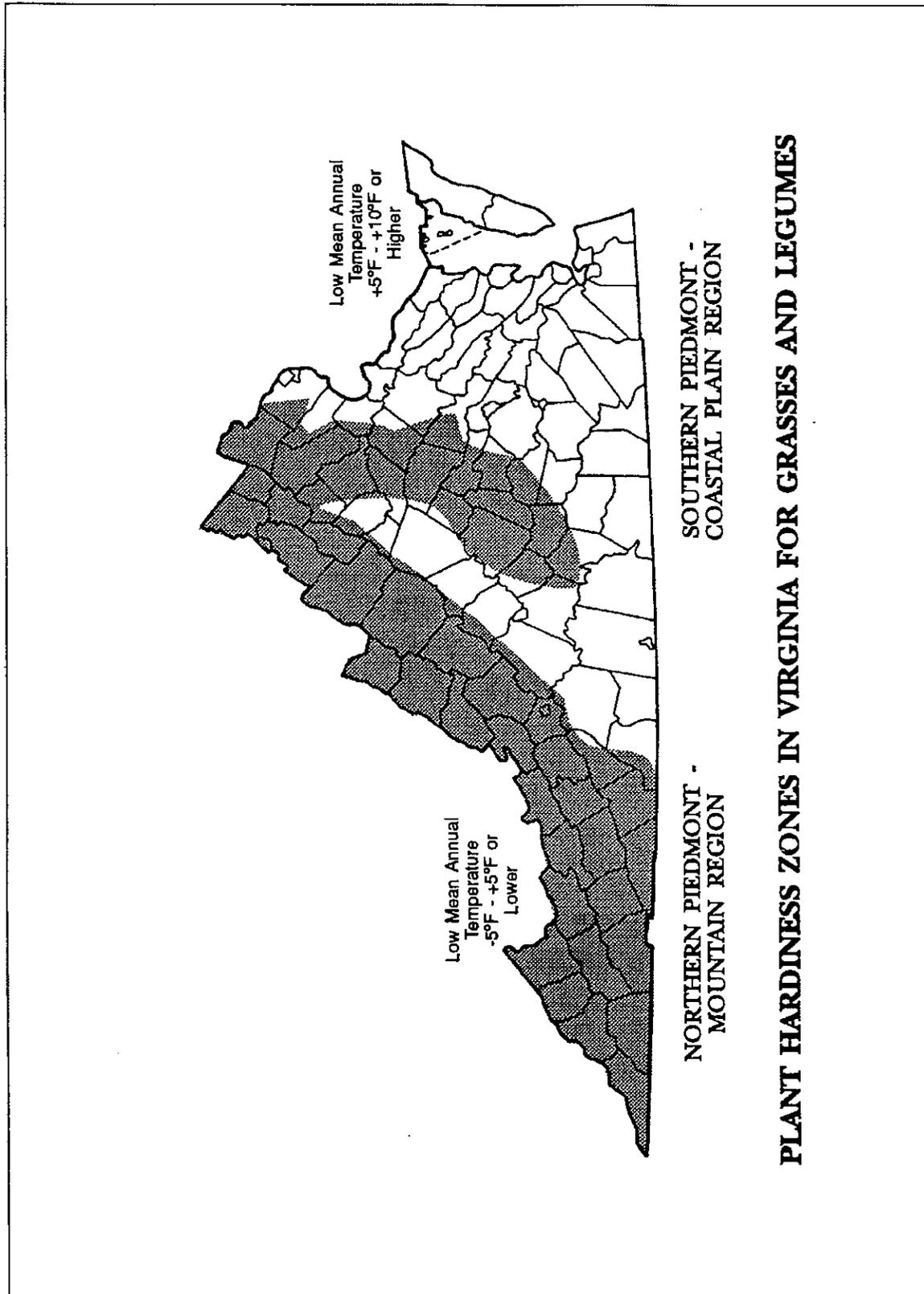
The addition of lime is equally as important as applying fertilizer. Lime is best known as a pH, or acidity, modifier, but it also supplies calcium and magnesium which are plant nutrients. Its effect on pH makes other nutrients more available to the plant. It can also prevent aluminum toxicity by making aluminum less soluble in the soil. Many soils in Virginia are high in aluminum, which stunts the growth of plant roots.

MAINTENANCE: Even with careful, well-planned seeding operations, failures can occur. When it is clear that plants have not germinated on an area or have died, these areas must be reseeded immediately to prevent erosion damage. However, it is extremely important to determine for what reason germination did not take place and make any corrective action necessary prior to reseeding the area. Healthy vegetation is the most effective erosion control available.

Specifications

Selection of Plant Materials

1. Selection of plant materials is based on climate, topography, soils, land use, and planting season. To determine which plant materials are best adapted to a specific site, use Tables 3.32-A and 3.22-B which describe plant characteristics and list recommended varieties.
2. Appropriate seeding mixtures for various site conditions in Virginia are given in Tables 3.32-C, 3.32-D and 3.32-E. These mixtures are designed for general use, and are known to perform well on the sites described. Check Tables 3.32-A and 3.32-B for recommended varieties.
3. A more extensive description of plant materials (grasses and legumes), their usage and pictorial representation can be found in Appendix 3.32-c.
4. When using some varieties of turfgrasses, the Virginia Crop Improvement Association (VCIA) recommended turfgrass mixtures may also be used. Consumer protection programs have been devised to identify quality seed of the varieties recommended by the Virginia Cooperative Extension Service. These will bear a label indicating



Source: Adapted from Virginia Climate Advisory, 1979.

Plate 3.32-2

that they are approved by the Association. Mixtures may be designed for a specific physiographic region or based on intended use. Special consideration is given to plant characteristics, performance, etc.

TABLE 3.32-A
CHARACTERISTICS OF COMMONLY SELECTED GRASSES

COMMON NAME (Botanical Name)	Life Cycle	Season	pH Range	Germination Time In Days	Optimum Germination Temperature (°F)	Winter Hardiness	Drought Tolerance	Fertility	Soil Drainage Tolerance	Seeds Per Pound	MAINTENANCE REQUIREMENTS	REMARKS	Suggested Varieties for Virginia
TALL FESCUE (<i>Festuca arundinacea</i>)	P	C	5.5- 6.2	10-14	60-85	F	F	M	SPD	225K	Low when used for erosion control; high when used in lawn	Better suited for erosion control and rough turf application.	Ky 31
TALL FESCUES (Improved)	P	C	5.5- 6.2	10-14	60-85	F	G	M	SPD	220K	Responds well to high maintenance.	Excellent for lawn and fine turf.	See current VCIA list.
KENTUCKY BLUEGRASS (<i>Poa pratense</i>)	P	C	6.0- 6.5	14	60-75	G	P	M	SPD	2.2m	Needs fertile soil, favorable moisture. Requires several years to become well established.	Excellent for fine turfs-takes traffic, mowing. Poor drought/heat tolerance.	See current VCIA list.
PERENNIAL RYEGRASS (<i>Lolium perenne</i>)	P	C	5.8- 6.2	7-10	60-75	F	F	M-H	SPD	227K	Will tolerate traffic.	May be added to mixes. * Improved varieties will perform well all year.	See current VCIA list.

KEY

A = Annual P = Perennial C = Cool Season Plant W = Warm Season Plant G = Good F = Fair P = Poor VP = Very Poor H = High
M = Medium L = Low SPD = Somewhat Poorly Drained MPD = Moderately Poorly Drained PPD = Poorly Drained VPD = Very Poorly Drained

TABLE 3.32-A (Continued)
CHARACTERISTICS OF COMMONLY SELECTED GRASSES

COMMON NAME (Botanical Name)	Life Cycle	Season	pH Range	Germination Time, In Days	Optimum Germination Temperature (°F)	Winter Hardiness	Drought Tolerance	Fertility	Soil Drainage Tolerance	Seeds Per Pound	MAINTENANCE REQUIREMENTS	REMARKS	Suggested Varieties for Virginia
HARD FESCUE (<i>Festuca Longifolia</i>)	P	C	5.0- 6.2	10- 14	60- 80	VG	G	L	MWD	400K	Grows well in sun or shade and will tolerate infertile soils; improved disease resistance.	Exceeds all fine fescues in most tests. Excellent for low-maintenance situations.	Reliant, Spartan, Aurora
	P	C	5.0- 6.2	10- 14	60- 80	VG	G	L	MWD	400K	Tolerates shade, dry infertile soils.	Poor traffic tolerance, less thatch than other fine fescues.	Flyer
RED FESCUE (<i>Festuca Rubra</i>)	P	C	5.0- 6.2	10- 14	60- 80	VG	G	L	MWD	400K	Low to medium fertility requirements. Requires well-drained soil.	Spreads by rhizomes, tillers and stolons. Will not take traffic - very shade tolerant.	Long- fellow, Victory
REED CANARYGRASS (<i>Phalaris arundinacea</i>)	P	C	5.8- 6.2	21	70- 85	G	G	M-H	VPD	530K	Do not mow closely or often.	Conservation cover in wet areas.	No named varieties

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TABLE 3.32-A (Continued)
CHARACTERISTICS OF COMMONLY SELECTED GRASSES

COMMON NAME (Botanical Name)	Life Cycle	Season	pH Range	Germination Time, In Days	Optimum Germination Temperature (°F)	Winter Hardness	Drought Tolerance	Fertility	Soil Drainage Tolerance	Seeds Per Pound	MAINTENANCE REQUIREMENTS	REMARKS	Suggested Varieties for Virginia
REDTOP (<i>Agrostis alba</i>)	P	C	5.8- 6.2	10	65-85	G	F	L	PD	5m	Will tolerate poor, infertile soils; deep rooted.	Does well in erosion control mixes - not for lawns.	No named varieties.
WEeping LOVEGRASS (<i>Eragrostis curvula</i>)	P	W	4.5- 6.2	14	65-85	F-P	G	L-M	SPD	1.5m	Low-fertility requirements; excellent drought tolerance.	Fast-growing, warm-season bunch grass. Excellent cover for erosion control.	No named varieties.
BERMUDAGRASS (<i>Cynodon dactylon</i>)	P	W	5.8- 6.2	21	70-95	P	G	M-H	SPD	1.8m hulled	High nitrogen utilization, excellent drought tolerance. Some varieties adapted to western VA.	Common varieties used for erosion control. Hybrids used for fine turf.	See current VCLA list.
ORCHARDGRASS (<i>Dactylis glomerata</i>)	P	C	5.8- 6.2	18	60-75	F	F	M	SPD	625K	Does best on well-drained, loamy soil.	Good pasture selection - may be grazed.	Virginia origin or Potomac

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TABLE 3.32-A (Continued)
CHARACTERISTICS OF COMMONLY SELECTED GRASSES

COMMON NAME (Botanical Name)	Life Cycle	Season	pH Range	Germination Time In Days	Optimum Germination Temperature (°F)	Winter Hardiness	Drought Tolerance	Fertility	Soil Drainage	Seeds Per Pound	MAINTENANCE REQUIREMENTS	REMARKS	Suggested Varieties for Virginia
ANNUAL RYEGRASS (<i>Lolium multiflorum</i>)	A	C	5.8- 6.2	7	60-70	G	P	M-H	SPD	227K	Will grow on most Virginia Soils. Do not use in fine-turf areas.	May be added into mixes or established alone as temporary cover in spring and fall.	No named varieties.
RYE (<i>Secale cereale</i>)	A	C	5.8- 6.2	7	55-70	VG	G	L-M	SPD	18K	Will establish in most all Virginia soils. Do not use in fine-turf areas.	May be added into mixes or established alone for late fall/winter cover.	Abruzzi, Balboa
FOXTAIL MILLET (<i>Setaria italica</i>)	A	W	5.8- 6.2	10	65-85	VP	G	M	MWD	220K	Establishes well during summer. Very low moisture requirements.	May be added to erosion-control mixes or established alone.	Common, German

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VPD = Very Poorly Drained

TABLE 3.32-B
CHARACTERISTICS OF LEGUMES APPROPRIATE FOR EROSION CONTROL

COMMON NAME (Botanical Name)	Life Cycle	Season	pH Range	Germination Time In Days	Optimum Germination Temperature (°F)	Winter Hardness	Drought Tolerance	Fertility	Soil Drainage Tolerance	Seeds Per Pound	MAINTENANCE REQUIREMENTS	REMARKS	Suggested Varieties for Virginia
CROWNVECH (<i>Coronilla varia</i>)	P	C	6.0- 6.5	14-21	70	G	VG	M	MWD	110K	Does best on well-drained soils. Minimum maintenance when established. May need phosphorus. Inoculation is essential.	Excellent for steep, rocky slopes. Produces colorful blooms in May/June. Slow to establish. Does best when seeded in spring.	Penngift Chemung Emerald
SERICEA LESPEDEZA (<i>Lespedeza cuneata</i>)	P	W	5.8- 6.2	21-28	70- 85	F	VG	L	MWD	335K	Grows in most well-drained soils. Low fertility requirements. Inoculation is essential.	Use hulled seed in spring; unhulled in fall. Very deep-rooted legume. Excellent choice for eastern Va.	Sericea Interstate
FLATPEA (<i>Lathyrus silvestris</i>)	P	C	5.0- 7.0	14-28	65- 75	G	G	L	PD	15K	Needs lime and high phosphorus. Good shade tolerance.	Tolerates acidic and wetter soils better than other legumes.	Lathco
BIRDSFOOT TREFOIL (<i>Lotus corniculatus</i>)	P	C	6.0- 6.5	7	65- 70	G	F	M	SPD	375K	Inoculation is essential. Grows in medium-fertile, slightly acid soils.	Grows better on poorly drained soils than most legumes. Poor drought/ heat tolerance.	No named varieties.

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TABLE 3.32-B (Continued)
 CHARACTERISTICS OF LEGUMES APPROPRIATE FOR EROSION CONTROL

COMMON NAME (Botanical Name)	Life Cycle	Season	pH Range	Germination Time In Days	Optimum Germination Temperature (°F)	Winter Hardiness	Drought Tolerance	Fertility	Soil Drainage Tolerance	Seeds Per Pound	MAINTENANCE REQUIREMENTS	REMARKS	Suggested Varieties for Virginia
ANNUAL LESPEDEZAS (<i>Lespedeza striata</i> , <i>L. stipulacea</i>)	A	W	5.8- 6.2	14	70- 85	F	VG	L	MWD	200K	Will grow on almost any well-drained soil.	Choose Kobe for southeastern Va.; needs almost no nitrogen to survive.	Kobe, Korean
RED CLOVER (<i>Trifolium pratense</i>)	P	C	6.0- 6.5	7-14	70	G	F	M	SPD	275K	Needs high levels of phosphorus and potassium.	Acts as a biennial. Can be added to low- maintenance mixes.	Kenstar, Kenland
WHITE CLOVER (<i>Trifolium repens</i>)	P	C	6.0- 6.5	10	70	G	P	M	PD	700K	Requires favorable moisture, fertile soils, high pH.	Spreads by soil surface stolons, white flowers.	Common, White Dutch

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**TABLE 3.32-C
SITE SPECIFIC SEEDING MIXTURES
FOR APPALACHIAN/MOUNTAIN AREA**

<u>Minimum Care Lawn</u>	<u>Total Lbs. Per Acre</u>
- Commercial or Residential	200-250 lbs.
- Kentucky 31 or Turf-Type Tall Fescue	90-100%
- Improved Perennial Ryegrass *	0-10%
- Kentucky Bluegrass	0-10%
<u>High-Maintenance Lawn</u>	
Minimum of three (3) up to five (5) varieties of bluegrass from approved list for use in Virginia.	125 lbs.
<u>General Slope (3:1 or less)</u>	
- Kentucky 31 Fescue	128 lbs.
- Red Top Grass	2 lbs.
- Seasonal Nurse Crop **	<u>20 lbs.</u>
	150 lbs.
<u>Low-Maintenance Slope (Steeper than 3:1)</u>	
- Kentucky 31 Fescue	108 lbs.
- Red Top Grass	2 lbs.
- Seasonal Nurse Crop **	20 lbs.
- Crownvetch ***	<u>20 lbs.</u>
	150 lbs.

* Perennial Ryegrass will germinate faster and at lower soil temperatures than fescue, thereby providing cover and erosion resistance for seedbed.

** Use seasonal nurse crop in accordance with seeding dates as stated below:
 March, April through May 15th Annual Rye
 May 16th through August 15th Foxtail Millet
 August 16th through September, October Annual Rye
 November through February Winter Rye

*** If Flatpea is used, increase to 30 lbs./acre. All legume seed must be properly inoculated. Weeping Lovegrass may also be included in any slope or low-maintenance mixture during warmer seeding periods; add 10-20 lbs/acre in mixes.

**TABLE 3.32-D
SITE SPECIFIC SEEDING MIXTURES FOR PIEDMONT AREA**

	<u>Total Lbs. Per Acre</u>
<u>Minimum Care Lawn</u>	
- Commercial or Residential	175-200 lbs.
- Kentucky 31 or Turf-Type Tall Fescue	95-100%
- Improved Perennial Ryegrass	0-5%
- Kentucky Bluegrass	0-5%
<u>High-Maintenance Lawn</u>	
- Kentucky 31 or Turf-Type Tall Fescue	200-250 lbs.
	100%
<u>General Slope (3:1 or less)</u>	
- Kentucky 31 Fescue	128 lbs.
- Red Top Grass	2 lbs.
- Seasonal Nurse Crop *	<u>20 lbs.</u>
	150 lbs.
<u>Low-Maintenance Slope (Steeper than 3:1)</u>	
- Kentucky 31 Fescue	108 lbs.
- Red Top Grass	2 lbs.
- Seasonal Nurse Crop *	20 lbs.
- Crownvetch **	<u>20 lbs.</u>
	150 lbs.

* Use seasonal nurse crop in accordance with seeding dates as stated below:
 February 16th through April Annual Rye
 May 1st through August 15th Foxtail Millet
 August 16th through October Annual Rye
 November through February 15th Winter Rye

** Substitute Sericea lespedeza for Crownvetch east of Farmville, Va. (May through September use hulled Sericea, all other periods, use unhulled Sericea). If Flatpea is used in lieu of Crownvetch, increase rate to 30 lbs./acre. All legume seed must be properly inoculated. Weeping Lovegrass may be added to any slope or low-maintenance mix during warmer seeding periods; add 10-20 lbs./acre in mixes.

Seedbed Requirements

Vegetation should not be established on slopes that are unsuitable due to inappropriate soil texture, poor internal structure or internal drainage, volume of overland flow, or excessive steepness, until measures have been taken to correct these problems.

To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. The existing soil must have these characteristics:

1. Enough fine-grained material to maintain adequate moisture and nutrient supply.
2. Sufficient pore space to permit root penetration. A bulk density of 1.2 to 1.5 indicates that sufficient pore space is present. A fine granular or crumb-like structure is also favorable.
3. Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans shall be 12 inches or more, except on slopes steeper than 2:1 where the addition of soil is not feasible.
4. A favorable pH range for plant growth. If the soil is so acidic that a pH range of 6.0-7.0 cannot be attained by addition of pH-modifying materials, then the soil is considered an unsuitable environment for plant roots and further soil modification would be required.
5. Freedom from toxic amounts of materials harmful to plant growth.
6. Freedom from excessive quantities of roots, branches, large stones, large clods of earth, or trash of any kind. Clods and stones may be left on slopes steeper than 3:1 if they do not significantly impede good seed soil contact.

If any of the above criteria cannot be met, i.e., if the existing soil is too coarse, dense, shallow, acidic, or contaminated to foster vegetation, then topsoil shall be applied in accordance with TOPSOILING, Std. & Spec. 3.30.

Necessary structural erosion and sediment control practices will be installed prior to seeding. Grading will be carried out according to the approved plan.

Surfaces will be roughened in accordance with SURFACE ROUGHENING, Std. & Spec. 3.29.

Soil Conditioners

In order to modify the texture, structure, or drainage characteristics of a soil, the following materials may be added to the soil:

1. Peat is a very costly conditioner, but works well. If added, it shall be sphagnum moss peat, hypnum moss peat, reed-sedge peat or peat humus, from fresh-water sources. Peat shall be shredded and conditioned in storage piles for at least six months after excavation.
2. Sand shall be clean and free of toxic materials. Sand modification is ineffective unless you are adding 80 to 90% sand on a volume basis. This is extremely difficult to do on-site. If this practice is considered, consult a professional authority to ensure that it is done properly.
3. Vermiculite shall be horticultural grade and free of toxic substances. It is an impractical modifier for larger acreage due to expense.
4. Raw manure is more commonly used in agricultural applications. However, when stored properly and allowed to compost, it will stabilize nitrogen and other nutrients. Manure, in its composted form, is a viable soil conditioner; however, its use should be based on site-specific recommendations offered by a professional in this field.
5. Thoroughly rotted sawdust shall have 6 pounds of nitrogen added to each cubic yard and shall be free of stones, sticks, and toxic substances.
6. The use of treated sewage sludge has benefitted from continuing advancements in its applications in the agricultural community. When composted, it offers an alternative soil amendment. Limitations include a potentially undesirable pH (because of lime added during the treatment process) and the possible presence of heavy metals. This practice should be thoroughly evaluated by a professional and be used in accordance with any local, state, and federal regulations.

Lime and Fertilizer

Lime and fertilizer needs should be determined by soil tests. Soil tests may be performed by the Cooperative Extension Service Soil Testing Laboratory at VPI&SU, or by a reputable commercial laboratory. Information concerning the State Soil Testing Laboratory is available from county extension agents. Reference Appendix 3.32-d for liming applications (in lbs.) needed to correct undesirable pH for various soil types.

Under unusual conditions where it is not possible to obtain a soil test, the following soil amendments will be applied:

Lime

Coastal Plain: 2 tons/acre pulverized agricultural grade limestone (90 lbs./1000 ft.²).

Piedmont and Appalachian Region: 2 tons/acre pulverized agricultural grade limestone (90 lbs./1000 ft.²).

Note: An agricultural grade of limestone should always be used.

Fertilizer

Mixed grasses and legumes: 1000 lbs./acre 10-20-10 or equivalent nutrients (23 lbs./1000 ft.²).

Legume stands only: 1000 lbs./acre 5-20-10 (23 lbs./ 1000 ft.²) is preferred; however, 1000 lbs./acre of 10-20-10 or equivalent may be used.

Grass stands only: 1000 lbs./acre 10-20-10 or equivalent nutrients, (23 lbs./1000 ft.²).

Other fertilizer formulations, including slow-release sources of nitrogen (preferred from a water quality standpoint), may be used provided they can supply the same amounts and proportions of plant nutrients.

Incorporation - Lime and fertilizer shall be incorporated into the top 4-6 inches of the soil by discing or other means whenever possible. For erosion control, when applying lime and fertilizer with a hydroseeder, apply to a rough, loose surface.

Seeding

1. Certified seed will be used for all permanent seeding whenever possible. Certified seed is inspected by the Virginia Crop Improvement Association or the certifying agency in other states. The seed must meet published state standards and bear an official "Certified Seed" label (see Appendix 3.32-a).

Kentucky Bluegrass Seed Mixtures

**MARYLAND - VIRGINIA
RECOMMENDED**



* Recommended Area is Shaded. **V 33505**

Kentucky Bluegrass Seed Blends

**VIRGINIA - MARYLAND
RECOMMENDED**



V 25004

2. Legume seed should be inoculated with the inoculant appropriate to the species. Seed of the Lespedezas, the Clovers and Crownvetch should be scarified to promote uniform germination.
3. Apply seed uniformly with a broadcast seeder, drill, culti-packer seeder, or hydroseeder on a firm, friable seedbed. Seeding depth should be 1/4 to 1/2 inch.
4. To avoid poor germination rates as a result of seed damage during hydroseeding, it is recommended that if a machinery breakdown of 30 minutes to 2 hours occurs, 50% more seed be added to the tank, based on the proportion of the slurry remaining in the tank. Beyond 2 hours, a full rate of new seed may be necessary.

Often hydroseeding contractors prefer not to apply lime in their rigs as it is abrasive. In inaccessible areas, lime may have to be applied separately in pelletized or liquid form. Surface roughening is particularly important when hydroseeding, as a roughened slope will provide some natural coverage of lime, fertilizer and seed.

Legume inoculants should be applied at five times the recommended rate when inoculant is included in the hydroseeder slurry.

Mulching

All permanent seeding must be mulched immediately upon completion of seed application. Refer to MULCHING, Std. & Spec. 3.35.

Maintenance of New Seedings

In general, a stand of vegetation cannot be determined to be fully established until it has been maintained for one full year after planting.

Irrigation: New seedings should be supplied with adequate moisture. Supply water as needed, especially late in the season, in abnormally hot or dry weather, or on adverse sites. Water application rates should be controlled to prevent excessive runoff. Inadequate amounts of water may be more harmful than no water.

Re-seeding: Inspect seeded areas for failure and make necessary repairs and re-seedings within the same season, if possible.

- a. If vegetative cover is inadequate to prevent rill erosion, over-seed and fertilize in accordance with soil test results.
- b. If a stand has less than 40% cover, re-evaluate choice of plant materials and quantities of lime and fertilizer. The soil must be tested to determine if acidity or nutrient imbalances are responsible. Re-establish the stand following seedbed preparation and seeding recommendations.

Fertilization: Cool season grasses should begin to be fertilized 90 days after planting to ensure proper stand and density. Warm season fertilization should begin at 30 days after planting.

Apply maintenance levels of fertilizer as determined by soil test. In the absence of a soil test, fertilization should be as follows:

Cool Season Grasses

4 lbs. nitrogen (N)	}	Per 1000 ft. ² per year
1 lb. phosphorus (P)		
2 lbs. potash (K)		

Seventy-five percent of the total requirements should be applied between September 1 and December 31st. The balance should be applied during the remainder of the year. **More than 1 lb. of soluble nitrogen per 1000 ft.² should not be applied at any one time.**

Warm Season Grasses

Apply 4-5 lbs. nitrogen (N) between May 1 and August 15th per 1000 ft.² per year.

Phosphorus (P) and Potash (K) should only be applied according to soil test.

Note: The use of slow-release fertilizer formulations for maintenance of turf is encouraged to reduce the number of applications and the impact on groundwater.

Additional Information on the Successful Establishment of Grasses and Legumes

See Appendix 3.32-b for "helpful hints" in achieving high success rates in grass or legume plantings.

APPENDIX 3.32-a**SEED QUALITY CRITERIA**

Where certified seed is not available, the minimum requirements for grass and legume seed used in vegetative establishment are as follows:

- a. All tags on containers of seed shall be labeled to meet the requirements of the State Seed Law.
- b. All seed shall be subject to re-testing by a recognized seed laboratory that employs a registered seed technologist or by a state seed lab.
- c. All seed used shall have been tested within twelve (12) months.
- d. Inoculant - the inoculant added to legume seed in the seed mixtures shall be a pure culture of nitrogen-fixing bacteria prepared for the species. Inoculants shall not be used later than the date indicated on the container. Twice the supplier's recommended rate of inoculant will be used on dry seedings; five times the recommended rate if hydroseeded.
- e. The quality of the seed used shall be shown on the bag tags to conform to the guidelines in Table 3.32-E.

TABLE 3.32-E
QUALITY OF SEED*

	Minimum Seed <u>Purity (%)</u>	Minimum <u>Germination (%)</u>
<u>Legumes</u>		
Crownvetch	98	65**
Lespedeza, Korean	97	85**
Lespedeza, Sericea	98	85**
<u>Grasses</u>		
Bluegrass, Kentucky	97	85
Fescue, Tall (Improved, Turf-Type Cultivars)	98	85
Fescue, Tall (Ky-31)	97	85
Fescue, Red	98	85
Redtop	94	80
Reed Canarygrass	98	80
Perennial Ryegrass	98	90
Weeping Lovegrass	98	87
<u>Annuals</u>		
Annual Ryegrass	97	90
German Millet	98	85
Oats	98	80
Cereal Rye	98	85

* Seed containing prohibited or restricted noxious weeds should not be accepted. Seed should not contain in excess of 0.5% weed seed. To calculate percent pure, live seed, multiply germination times purity and divide by 100.

Example: Ky-31 Tall Fescue with a germination of 85 percent and a purity of 97 percent.

$$97 \times 85 = 8245. \quad 8245 \div 100 = 82.45 \text{ percent pure live seed.}$$

** Includes "hard seed"

APPENDIX 3.32-b**KEYS TO SUCCESSFUL ESTABLISHMENT OF GRASSES AND LEGUMES****Planning**

Where feasible, grading operations should be planned around optimal seeding dates for the particular region. The most effective times for establishing perennial grass in Virginia generally extend from March through May and from August through October. Outside these dates, the probability of failure is much higher. If the time of year is not suitable for seeding a permanent cover (perennial species), a temporary cover crop should be planted. Temporary seeding of annual species (small grains, ryegrasses or millets) often succeeds during periods of the year that are unsuitable for seeding permanent (perennial) species.

Variations in weather and local site conditions can modify the effects of regional climate on seeding success. For this reason, mixtures including both cool and warm season species are preferred for low-maintenance cover, particularly in the Coastal Plain. Such mixtures promote cover which can adapt to a range of conditions. Many of these mixtures are not desirable, however, for high quality lawns, where variation in texture of the turf is inappropriate. It is important to note that in Virginia the establishment of 100% warm season grasses in a high quality lawn is limited to the extreme eastern portions of the Coastal Plain.

Selection

Species selection should be considered early in the process of preparing an erosion and sediment control plan. A variety of vegetation can be established in Virginia due to the diversity in both soils and climate. However, for practical, economical stabilization and long-term protection of disturbed sites, species selection should be made judiciously.

Seasonality must be considered when selecting species. Grasses and legumes are usually classified as warm or cool season in reference to their season of growth. Cool season plants realize most of their growth during the spring and fall and are relatively inactive or dormant during the hot summer months. Therefore, fall is the most favorable time to plant them. Warm season plants "green-up" late in the spring, grow most actively during the summer, and go dormant at the time of the first frost in fall. Spring and early summer are preferred planting times for warm season plants.

Seed Mixtures

As previously noted, the establishment of high quality turf frequently involves planting one single species. However, in seedings for erosion control purposes, the inclusion of more than one species should always be considered. Mixtures need not be excessive in poundage or seed count. The addition of a quick-growing annual provides early protection and facilitates establishment of one or two perennials in a mix. More complex mixtures might include a quick-growing annual, one or two legumes and more than one perennial grass.

The addition of a "nurse" crop (quick-growing annuals added to permanent mixtures) is a sound practice for soil stabilization, particularly on difficult sites - those with steep slopes; poor, rocky, erosive soils; those seeded out the optimum seeding periods; or in any situation where the development of permanent cover is likely to be slow. The nurse crop germinates and grows rapidly, holding the soil until the slower-growing perennial seedlings become established.

APPENDIX 3.32-c

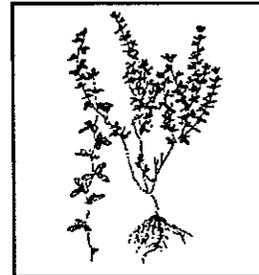
PLANT INFORMATION SHEETS

Contents:Annual Grasses and Grains

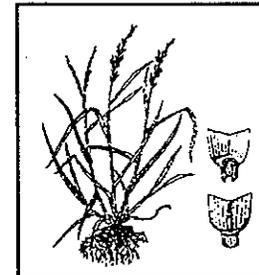
Oats
Rye
Foxtail Millet
Annual Ryegrass

Annual Legumes

Annual Lespedeza

Perennials

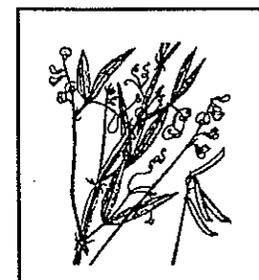
Tall Fescue
Kentucky Bluegrass
Perennial Ryegrass
Fine Fescues
Bermudagrass
Reed Canarygrass

Miscellaneous Erosion Control Grasses

Weeping Lovegrass
Redtop

Legumes

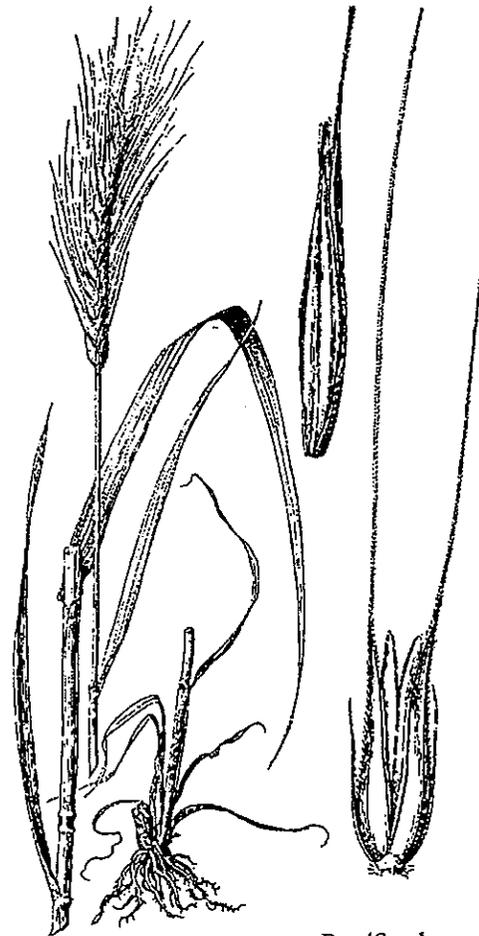
Crownvetch
Flatpea
Sericea Lespedeza
White Clover



ANNUAL GRASSES AND GRAINS

Small grains are cool season annual grasses primarily grown for animal feed and human consumption. In Virginia, the grains used for soil stabilization are primarily Rye and Oats. Foxtail Millet, which is sometimes considered a small grain, is becoming a very popular and successful planting for soil stabilization.

1. Oats (*Avenasativa*): A cool season annual grass primarily grown for animal feed and human consumption, but also used for soil stabilization. Oats are seeded in early spring in the western part of the state (winter oats may be sown in the Coastal Plain). Seeding rates are 3 bushels (100 lbs.) per acre bare ground or 2-1/2 lbs. per 1000 square feet.
2. Rye (*Secale cereale*): Often referred to as Winter Rye because of its winter hardiness, Rye is the most common small grain used for soil stabilization. It is also the most productive grain on dry, infertile, acid or sandy soils. It may be seeded in the fall for winter ground cover. By maturing early, it offers less competition during the late spring period, a critical time in the establishment of perennial species. Rye grain germinates quickly and is tolerant of poor soils. Including Rye grain in fall-seeded mixtures is almost always advantageous, but it is particularly helpful on difficult and erodible soils, erodible slopes or when seeding is late. Rates up to 100 lbs. for bare ground. Overly thick stands of Rye grain will suppress the growth of perennial seedlings. Approximately 50 lbs. per acre is the maximum for this purpose and, where lush growth is



Rye (Secale cereale)

expected, that rate should either be cut in half, or Rye grain should be totally eliminated from the mixture.

3. Foxtail Millet (*Setaria italica*): A warm season annual grass which may be used for temporary cover. German Millet (variety commonly used in Virginia) germinates quickly and goes to seed quickly. These features make it an excellent companion grass for summer seedlings. It dies at first frost. Seeding rates are up to 50 lbs. per acre for temporary cover. Use 10 to 20 lbs. per acre in mixes.

4. Annual Rye (*Lolium multiflorum*): A cool season annual grass used for temporary cover or as a nurse grass to allow for germination of permanent stands. Most commonly used in mixes for erosion control. Performs well throughout the state in neutral to slightly acid soils. Rates up to 100 lbs. per acre for temporary cover. Use 10 to 20 lbs. per acre in mixes.



Foxtail Millet (Setaria italica)



Annual Rye (Lolium multiflorum)

ANNUAL LEGUMES

1. Annual Lespedezas (*Lespedeza striata*)

Uses: Pasture, hay, erosion control, soil improvement, wildlife food.

Description: Annual warm season legumes. Korean Lespedeza is larger and coarser than Common Lespedeza and grows to about 12 inches. Seed of Korean is shiny and black, while seed of Common is stippled. Kobe is the most desirable variety of Common Lespedeza.

Adaptation: Throughout Virginia. Optimum pH range is 6.0 to 6.5; will grow from 5.5 to 7.0. Will grow in soil textures ranging from sands to clays and through a wide range of fertility conditions.

Establishment: Seed should always be inoculated. May be seeded alone or mixed with grasses or small grains. Requires a firm seedbed; may be broadcast or drilled. Should be seeded in early spring at 25 to 40 lbs. per acre or one-half to 1 lb. per 1000 square feet, depending on use. (Use lower figure as half the seeding rate of any spring seeding with grass or grain.) Should not be mowed at less than three inches. Lespedeza will not make a large contribution in sod grasses like Bluegrass; they do best in open sod grasses like tall fescue.

Sources: Seed of common variety (Kobe) and Korean varieties (Climax, Harbin and Rowan) are commercially available.



Annual Lespedezas (*Lespedeza striata*)

PERENNIALS

1. Tall Fescue (*Festuca arundinacea*)

Uses: Pasture, hay, recreation areas, lawns and stabilization of waterways, banks, slopes, cuts, fills, and spoils. It is the most widely used grass at this time for stabilizing large disturbed areas.

Description: A robust, cool season, long-lived, deep-rooted bunchy grass which may have short rhizomes (underground stems). Kentucky 31 is the best-known variety. A number of new varieties of Tall Fescue are becoming available for lawn and other fine-turf uses, and several offer definite improvements. However, their higher cost over the old standby, KY 31, is seldom justified when used for purposes of stabilization and erosion control. Tall Fescue tolerates a wide range of seeding dates; however, with the possible exception of high mountain elevation, it is most dependable when planted in fall.

Adaptation: Adapts well to both high and low maintenance uses throughout Virginia. Adapted to a wide range of climatic conditions. Optimum pH range is 6.0 to 7.0; will tolerate from 3.0 to 8.0. Will grow on shallow and claypan soils if they are moist. Growth is limited more by moisture than by temperature extremes, but it will tolerate drought, infertile soils and moderate shade.

Establishment: Requires a firm seedbed. Hydroseeding is successful. Seeding rates vary from 100 lbs. per acre for erosion control to 250 lbs. per acre for lawns. Plant in early spring or from the middle of August through September. Legumes may not thrive in fescue stands due to the aggressive growth habits of this grass. Mowing is desirable on critical areas at least once every two years; lack of periodic mowing will encourage clumpiness.

Sources: Readily available as seed and sod.



Tall Fescue (Festuca arundinacea)

2. Kentucky Bluegrass (*Poa pratense*)

Uses: Pasture, turf for lawns, athletic fields, golf courses, and playgrounds. Also used to stabilize waterways, slopes, cuts and fills. Choice food for grouse, turkeys, deer and rabbits.

Description: Long-lived, cool season perennial grass which forms a dense sod. Becomes dormant in the heat of summer since its growing season is spring and fall.

Adaptation: Best adapted to well-drained, fertile soils of limestone origin and the climate of northern and western Virginia. Optimum pH range is 6.0 to 7.0. Bluegrasses are better suited to high maintenance situations in the transition zone. Essentially dormant during dry or hot weather; however, it will normally survive severe drought.

Establishment: Requires a firm, weed-free seedbed and adequate fertilization (liberal phosphorus) and lime are important. Can be used with Tall Fescues at low rates. Minimum mowing height is 1-1/2 inches. Critical erosion areas may be mowed only once per year, if desired. This grass is usually seeded with a mixture of other grasses or legumes; several varieties of Bluegrass should be used together to ensure good stand survival. Bare ground rates are 120 lbs. per acre. Overseed 1 to 1-1/2 per 1000 square feet.

Sources: Readily available as seed and sod.



Kentucky Bluegrass (Poa pratense)

3. Perennial Ryegrass (*Lolium perenne*)

Uses: Erosion control, soil improvement, lawns, pasture, and hay; newer varieties are excellent for high-traffic areas.

Description: Perennial Ryegrasses are an excellent selection where rapid establishment is desired. Cool season. Ryegrasses cross-pollinate freely so "Common Ryegrass" may be a mixture of annual and perennial species. Certified seed of Perennial Ryegrass varieties is produced: Blaser, Palmer, Goalie, Fiesta II, Ranger, Regal and Pennfine may be used in Virginia.

Adaptation: Throughout Virginia. Grows best on dark, rich soils in mild climates. Newer varieties have good drought tolerance but may require irrigation if under drought stress or heavy traffic. Will tolerate wet soils with good surface drainage.

Establishment: A firm, mellow surface over compact subsoils gives good results. Seed in fall or spring. Perennial Ryegrass may also be seeded in mid-August to early September. For turf, use a rate of 5 to 8 lbs. per 1000 square feet, if seeded alone; lesser amounts are suitable in mixtures, depending on the characteristics of the companion species. Generally not seeded alone except on athletic fields with intensive use. Perennial Ryegrass does best when used with bluegrass as 20 percent or less of the mixture. Ryegrasses germinate rapidly which makes them particularly suited to disturbed-area stabilization and temporary



Perennial Ryegrass (*Lolium perenne*)

seeding. They will, however, tend to dominate stands in mixtures if percentage is too high.

Sources: Readily available commercially. Care should be taken to buy seed appropriate to the needs of the project.

4. Fine Fescues

- * Red Fescue
- * Hard Fescue
- * Chewings Fescue

Uses: Excellent for shady, low maintenance areas and north-facing slopes. May be used to stabilize waterways, slopes, banks, cuts, fills, and as a cover crop in orchards.

Description: Red Fescue is a cool season perennial that occurs in two forms: bunch-type and creeping. Creeping Red Fescue forms a tight sod. The leaves of Red Fescue are narrow and wiry. Hard Fescues are slow-growing with excellent shade tolerance.

Adaptation: Shade tolerant and somewhat drought-resistant once established. Grows well in sandy and acidic soils. Optimum pH range is 4.5 to 6.0. Prefers well-drained soils but requires adequate moisture for establishment. In areas of high temperature and humidity (such as southeastern Virginia), some Fine Fescues may turn brown or deteriorate during the summer. Newer varieties of Hard Fescue are more drought tolerant.

Establishment: Rarely seeded in pure stands. Seedbed preparation and fertility adjustments are usually dictated by the other grasses in the mixture. Red Fescues may comprise 25 to 60% by weight of a seeding mixture. In shaded areas red fescue may be the key grass in the mixture. Mowing consistently below 1-1/2 is not recommended.

Sources: Readily available commercially. New Hard Fescues may be in short supply.



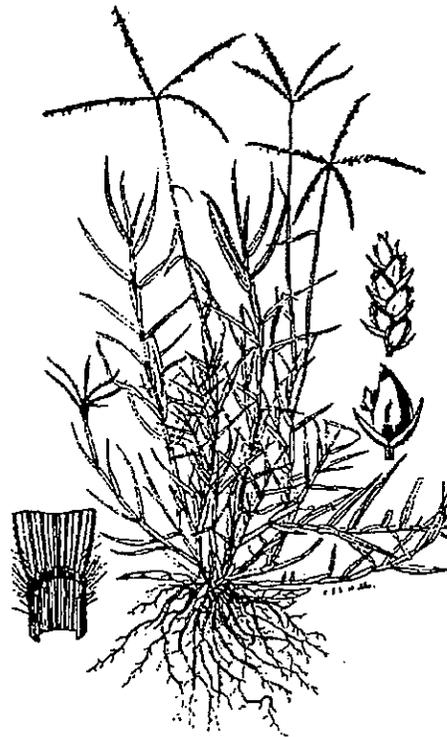
Red Fescue (Festuca rubra)

5. Bermudagrass (*Cynodon dactylon*)

Uses: Soil and water conservation, pasture, hay, silage, lawns, both high maintenance and general purpose turf, and stabilization of grassed waterways.

Description: A long-lived, warm season perennial that spreads by stolons and rhizomes (runners and underground stems). Height of stems of Common Bermudagrass may be 12 inches. The stems are short-jointed and the leaves flat and spreading. Common Bermudagrass may be established vegetatively with sprigs (sections of stems) or from seeds; however, it has the potential to develop into a weed problem because it spreads vigorously. Cold-tolerant hybrids are usually specified. These are traditionally established from sprigs or sod, but seed is now available.

Adaptation: Southern Piedmont and Coastal Plain in Virginia and some southern appalachian ridges and valleys. Check Std. & Spec. 3.34 for regional adaptations of varieties. Makes its best growth when average daily temperatures are above 75 degrees. Grows on a wide range of soils from heavy clays to deep sands. Optimum pH is 6.0 to 6.5. It is drought-resistant and salt-tolerant. Tolerates floods of short duration but will not thrive on waterlogged soils; does not persist under heavy shade. For rough areas, the varieties Midland (a forage hybrid) and Coastal are recommended. For fine-turf areas, Tufcote (a fine-leaved turf hybrid), Midiron, Tifway, and Vamont are used in Virginia.



Bermudagrass (*Cynodon dactylon*)

Establishment: By sodding or planting sprigs. Sprigs should be planted (by hand or machine) when soil is warm in a well-prepared, moist seedbed. One end of the sprig should extend above ground, and the other should be covered by firmly packed soil.

Sources: Readily available as seed, sprigs, and sod.

6. Reed Canarygrass (*Phalaris arundinacea*)

Uses: Pasture, hay silage, and erosion control. An excellent grass for stabilizing waterways, healing and controlling gullies, and protecting shorelines of ponds and reservoirs from wave action. Also provides good cover for shooting preserves. Can be used in deep gullies and drainage ditches where streamflow is rapid. Vigorous growth may impede flow in small, low velocity channels.

Description: A long-lived, cool season, clumpy perennial with coarse rhizomes (underground stems). Grows 4 to 7 feet tall. Most widely used variety is loreed.

Adaptation: Throughout Virginia. Does best in a cool, moist climate. Makes best growth on fertile, moist, medium to fine soils; but will grow in a wide range of soil moisture conditions. Will also grow well on swampy or floodplain soils consisting of peat, muck or sand. Will withstand flooding, yet is quite drought-tolerant when mature. Optimum pH range 5.0 to 7.5.



Reed Canarygrass (Phalaris arundinacea)

Establishment: Requires a well-prepared seedbed that is firm and weed free. Seed in spring or late summer; drill seed alone or with a legume. Seed must be fresh - it should be labeled as having at least 70% germination tested within the last 6 months. Normally, pure stands should be established because this grass is not very compatible with other plants. Mowing should not occur more than twice a year on stabilized critical erosion areas or waterway as this will result in reduced stands.

Sources: Available commercially.

MISCELLANEOUS EROSION CONTROL GRASSES

1. Weeping Lovegrass (*Eragrostis curvula*)

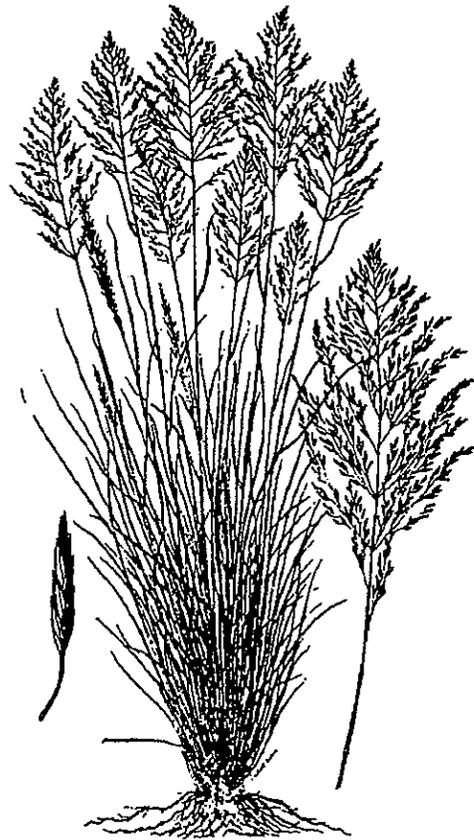
Uses: Fast-growing cover for erosion control. In the northeast, weeping lovegrass acts as a summer annual. The normal life of 3 to 5 years may be foreshortened by low winter temperatures. May provide permanent cover on southern exposure.

Description: A rapid-growing, warm season bunch grass introduced from East Africa. The long, narrow leaves are numerous, very fine, and droop over to the ground, hence the name. Leaf height is rarely above 12 inches.

Adaptation: Prefers light-textured, well-drained soil; will thrive on soil of low fertility. Low winter temperatures may deplete stand.

Establishment: Easy to establish by seed; germinates rapidly and grows quickly. Lime and fertilizer needs are similar to those of Tall Fescue and Ryegrass. Requires pH of 5.5 or higher. May be planted any time after danger of frost and throughout the summer. Very fine seed, commonly added to erosion control seed mixtures. Use of hydroseeders is successful if the seeding rate is increased to compensate for the lack of a firm seedbed. Normal seeding rates are 5 to 20 lbs. per acre in mixes.

Sources: Readily available from large seed companies.



Weeping Lovegrass (Eragrostis curvula)

2. Redtop (*Agrostis alba*)

Uses: Erosion control, pasture, companion grass in turf seedings and stabilizing ditch and channel banks, grassed waterways, and other disturbed areas.

Description: A coarse, cool season perennial grass with rhizomes (underground stems). Grows to 30 to 40 inches.

Adaptation: Throughout Virginia; does better in the cool, humid areas. Will grow under a wide variety of soil and moisture conditions. Grows on very acid soils (pH 4.0 to 7.5) and poor, clay soils of low fertility. While drought-resistant, it is also a useful wetland grass.

Establishment: Has very small seed and requires a compact seedbed. May be sown in early spring or late summer. Seldom seeded alone except as temporary turf. Adequate fertilization is essential on critical areas to obtain good cover rapidly. Most commonly added to mixes, usually 2 to 3 lbs. per acre. Redtop will disappear from a stand under frequent low mowing.

Sources: Available from commercial sources.



Redtop (Agrostis alba)

LEGUMES

1. Crownvetch (*Coronilla varia*)

Uses: For erosion control of critical areas such as steep roadbanks, surface mine spoil and industrial waste areas. It is also useful as a residential ground cover. It provides high-quality forage for ruminant animals and serves as a wildlife food and cover plant.

Description: A deep-rooted, cool season, perennial, herbaceous legume with a semi-reclining growth habit. It reaches 2 to 3 feet in height, and does not climb or twine. It fixes nitrogen in the soil and makes a dense mat of vegetative cover.

Adaptation: Best adapted to the northern Piedmont and Mountain regions of Virginia. It grows best on well-drained soils with a pH range of 5.5 to 8.3. It will persist on more acid soils for a prolonged period once established. It is not adapted to soils with poor drainage. Crownvetch is winter-hardy and drought-tolerant. Varieties commonly used are Chemung, Penngift and Emerald.



Crownvetch (Coronilla varia)

Establishment: Only inoculated seed should be used. Requires at least 500 lbs. per acre of 5-10-10 fertilizer (or the area should be fertilized according to soil test results). Soil acidity must be raised above a pH of 5.5. Crownvetch requires mulch and can be hydroseeded successfully. Seeding in the spring is most successful. Frost-seeding may be used on steep or stony sites (seed in late winter, and allow frost action to work the seed into soil). Crownvetch often takes 2 to 3 years to establish a dense stand. A companion grass such as Perennial Ryegrass or Redtop needs to be mixed into the initial planting, but the Crownvetch will eventually crowd out the companion plants. It will not persist under frequent mowing.

Sources: Available commercially.

2. Flatpea (*Lathyrus sylvestris*)

Uses: Flatpea is an erosion control plant that provides a thick mat of vegetative cover, fixes nitrogen in the soil, and can be maintained with a minimum of management. It is useful on roadbanks, dams, borrow area, gravel pits, surface mine spoil, and industrial waste areas. It is an ideal plant for stabilizing logging roads and utility right-of-ways since it will restrict the invasion of many woody species. It also provides good wildlife cover and food.

Description: A cool season perennial legume. It will climb to a height of 6 to 7 feet if support is available, but the normal height is 2 to 3 feet.

Adaptation: Flatpea is adaptable to a wide variety of soil conditions. It is drought-tolerant, cold-hardy, and does well on low-fertility sites such as sands, gravels, and soils from acid sandstones. It is not adapted to wet sites, but it will grow on somewhat poorly drained soils. It will tolerate minor shade and a minor degree of flooding. The optimum pH range is from 6.0 to 6.5. The only available variety is Lathco, developed by the USDA-Soil Conservation Service.

Establishment: Use only inoculated seed. The seedbed should be scarified, if possible. The seed is normally drilled or band seeded, but on rough sites or steep slopes, it can be broadcast and then worked into the soil by light dragging. Where possible, a light application of mulch, properly anchored, will assure a good stand. Lime is essential if the soil is below a pH of 5.0. Fertilize according to a soil test or apply 400 lbs. per acre of 10-20-10. Work lime and fertilizer into soil when preparing



Flatpea (Lathyrus sylvestris)

the seedbed. For a primary stand, use a seeding rate of 30 to 40 lbs. in a mixture with 8 to 10 lbs. of Perennial Ryegrass or 10 to 15 lbs. of Tall Fescue. Flatpea is slow to germinate, so grasses are needed to provide quick cover. Early spring seedings in April or May are best; June seedings are less desirable. Grass seedings may be overseeded with Flatpea from November through March. Flatpea is usually not winter-hardy if seeded in mid or late summer; therefore, dormant seedings are recommended. Mulch with straw at a minimum rate of 1-1/2 tons per acre on all critical sites, and anchor. Little management is required. Remove woody vegetation if the site is invaded. Mowing is acceptable once the stand is established. Mow after full bloom at a 6-inch minimum height.

Sources: Lathco is commercially available.

3. Sericea Lespedeza (*Lespedeza cuneata*)

Uses: Hay, pasture, erosion control, cover crop, wildlife food.

Description: Warm season perennial legume with upright woody stems 12 to 18 inches tall. Roots widely branched penetrating soil 3 feet or more.

Adaptation: Well adapted to all parts of Virginia. Best on well-drained, deep soils of medium texture. Will also grow on sandy, rather acidic, infertile soils. Most often the legume of choice for eastern Virginia. Optimum pH range is 6.0 to 6.5, but will tolerate a range of 5.0 to 7.0. It is drought-tolerant. Common varieties in Virginia are Serala and Interstate.

Establishment: Seed from April to June. Requires a firm seedbed. Use only inoculated seed. Rates vary from 20 to 30 lbs. of unhulled seed per acre. Requires phosphate and potash. Will not persist under frequent mowing (once a year recommended).

Sources: Seed of common varieties is commercially available.



Sericea Lespedeza (Lespedeza cuneata)

4. White Clover (*Trifolium repens*)

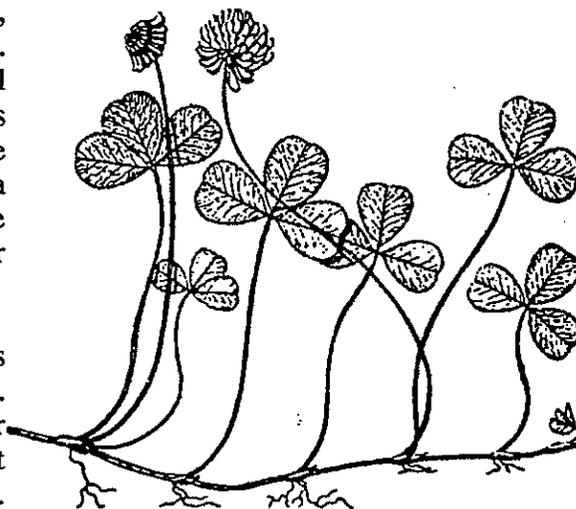
Uses: Common White Clover is used mostly for pastures. Ladino clover, a giant white clover, is also used for hay and silage in mixtures with a grass. The thick-growing, spreading characteristics of the common type make it ideal for erosion control.

Description: A cool season perennial legume. The common type has a prostrate type of growth, while the Ladino is more upright. Both spread by stolons (horizontal branches along ground) and by roots at the nodes. Representative common varieties used in Virginia are Tillman, Common and White Dutch. Ladino is the only cultivar for the large type.

Adaptation: Thrives in cool climates and on moist, rich soils with full sun. Will not tolerate extremes of cold or drought. Where soil moisture is not adequate, Ladino is short-lived. Optimum soil pH is 6.5, but it will grow in a range of 5.0 to 7.5. Common White Clover volunteers readily in Bluegrass mixtures where moderate to high fertility is maintained. Stands are persistent.

Establishment: Ladino Clover requires inoculation, fertilizing, and liming for successful growth. Phosphorus and potash are the key fertilizer elements required. Ladino makes a good companion crop with grasses such as Orchardgrass, Bromegrass, Tall Fescue and Timothy. These grasses will normally crowd out the Ladino after 2 to 3 years. Seed should be planted (drilled or broadcast) at shallow depths, and a firm seedbed is desirable.

Sources: Available commercially.



White Clover (Trifolium repens)

APPENDIX 3.32-d

TABLE 3.32-F

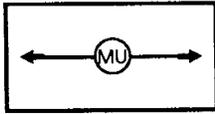
**LBS. OF GROUND AGRICULTURAL LIMESTONE*
PER THOUSAND SQUARE FEET NEEDED
TO CORRECT pH LEVEL OF ACID SOILS TO 6.5**

Existing pH	Soil Texture		
	Sandy Loam	Loam	Clay Loam
6.2	20	35	40
6.0	40	55	70
5.8	55	65	85
5.6	70	80	105
5.4	90	100	125
5.2	105	120	140
5.0	120	140	160
4.8	125	180	205
4.6	155	210	230
4.0	200	250	300

* Lime should always be applied in accordance with the results of a soil test, such as may be obtained through the soil testing laboratory at VPI&SU or through a reputable commercial laboratory.

Source: DSWC's Basic Urban E&S in Virginia

STD & SPEC 3.35



MULCHING

Definition

Application of plant residues or other suitable materials to the soil surface.

Purposes

1. To prevent erosion by protecting the soil surface from raindrop impact and reducing the velocity of overland flow.
2. To foster the growth of vegetation by increasing available moisture and providing insulation against extreme heat and cold.

Conditions Where Practice Applies

1. Areas which have been permanently seeded (see Std. & Spec. 3.32, PERMANENT SEEDING) should be mulched immediately following seeding.



2. Areas which cannot be seeded because of the season should be mulched to provide some protection to the soil surface. An organic mulch should be used, and the area then seeded as soon weather or seasonal conditions permit. It is not recommended that fiber mulch be used alone for this practice; at normal application rates it just simply does not provide the protection that is achieved using other types of mulch.
3. Mulch may be used together with plantings of trees, shrubs, or certain ground covers which do not provide adequate soil stabilization by themselves.
4. Mulch shall be used in conjunction with temporary seeding operations as specified in TEMPORARY SEEDING, Std. & Spec. 3.31.

Planning Considerations

Mulches are applied to the soil surface to conserve a desirable soil property or to promote plant growth. A surface mulch is one of the most effective means of controlling runoff and erosion on disturbed land.

Mulches can increase the infiltration rate of the soil, reduce soil moisture loss by evaporation, prevent crusting and sealing of the soil surface, modify soil temperatures, and provide a suitable microclimate for seed germination.

Organic mulch materials, such as straw, wood chips, bark, and fiber mulch have been found to be the most effective.

Chemical soil stabilizers or soil binders should not be used alone for mulch. These materials are useful to bind organic mulches together to prevent displacement.

A variety of manufactured SOIL STABILIZATION BLANKETS AND MATTING (see Std. & Spec. 3.36) have been developed for erosion control in recent years. Some of these products can be used as mulches, particularly in critical areas such as waterways. They also may be used to hold other mulches to the soil surface.

The choice of materials for mulching will be based on the type of soil to be protected, site conditions, season and economics. It is especially important to mulch liberally in mid-summer and prior to winter, and on cut slopes and southern slope exposures.

Organic Mulches

Straw - The mulch most commonly used in conjunction with seeding. The straw should come from wheat or oats (free of troublesome weed seeds) and may be spread by hand or machine. Straw can be windblown and must be anchored down by an acceptable method.

Hay - May be used in lieu of straw where volunteers will not present a problem, and may be spread by hand or machine. Hay can be windblown and must also be anchored or tacked down.

Corn Stalks - These should be shredded into 4- to 6-inch lengths. Stalks decompose slowly and are resistant to displacement.

Wood Chips - Suitable for areas that will not be closely mowed, and around ornamental plantings. Chips decompose slowly and do not require tacking. They must be treated with 12 pounds of nitrogen per ton to prevent nutrient deficiency in plants; however, can be a very inexpensive mulch if chips are obtained from trees cleared on the site.

Bark Chips, Shredded Bark - These are by-products of timber processing which are used in landscaped plantings. Bark is also a suitable mulch for areas planted to grasses and not closely mowed. It may be applied by hand or mechanically and is not usually toxic to grasses or legumes; additional nitrogen fertilizer is not required.

Fiber Mulch - Used in hydroseeding operations and applied as part of the slurry. It creates the best seed-soil contact when applied over top of (as a separate operation) newly seeded areas. These fibers do not require tacking, although tacking agents or binders are sometimes used in conjunction with the application of fiber mulch. This form of mulch does not provide sufficient protection to highly erodible soils. Additionally, fiber mulch will not be considered adequate mulch when used during the dry summer months or when used for late fall mulch cover. Use straw mulch during these periods. Fiber mulch may be used to tack (anchor) straw mulch. This treatment is well suited for steep slopes, critical areas, and areas susceptible to displacement.

There are other organic materials which make excellent mulches but are only available locally or seasonally. Creative use of these materials can reduce costs.

Chemical Mulches and Soil Binders

A wide range of synthetic, spray-on materials are marketed to stabilize and protect the soil surface. These are emulsions or dispersions of vinyl compounds, rubber or other substances which are mixed with water and applied to the soil. They may be used alone in some cases as temporary stabilizers, or in conjunction with fiber mulches or straw.

When used alone, chemical mulches do not have the capability to insulate the soil or retain soil moisture that organic mulches have. This soil protection is also easily damaged by traffic. Application of these mulches is usually more expensive than organic mulching, and the mulches decompose in 60-90 days.

Blankets and Matting

Field experience has shown that plastic netting, when used alone, does not retain soil moisture or modify soil temperature. In some cases it may stabilize the soil surface while

grasses are being established, but is primarily used in grassed waterways and on slopes to hold straw or similar mulch in place.

Jute mesh and other soil stabilization blankets are good choices for mulching on difficult slopes and in minor drainage swales. Most of the soil stabilization mattings (used to create a permanent matrix for root growth within the soil) must receive mulching in order to properly stabilize an area. Notably, some manufacturers have recently developed permanent mattings which include self-contained, temporary mulching materials; however, these measures will have to meet the requirements noted in Std. & Spec. 3.36, SOIL STABILIZATION BLANKETS AND MATTING, before they can be recommended for use on steep slopes and in channel flow situations.

The most critical aspect of installing blankets and mats is obtaining firm, continuous contact between the material and the soil. Without such contact, the material may fail and thereby allow erosion to occur. It is important to use an adequate number of staples and make sure the material is installed properly in order to maximize soil protection. These products are discussed in more detail in Std. & Spec. 3.36, SOIL STABILIZATION BLANKETS & MATTING.

Specifications

Organic Mulches

Organic mulches may be used in any area where mulch is required, subject to the restrictions noted in Table 3.35-A.

Materials: Select mulch material based on site requirements, availability of materials, and availability of labor and equipment. Table 3.35-A lists the most commonly used organic mulches. Other materials, such as peanut hulls and cotton burs, may be used with the permission of the local Plan-Approving Authority.

Prior to mulching: Complete the required grading and install needed sediment control practices.

Lime and fertilizer should be incorporated and surface roughening accomplished as needed. Seed should be applied prior to mulching except in the following cases:

- a. Where seed is to be applied as part of a hydroseeder slurry containing fiber mulch.
- b. Where seed is to be applied following a straw mulch spread during winter months.

TABLE 3.35-A
ORGANIC MULCH MATERIALS AND APPLICATION RATES

MULCHES:	RATES:		NOTES:
	Per Acre	Per 1000 sq. ft.	
Straw or Hay	1½ - 2 tons (Minimum 2 tons for winter cover)	70 - 90 lbs.	Free from weeds and coarse matter. Must be anchored. Spread with mulch blower or by hand.
Fiber Mulch	Minimum 1500 lbs.	35 lbs.	Do not use as mulch for winter cover or during hot, dry periods.* Apply as slurry.
Corn Stalks	4 - 6 tons	185 - 275 lbs.	Cut or shredded in 4-6" lengths. Air-dried. Do not use in fine turf areas. Apply with mulch blower or by hand.
Wood Chips	4 - 6 tons	185 - 275 lbs.	Free of coarse matter. Air-dried. Treat with 12 lbs nitrogen per ton. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.
Bark Chips or Shredded Bark	50 - 70 cu. yds.	1-2 cu. yds.	Free of coarse matter. Air-dried. Do not use in fine turf areas. Apply with mulch blower, chip handler, or by hand.

* When fiber mulch is the only available mulch during periods when straw should be used, apply at a minimum rate of 2000 lbs./ac. or 45 lbs./1000 sq. ft.

Source: Va. DSWC

Application: Mulch materials shall be spread uniformly, by hand or machine.

When spreading straw mulch by hand, divide the area to be mulched into approximately 1,000 sq. ft. sections and place 70-90 lbs. (1½ to 2 bales) of straw in each section to facilitate uniform distribution.

Mulch Anchoring: Straw mulch must be anchored immediately after spreading to prevent displacement. Other organic mulches listed in Table 3.35-A do not require anchoring. The following methods of anchoring straw may be used:

1. **Mulch anchoring tool** (often referred to as a **Krimper** or **Krimper Tool**): This is a tractor-drawn implement designed to punch mulch into the soil surface. This method provides good erosion control with straw. It is limited to use on slopes no steeper than 3:1, where equipment can operate safely. Machinery shall be operated on the contour.
2. **Fiber Mulch:** A very common practice with widespread use today. Apply fiber mulch by means of a hydroseeder at a rate of 500-750 lbs./acre over top of straw mulch or hay. It has an added benefit of providing additional mulch to the newly seeded area.
3. **Liquid mulch binders:** Application of liquid mulch binders and tackifiers should be heaviest at edges of areas and at crests of ridges and banks, to prevent displacement. The remainder of the area should have binder applied uniformly. Binders may be applied after mulch is spread or may be sprayed into the mulch as it is being blown onto the soil.

The following types of binders may be used:

- a. **Synthetic binders** - Formulated binders or organically formulated products may be used as recommended by the manufacturer to anchor mulch.
- * b. **Asphalt** - Any type of asphalt thin enough to be blown from spray equipment is satisfactory. Recommended for use are rapid curing (RC-70, RC-250, RC-800), medium curing (MC-250, MC-800) and emulsified asphalt (SS-1, CSS-1, CMS-2, MS-2, RS-1, RS-2, CRS-1, and CRS-2).

Apply asphalt at 0.10 gallon per square yard (10 gal./1000 sq. ft. or 430 gal./acre). Do not use heavier applications as it may cause the straw to "perch" over rills. All asphalt designations are from the Asphalt Institute Specifications.

* **Note:** This particular method is not used as commonly today as it once was in the past. The development of hydraulic seeding equipment promoted the industry

to turn to synthetic or organically based binders and tackifiers. When this method is used, environmental concerns should be addressed to ensure that petroleum-based products do not enter valuable water supplies. Avoid applications into waterways or channels.

4. Mulch nettings: Lightweight plastic, cotton, or paper nets may be stapled over the mulch according to manufacturer's recommendations.
5. Peg and twine: Because it is labor-intensive, this method is feasible only in small areas where other methods cannot be used. Drive 8- to 10-inch wooden pegs to within 3 inches of the soil surface, every 4 feet in all directions. Stakes may be driven before or after straw is spread. Secure mulch by stretching twine between pegs in a criss-cross-within-a square pattern. Turn twine 2 or more times around each peg.

Chemical Mulches

Chemical mulches* may be used alone only in the following situations:

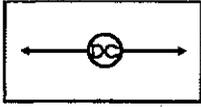
- a. Where no other mulching material is available.
- b. In conjunction with temporary seeding during the times when mulch is not required for that practice.
- c. From March 15 to May 1 and August 15 to September 30, provided that they are used on areas with slopes no steeper than 4:1, which have been roughened in accordance with SURFACE ROUGHENING, Std. & Spec. 3.29. If rill erosion occurs, another mulch material shall be applied immediately.

* Note: Chemical mulches may be used to bind other mulches or with fiber mulch in a hydroseeded slurry at any time. Manufacturer's recommendations for application of chemical mulches shall be followed.

Maintenance

All mulches and soil coverings should be inspected periodically (particularly after rainstorms) to check for erosion. Where erosion is observed in mulched areas, additional mulch should be applied. Nets and mats should be inspected after rainstorms for dislocation or failure. If washouts or breakage occur, re-install netting or matting as necessary after repairing damage to the slope or ditch. Inspections should take place up until grasses are firmly established. Where mulch is used in conjunction with ornamental plantings, inspect periodically throughout the year to determine if mulch is maintaining coverage of the soil surface; repair as needed.

STD & SPEC 3.39



DUST CONTROL

Definition

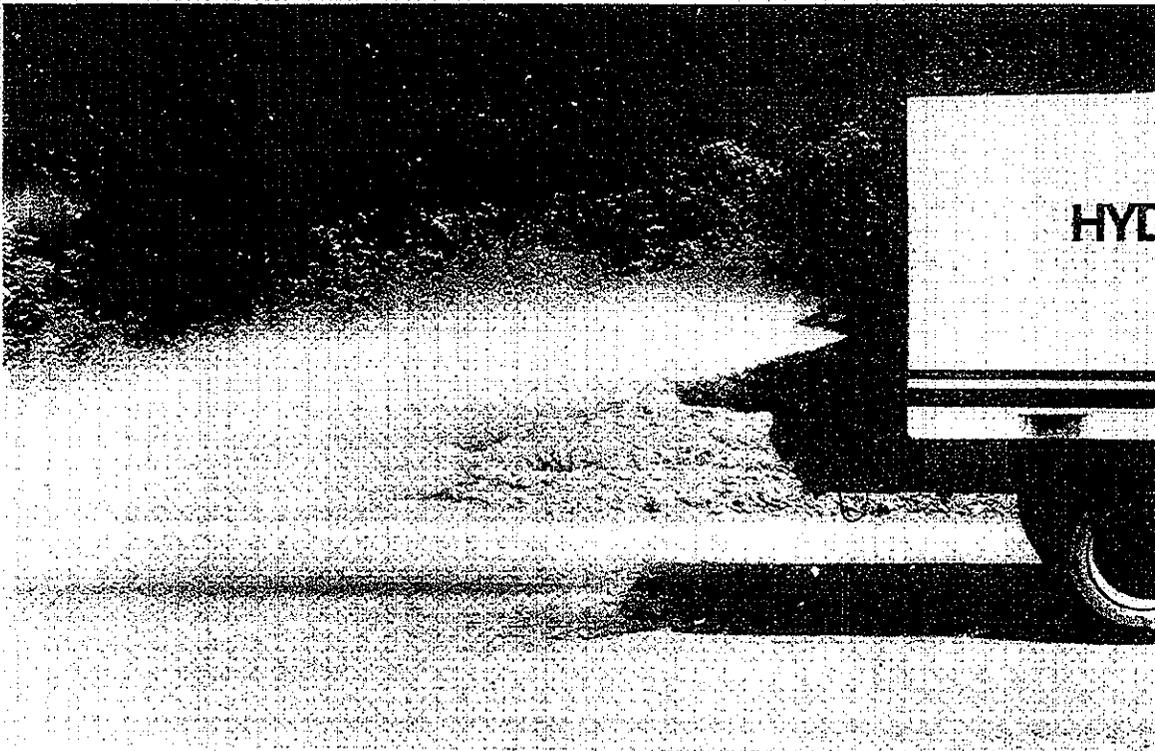
Reducing surface and air movement of dust during land disturbing, demolition and construction activities.

Purpose

To prevent surface and air movement of dust from exposed soil surfaces and reduce the presence of airborne substances which may present health hazards, traffic safety problems or harm animal or plant life.

Conditions Where Practice Applies

In areas subject to surface and air movement of dust where on-site and off-site damage is likely to occur if preventive measures are not taken.



Planning Considerations

Construction activities inevitably result in the exposure and disturbance of soil. Fugitive dust is emitted both during the activities (i.e., excavation, demolition, vehicle traffic, human activity) and as a result of wind erosion over the exposed earth surfaces. Large quantities of dust are typically generated in "heavy" construction activities, such as road and street construction and subdivision, commercial or industrial development, which involve disturbance of significant areas of the soil surface. Research of construction sites has established an average dust emission rate of 1.2 tons/acre/month for active construction. Earth-moving activities comprise the major source of construction dust emissions, but traffic and general disturbance of the soil also generate significant dust emissions.

In planning for dust control, limiting the amount of soil disturbance at any one time should be a key objective. Therefore, phased clearing and grading operations and the utilization of temporary stabilization in accordance with MS #1 can significantly reduce dust emissions. Undisturbed vegetative buffers (minimum 50-foot widths) left between graded areas and protected areas can also be very helpful in dust control.

Temporary Measures Used During Construction

1. Vegetative Cover - In areas subject to little or no construction traffic, a vegetatively stabilized surface will reduce dust emissions (see TEMPORARY SEEDING, Std. & Spec. 3.31).
2. Mulch - When properly applied, mulch offers a fast, effective means of controlling dust. Not recommended for areas within heavy traffic pathways. Binders or tackifiers should be used to tack organic mulches (see MULCHING, Std. & Spec. 3.35).
3. Tillage - This practice is designed to roughen and bring clods to the surface. It is an emergency measure which should be used before wind erosion starts. Begin plowing on windward side of site. Chisel-type plows spaced about 12 inches apart, spring-toothed harrows, and similar plows are examples of equipment which may produce the desired effect.
4. Irrigation - This is the most commonly used dust control practice. Site is sprinkled with water until the surface is wet. Repeat as needed. It offers fast protection for haul roads and other heavy traffic routes.
5. Spray-On Adhesives - Tremendous progress has been made in recent years in the development of products of this type. Most are effective on "mineral" soils and are ineffective on "muck" soils. These coherics are derived from a variety of compounds, both organic and synthetic based. Many of the adhesives will withstand heavy traffic loads. The organics include derivatives from pine tar and vegetable gum; synthetics may be acrylic or petroleum based.

The following table list various adhesives and provides corresponding information on mixing and application:

TABLE 3.39-A

ADHESIVES USED FOR DUST CONTROL

<u>Adhesive</u>	Water Dilution (<u>Adhesive: Water</u>)	<u>Type of Nozzle</u>	Application Rate <u>Gallons/Acre</u>
Anionic Asphalt Emulsion	7:1	Coarse Spray	1,200
Latex Emulsion	12.5:1	Fine Spray	235
Resin in Water	4:1	Fine Spray	300
Acrylic Emulsion (Non-Traffic)	7:1	Coarse Spray	450
Acrylic Emulsion (Traffic)	3.5:1	Coarse Spray	350

Source: Va. DSWC

6. Stone - Stone can be used to stabilize roads or other areas during construction using crushed stone or coarse gravel (see CONSTRUCTION ROAD STABILIZATION, Std. & Spec. 3.3).
7. Barriers - A board fence, wind fence, sediment fence, or similar barrier can help to control air currents and blowing soil. Place barriers perpendicular to prevailing air currents at intervals of about 15 times the barrier height. Where dust is a known problem, existing windbreak vegetation should be preserved.
8. Calcium Chloride - This chemical may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage. Application rates should be strictly in accordance with suppliers' specified rates.

Permanent Methods

1. Permanent Vegetation - The application of PERMANENT SEEDING (see Std. & Spec. 3.32) and saving existing trees and large shrubs can help reduce soil and air movement from construction sites.
2. Stone - Crushed stone or coarse gravel can be used as a permanent cover which will provide control of soil emissions.

MEETING MINUTES

CHEATHAM ANNEX SITE 11 HOTSPOT REMOVAL ACTION WORK PLAN RTC DISCUSSION

FEBRUARY 6, 2009, 1300 to 1430

MEETING ATTENDANCE

The following people attended the meeting via conference call:

Chris Murray (NAVFAC MIDLANT), Donna Caldwell (NAVFAC Atlantic), Wade Smith (VDEQ), Sue Haug (EPA), Peter Knight (EPA BTAG), Jim Gravette (CH2M HILL), Bill Kappleman (CH2M HILL ecological specialist), Stephanie Sawyer (CH2M HILL), Marlene Ivester (CH2M HILL), Skip Dunham (Shaw), and Bonnie Roberts (Shaw).

Introductions: Chris Murray/NAVFAC MIDLANT

Discussion Leader: Marlene Ivester/CH2M HILL

Desired Outcome: Team Consensus on WP Response to Comments (RTCs)

Discussion: Marlene opened the discussion stating that the EPA and VDEQ accepted all comment response with the exception of the ones that were going to be discussed during this call. For VDEQ, the response to Comment #9 and for EPA, the responses to BTAG's Comments 1, 2, 3, and 5 will be discussed. Marlene began with VDEQ's Comment #9, and asked Wade to discuss what clarity he needed. He felt the comment was addressed adequately by Shaw; however, the response was a little confusing because it said "maximum" depth for Areas 1, 3, and 4, but not for Area 2. The Navy clarified that all four areas would be excavated to three feet, and digging would end there. Wade asked that the WP revision be clear. The Navy proposed the following Work Plan revisions:

Text of worksheet #10 of the SAP will be revised to state *"It is anticipated that Areas 1, 2, 3, and 4 will be excavated to a depth of 3 feet below ground surface (bgs)."*

Section 3.4.1 work plan text will be revised to state: *"It is anticipated that the four soil focus areas (Areas 1 to 4) will be excavated to a depth of three (3) feet below ground surface (bgs)."*

With the revision above, Wade concurred with all RTCs to VDEQ comments.

Marlene continued the discussion, next addressing EPA BTAG Comments 1, 2, 3, and 5:

Comment #1: Peter was concerned about why an additional focus area was not included in the vicinity of sample 11SS12 where lead concentrations were detected above the ecological screening criteria of 120 ppm? He feels that this location should be an additional focus area for removal activities. Bill Kappleman reiterated the argument presented when this same comment was addressed related to the Site 11 EE/CA, stating that:

The post-removal scenarios evaluated (with the existing samples from Areas 1 through 4 removed) included an evaluation of the maximum, arithmetic mean, 95% upper confidence limit (UCL) of the arithmetic mean, and the geometric mean. The residual concentration of all contaminants of concern would be less than screening values based upon the 95% UCL, which is consistent with a baseline ecological risk assessment level conclusion of no unacceptable site-wide risk. For lead, SS-12 at 385 ppm would be the only screening value exceedance (of the 24 remaining samples) with a maximum hazard quotient (HQ) of 3.21. The frequency and magnitude of this exceedance, compared to the conservative, literature-based screening value (120 ppm) (not site-specific effects-based values), warrants a conclusion of no unacceptable post-remedial risk for the site.

Peter said he did not agree with the "frequency" argument and feels the closest RI samples to 11SS12 are far enough away to warrant additional sampling and a possible removal.

Jim Gravette pointed out that this same comment and discussion occurred with the Site 11 EE/CA during the July 2008 Partnering meeting (see EE/CA RTC response letter to EPA dated July 11, 2008, Comment #1), and the then EPA CAX RPM, Rob Thomson, agreed with the above argument and that the EE/CA could go final. Shaw's work plan reflects the EE/CA language.

Chris asked Sue if she was overruling the former RPM's decision? Sue replied she was because, quoting BTAG's Comment #1 on the Site 11EE/CA, ". . . the baseline ecological risk assessment was reviewed by the EPA BTAG, but not concurred with, per BTAG's 5/2/07 e-mail comments" and BTAG buy-in was necessary for site closure. Chris stated that the Navy would take the comment

“under advisement,” meaning he was not going to agree or disagree with the sampling during this call, thus this comment will be resolved later. Sue asked about the impact on the current schedule for the removal action? Chris said resolution of this comment will not hold up the proposed field work since the work plan was written for Areas 1 through 4. Therefore, the Team agreed that the work at Areas 1 to 4 could continue.

Comment #2: Peter is concerned about the definition of “clean” fill. Shaw stated that fill used at CAX comes from one of two sources which have previously met site-specific clean fill standards. Nonetheless, Peter is concerned as to where the fill comes from and the possibility that former sampling of the borrow source may not adequately characterize all soil within that borrow source. The Navy stated that clean fill determinations are generally made based on the history of the borrow source and/or sampling results. Peter was informed that the clean fill for this project will be sampled to confirm “clean” prior to being brought on-base; however, the results are not known during the work plan phase. The SAP (Worksheet #10) indicates that the fill will be analyzed for full suite, plus State required parameters (i.e., TPH) prior to being used at Site 11.

The team agreed that the clean fill will be sampled for select analytes in accordance with the SAP. The analytical results will be compared to the Site 11 established PRGs and background concentrations to determine if the fill used as backfill can be used at Site 11. If the analyzed constituents, detailed in the SAP, are equal to or below the PRGs or the CAX background levels, the fill can be used at Site 11. This agreement is specific to Site 11.

Comment #3: Regarding Section 5.4 of the WP which addresses “protection of natural resources,” Peter said he didn’t know what the CAX requirements for the “Protection of Natural Resources” are and the Work Plan should identify them. Since there are no requirements at Site 11 for the protection of natural resources, the team agreed to change this section to state that there are no known special protection requirements for natural resources.

Comment #5: Peter is concerned that the proposed pre-removal sampling in Areas 1, 3, and 4 is not adequate. For Area 1, upon further explanation of the sample locations and their ID’s, Peter agreed it was adequate. For Areas 3 and 4 (two man-made pits), Jim Gravette explained that the lateral extent of these areas is defined by the pit walls, except at the downgradient spillover point for each pit. Peter asked the diameter of the spillover for each pit. Jim indicated that each was about 2 feet wide. Jim also pointed out that each pit is surrounded by a berm about 2 feet high. Peter questioned why soils immediately outside these pits were only sampled to the northwest. Jim pointed out that soils to the northwest were samples since that was the most likely direction from which material was brought to these pits. Jim further explained that these pits sit at the point of a peninsula with steep slopes (~20 feet) down to Penniman Lake to the east, southeast, and south. Peter agreed the lateral extent of contamination within these pits was likely constrained by the pit walls on all sides except at the spillover point. Therefore, since proposed pre-removal sampling in Areas 3 and 4 already includes soil samples at each spillover point, the team agreed that the sampling plan as is was adequate, and based on those sampling results, the Team will determine if any additional sampling is needed.

Wrap-Up/Action Item: In summary, the DEQ is fine with the comments as they were addressed in Shaw’s Response to Comments. The team agreed to all comment responses determined during this meeting with the exception of the response to EPA BTAG Comment #1. This comment still needs to be addressed and a resolution to this comment is forthcoming. However, since resolving this comment has nothing to do with Areas 1 to 4 of the WP, the work plan can go final and Shaw can begin field activities.

**REPSONSE TO COMMENTS FROM THE DEQ
DRAFT FINAL WORK PLAN
HOT SPOT REMOVAL ACTION AT SITE 11
CHEATHAM ANNEX, NAVAL WEAPONS STATION YORKTOWN, VIRGINIA**

#	Section / Page	Comment	Response	Accepted
1	List of Appendices	Please include the Site Specific Health and Safety Plan in the Final Work Plan.	The Site Specific Health and Safety Plan will be provided as part of the Final Work Plan.	
2	List of Appendices	Please update to indicate that Susanne Haug is the EPA RPM.	Text revised in the Uniform Federal Policy Sampling and Analysis Plan to indicate Susanne Haug as the EPA representative per comment.	
3	List of Figures	Please include the Monitoring Well IDs on Figure 3.	Monitoring well ID's were added to Figure 3 per comment.	
4	Section 1.1	Please revise text to say, the overall goal of this removal action is to mitigate potential unacceptable ecological risk from exposure to site soil through the removal and disposal of contaminated soil to a depth of 3 feet at four soil focus areas.	Text was revised to State: <i>“The overall goal of this removal action is to mitigate potential unacceptable ecological risk from exposure to site soil through the removal and disposal of contaminated soil to a depth of 3 feet at four soil focus areas.”</i>	
5	Section 1.2 / Page 1-2	Revise section to state: The human health risk assessment concluded there were no potential unacceptable risks to current on-site workers or trespassers or to future construction workers or adult residents from exposure to soils. Furthermore, while potential unacceptable risk was identified for future child residents, mainly due to ingestion of iron, that risk is considered manageable since that average iron concentration across the site is less than background and the USEPA Region 3 residential	Text revised per comment to state: <i>“The human health risk assessment concluded there were no potential unacceptable risks to current on-site workers or trespassers or to future construction workers or adult residents from exposure to soils. Furthermore, while potential unacceptable risk was identified for future child residents, mainly due to ingestion of iron, that risk is considered manageable since that average iron concentration across the site is less than background and the Environmental Protection Agency (EPA) Region 3 residential soil screening level. The Ecological Risk Assessment (ERA) indicated that</i>	

		<p>soil screening level.</p> <p>The ERA indicated that PAHs, pesticides, and inorganics contributed to a potential unacceptable ecological risk in soil. The soils that pose a potential ecological risk are isolated to four areas. While this assessment identified two other soil sample locations that were recommended for further evaluation (RI sample locations 11SS24 and 11SS12), these locations will not be included in this action. RI sample location 11SS24, where mercury was detected at 0.17 L ppm, will not be included because this concentration is below background (0.24 ppm). RI sample location 11SS12, where lead was detected at 385 ppm, will not be included because both the maximum concentration of lead in surrounding soils (58.6 ppm at RI sample location 11SS13) and average residual concentrations of lead across the site without addressing sample location 11SS12 (42 ppm) are below the ecological screening criteria of 120 ppm.</p>	<p><i>Polychlorinated Aromatic Hydrocarbons (PAHs), pesticides, and inorganics contributed to a potential unacceptable ecological risk in soil. The soils that pose a potential ecological risk are isolated to four areas. While this assessment identified two other soil sample locations that were recommended for further evaluation (Remedial Investigation [RI] sample locations 11SS24 and 11SS12), these locations will not be included in this action. RI sample location 11SS24, where mercury was detected at 0.17 L parts per million (ppm), will not be included because this concentration is below background (0.24 ppm). RI sample location 11SS12, where lead was detected at 385 ppm, will not be included because both the maximum concentration of lead in surrounding soils (58.6 ppm at RI sample location 11SS13) and average residual concentrations of lead across the site without addressing sample location 11SS12 (42 ppm) are below the ecological screening criteria of 120 ppm (Final EE/CA for CAX Site 11 CH2M HILL, 2008)."</i></p>	
6	Section 3.1 / Page 3-1	<p>The planting of trees and shrubs was eliminated during the November 19, 2008 CAX Partnering Meeting. Please clarify.</p> <p>As mentioned in Section 3.5, please coordinate restoration activities with John McCloskey of the U.S. Fish & Wildlife Service.</p>	<p>Text revised to state "<i>Restoration will include backfilling the excavated areas with clean fill material, compacting with field equipment, applying a layer of topsoil, re-grading the fill material to approximate original elevations, and vegetation with native grasses.</i>"³</p> <p>As stated in Section 3.5 of the work plan: "<i>Shaw will coordinate the planting of native grasses with Mr. John</i></p>	

			<i>McCloskey of the U.S. Fish & Wildlife Service.”</i>	
7	Section 3.3.9 / Page 3-4	Figure 2 indicates a Stockpile area located between Soil Focus Area 1 and Soil Focus Area 2 (located directly on top of RI Sample 11SS12 – Lead @ 385 ppm). Please clarify.	Stockpile Area on Figure 2 was reduced in size and relocated to the side of concrete foundation of demolished building 269.	
8	Section 3.3.10 / Page 3-4	Figure 3: Please indicate that these are approximate/proposed sample locations.	Text in legend of Figure 3 was revised to say “Approximate Pre-Construction Perimeter Sample Location”	
9	Section 3.4.1 / Page 3-6	SAP Worksheet #10 indicates that Area 2 will be excavated to 1 foot bgs. Please clarify. Please revise Section 3.4.1 to state that Area 2 will be excavated to 3 bgs.	Text of worksheet #10 of the SAP has been revised to state “ <i>It is anticipated that Area 1, 2, 3, and 4 will be excavated to depth of 3 feet bgs</i> ”. Section 3.4.1 work plan text has been revised to state: “ <i>It is anticipated that the four soil focus areas (Area 1-4) will be excavated to a depth of three (3) feet below ground surface (bgs).</i> ”	
10	Section 3.5	Please revise text to state, the final grade for Area 1 and 2 will be original grade and Area’s 3 and 4 will be backfilled to grade.	Text was revised to state: “ <i>The final grade for Area 1 and 2 will be original grade and Area’s 3 and 4 will be backfilled to grade.</i> ”	

**RESPONSE TO COMMENTS FROM THE EPA-RPM
DRAFT FINAL WORK PLAN
HOT SPOT REMOVAL ACTION AT SITE 11
CHEATHAM ANNEX, NAVAL WEAPONS STATION YORKTOWN, VIRGINIA**

#	Section / Page	Comment	Response	Accepted
1	Section 3.3.1	States that the high-visibility fence will be removed at the completion of soil removal. Please change “soil removal” to “backfilling” or “restoration”.	Text revised per comment	
2	Section 6.2.	Please add “and stabilized” to the end of the last sentence.	Text revised per comment	
3	Appendix B, Section 2.2.3.	Please change “generated” to “contained”.	Text revised per comment	
4	Appendix B, Section 2.3, 5 th bullet.	Please remove sentence regarding tree planting.	Text revised per comment	
5		Please send a copy of this report to John McClosky of FWS.	Shaw will provide a copy of Final Work Plan to John McClosky	

**RESPONSE TO COMMENTS FROM THE EPA-BTAG
DRAFT FINAL WORK PLAN
HOT SPOT REMOVAL ACTION AT SITE 11
CHEATHAM ANNEX, NAVAL WEAPONS STATION YORKTOWN, VIRGINIA**

1	Section 1.2	<p>Site Description and Background, states “RI sample location 11SS12, where lead was detected at 385 ppm, will not be included because both the maximum concentration of lead in surrounding soils (58.6 ppm at RI sample location 11SS13) and average residual concentrations of lead across the site without addressing sample location 11SS12 (42 ppm) are below the ecological screening criteria of 120 ppm.” Based on Figure 3, the nearest sample (11HA02) is approximately 100 feet away to the west south west of 11SS12. Sample location 11SS06 is approximately 100 feet to the south west of 11SS12. Sample location 11SS13 (Soil Focus Area 2 – 100 square feet) is located approximately 160 feet to the east north east of 11SS12. Sample 11SS21 is approximately 240 feet north north east of 11SS12. This suggests the area around sample 11SS12 in excess of the lead PRG could be 10,000 square feet or more. The fact that the lead concentration at 11SS12 is over three times higher than the lead PRG (120 ppm) and the size of the area potentially affected by this lead concentration could be 10,000 square feet or more suggests this sample should be identified as an additional soil focus area.</p>	<p>The Navy respectfully disagrees. The language from the work plan quoted in your comment is directly from Section 2.4.2 (Ecological Risk) of the Final Engineering Evaluation/Cost Analysis (EE/CA) for CAX Site 11 (CH2M HILL, 2008). During its review of the draft EE/CA, EPA provided a comment similar to this, stating, in part, that “. . . average concentrations are not appropriate for protecting receptors with limited or no mobility (invertebrates and plants). The size and concentration [at location 11SS12] should also be considered” (refer to EPA’s comment letter on the draft EE/CA dated June 12, 2008). The Navy responded, in part, (refer to Navy’s RTC letter for EPA’s comments on the draft EE/CA dated July 11, 2008) that:</p> <p style="padding-left: 40px;">The post-removal scenarios evaluated (with the existing samples from Areas 1 through 4 removed) included an evaluation of the maximum, arithmetic mean, 95% upper confidence limit (UCL) of the arithmetic mean, and the geometric mean. The residual concentration of all contaminants of concern would be less than screening values based upon the 95% UCL, which is consistent with a baseline ecological risk assessment level conclusion of no</p>	
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			<p>unacceptable site-wide risk. For lead, SS-12 at 385 ppm would be the only screening value exceedance (of the 24 remaining samples) with a maximum hazard quotient (HQ) of 3.21. The frequency and magnitude of this exceedance, compared to the conservative, literature-based screening value (120 ppm) (not site-specific effects-based values), warrants a conclusion of no unacceptable post-remedial risk for the site. No change to the document based on this comment is warranted.</p> <p>At the July 23, 2008 Partnering Meeting, this issue, as well as all, Navy responses to EPA and State comments on the draft EE/CA were discussed. The EPA RPM, Rob Thomson, concurred with all responses and agreed the draft EE/CA could go final. Based on the EPA's concurrence with the EE/CA language and that the hot spot removal action work plan reflects this language, the Navy feels this issue has been addressed and no change to the work plan is necessary.</p> <p>After the meeting conducted on February 6, 2009 between EPA, DEQ, NAVY, Shaw and CH2M Hill this comment was note resolved. Resolution of this comment will not hold up the proposed field work since the work plan was written for Areas 1 through 4. Therefore, the Team agreed that the work at Areas 1 to 4 could continue, and</p>	
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			this comment will be addressed at a later date.	
2	Section 3.5	Site Restoration indicates that backfilling will be with “common fill material.” The plan needs to document that this common fill material will not pose any risks to ecological receptors at this site.	Text revised to state: “ <i>Shaw will ensure that imported materials are certified clean through laboratory analytical testing. Imported fill material and topsoil will be sampled and analyzed per the UFP-SAP (Appendix E). Geotechnical and chemical testing results will be submitted to WPNSTA Yorktown CAX.</i> ”	
3	Section 5.4	Protection of Natural Resources indicates that Shaw will conform to CAX requirements with respect to the protection of natural resources. These requirements need to be documented in this report.	Text revised to state “ <i>There are no known special protections of natural resources at this site.</i> ”	
4	Section 6.1	Silt Fence, indicates a silt fence will be used to minimize “... off-site migration of sediment”. The description of these four areas suggests they are upland and the removal will be of surface soil down to a depth approximately 3 feet below ground surface. It appears that the word “sediment” be changed to “soil” in the quote.	Text revised per comment.	
5	Figure 3	Shows pre-construction sample locations. The samples for Area 2 seem reasonable because they surround the area. However, the pre-construction samples for Areas 1, 3, and 4 do not surround each area and appear only on one side of each of these areas. The samples at Areas 1, 3, and 4 do not appear to be adequate.	The pre-removal sampling presented in the work plan is consistent with the language in Section 4.1.2 (and reflected on Figure 4-2) of the final EE/CA, which states: <ul style="list-style-type: none"> • Area 1: Collect co-located surface (0-6 inches) and subsurface soil (2-3 ft bgs) samples at the three locations shown on Figure 3. The northeast/east portion of Area 1 is already defined by the 1999 removal action sample locations 11-HA01, 11-HA03, and 11- 	

			<p>HA06 (Baker, 2007) Analyze for total PAHs, 4,4-DDD, 4,4-DDE, copper, lead, mercury, and zinc.</p> <p><i>(Page change is required for the final EECA: Area 1 bullet should also reference 2002 RI sample location 11SS02 as an existing clean data point).</i></p> <ul style="list-style-type: none"> • Area 2: Collect co-located surface (0-6 inches) and subsurface soil (2-3 ft bgs) samples at the four locations approximately 10 feet out from former RI sample location 11SS13 as shown on Figure 3. Analyze for zinc only. • Area 3: Collect one surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression shown on Figure 3. The lateral extent of contamination is constrained by the limits of the pit. Analyze for 4,4-DDD, 4,4-DDE, copper, iron, lead, mercury, selenium, and zinc. • Area 4: Collect one surface soil (0-6 inches) sample at the end of the surficial drainage point exiting the depression shown on Figure 3. The lateral extent of contamination is constrained by the limits of the pit. Analyze for 4,4-DDD, 4,4-DDE, lead, mercury, selenium, and zinc. <p>Thus, with regulatory approval and finalization of the EECA, the CAX Partnering Team agreed that existing soil data is sufficient to define the lateral extent around most of Area 1, however, pre-construction sampling is required along the</p>	
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			<p>western side (3 locations). For Areas 3 and 4, they are depressions/pits; therefore, the Team agreed that sampling around the outside of the pits is unnecessary as “the lateral extent of contamination is constrained by the limits of the pit.” However, on the southern side of each pit, there is a man-made overflow swale where surface water would exit the pit when it fills up during heavy rainfall events. The Team agreed that a surface soil sample should be collected of this overflow point to confirm that contaminants associated with each pit have not migrated out of the pit.</p> <p>The Navy feels the pre-removal sampling at Areas 1 to 4 is adequate. The four bulleted items above will be added to Section 3.3.10 of the work plan to provide further clarity since Figure 3 by itself does not convey this information.</p>	
6	Restoration	<p>Regarding any restoration planting of soils, the seed mix needs to contain only native species. Fescue is not acceptable. A seed mix consisting of the following would be acceptable:</p> <ul style="list-style-type: none"> a. 10 pounds per acre of switchgrass (<i>Panicum virgatum</i>); b. 10 pounds per acre of Virginia wild rye (<i>Elymus virginicus</i>); c. 2 pounds per acre of partridge pea (<i>Cassia fasciculata</i>); and, d. 25 pounds per acre of annual rye (<i>Lolium multiflorum</i>) as a nurse crop. 	<p>Comment is noted; the work plan states: “<i>Shaw will plant a blend of native grass seed, as per the SOW, to complete site restoration. Shaw will coordinate the planting of native grasses with Mr. John McCloskey of the U.S. Fish & Wildlife Service.</i>”</p>	