

Health and Safety Plan
for
Pilot Study
Air Sparging/Vapor Extraction
System
Naval Weapons Industrial Reserve
Plant (NWIRP)
Calverton, New York



Northern Division
Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0223

June 1995

**HEALTH AND SAFETY PLAN
Pilot Study
Air Sparging/Vapor Extraction System
FOR
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
CALVERTON, NEW YORK**

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

**Submitted to:
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1.0 INTRODUCTION

This Health and Safety Plan (HASP) addendum has been specifically written for Naval Weapons Industrial Reserve Plant (NWIRP), Calverton, Suffolk County, New York. This HASP addendum provides the minimum health and safety practices and procedures required for Halliburton NUS, C. F. Braun, and subcontractor personnel involved in the site characterization and Air Sparging/Soil Vapor Extraction (AS/SVE) Remediation System installation. The latest available information regarding known or suspected chemical contaminants and potential physical hazards are included in this document. This addendum must be used in conjunction with the Halliburton NUS Health and Safety Guidance Manual which contains detailed information on the policies and procedures listed within this HASP addendum. Additionally, this HASP must be used in conjunction with the Final HASP (Halliburton NUS, July 1993, CTO 0090) of which is modified for these tasks through the inclusion of this addendum. Sections of the final HASP CTO 0090 dated July 1993 not addressed by this addendum will remain intact and take precedence for guidance and direction for on site activities. This plan may be modified as new information becomes available. Requests for modifications to this plan will be directed to the SSO who will in turn, determine and make the necessary changes. The SSO will notify the Project Manager (PM) who will notify all affected personnel of all changes. A Site Safety Follow Up Report will document all changes to this plan. This HASP has been written and is intended to be in compliance with the requirements established by OSHA 29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response" (HAZWOPER) and applicable sections of 29 CFR 1926 "Safety and Health Regulations For Construction." The information contained in this plan and policies on conducting on site operations were obtained from the Halliburton NUS Health and Safety Program and Calverton NWIRP policies and procedures.

1.1 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibility for site safety and health for Halliburton NUS and subcontractor employees engaged in on site activities. Personnel assigned to these positions will exercise the primary responsibility for all on site health and safety. These persons will be the primary point of contact for any questions regarding the safety and health procedures and the selected control measures.

- The Halliburton NUS Project Manager (PM) is responsible for the overall direction and implementation of health and safety for this project.

- The Halliburton NUS Field Operations Leader (FOL) is responsible for implementation of this HASP with the assistance of an appointed Site Safety Officer (SSO). The FOL duties may include:
 - Managing field activities.
 - Execution of the work plan.
 - Enforcement safety procedures, as applicable to the work plan.
 - Implementation of activities deemed necessary by the SSO.
 - The FOL will mark the original HASP (Halliburton NUS CTO 0090, July 1993) so on site personnel will know what sections have been modified in support of this task order.

- The SSO supports site activities by advising the FOL on all aspects of health and safety on site. These duties may include:
 - Coordinates all health and safety activities with the FOL.
 - Selects, applies, inspects, and maintains personal protective equipment.
 - Establishes work zones and control points.
 - Implements air monitoring program for onsite activities.
 - Verifies training and medical of status of onsite personnel.
 - Implements hazard communication and respiratory protection programs.
 - Coordinates emergency services.

- Compliance to these requirements is monitored by the SSO and coordinated through the CLEAN HSM.

2.0 EMERGENCY ACTION PLAN

2.1 INTRODUCTION

In the event of onsite emergencies, site personnel will be evacuated to a safe place of refuge. The appropriate emergency response agencies will be notified. The emergency response agencies listed in this plan are capable of providing the most effective response. These agencies are located within a reasonable distance from the area of operations. This ensures adequate emergency response time. Halliburton NUS and subcontractor personnel will not provide emergency response support. This is due to the types of emergencies most likely to be encountered during performance of this work, and limitations of the field crew concerning the types of equipment necessary to support this type of operation. This emergency action plan conforms to the requirements of OSHA Standard 29 CFR 1910.38(a), as defined in OSHA 29 CFR 1910.120(l)(1)(ii).

2.2 PRE-EMERGENCY PLANNING

Pre-emergency planning activities associated with this project include the following:

- The SSO and/or the FOL are responsible for coordinating with Calverton NWIRP Security Services personnel to ensure that Halliburton NUS emergency action activities are compatible with existing facility emergency response procedures.
- The Halliburton NUS FOL with the assistance of the SSO will be responsible for establishing and maintaining information at the project staging area (support zone) for easy access in the event of an emergency. This information will include the following:
 - Chemical Inventory List (used on site), with Material Safety Data Sheets.
 - Onsite personnel medical records (medical data sheets).
 - A logbook identifying personnel on site, and activities which are being conducted each day.
- The FOL and the SSO will periodically evaluate ongoing operation in an effort to identify and/or minimize potential hazards and foreseeable emergencies. This activity will be documented within

the logbook. Preliminary evaluations of the planned activities indicate that the only foreseeable emergencies in this case is the potential for injury or illness.

- Identifying a chain of command for emergency action. For on site activities at NWIRP, the FOL will serve as the primary point of contact for Halliburton NUS and subcontractor personnel. The FOL will be supported in this effort by the SSO who will serve as an alternate.

2.3 EMERGENCY RECOGNITION AND PREVENTION

2.3.1 Recognition

Generally, potential emergency situations are recognizable by visual observation. An injury or illness will be considered an emergency, if it requires treatment other than self administered first aid (i.e. requires treatment by a medical professional).

2.3.2 Prevention

Halliburton NUS will attempt to minimize or prevent emergencies by ensuring compliance with this site-specific HASP addendum, and regular monitoring of the work areas and field crews.

2.4 SAFE DISTANCES AND PLACES OF REFUGE

In the event that the site must be evacuated, all personnel will immediately stop activities and report to the telephone communications point for that area (entry gate). Upon reporting to the refuge location, personnel will remain there until directed otherwise by the Halliburton NUS FOL. The FOL or the SSO will take a head count at this location, using the logbook, to confirm the location of all site personnel.

2.5 EVACUATION ROUTES AND PROCEDURES

An evacuation will be initiated whenever: a fire or explosion occurs; readings on monitoring instrumentation indicate levels of contamination greater than instituted action levels; or personnel show signs or symptoms of overexposure to potential site contaminants. In the event of an evacuation, personnel will proceed immediately to the support zone (entry gate), unless doing so would further jeopardize the welfare of workers. Should access to the primary assembly point be denied, personnel will proceed to an alternate location until instructed otherwise by the Halliburton NUS FOL. Alternate locations will be selected by the

FOL or the SSO and communicated to the field crews, prior to the initiation of any work relative to the area of operation for that day. These locations, once resolved, will be documented in the logbook for each area of operation.

Emergency alerting and evacuation procedures will be drilled at a time selected by the FOL and SSO to determine its effectiveness.

2.6 DECONTAMINATION PROCEDURES/EMERGENCY MEDICAL TREATMENT

Decontamination procedures will be performed only if doing so does not further jeopardize the welfare of site workers. Decontamination will not be performed, if the action which initiates an evacuation would further endanger the lives of workers, if workers were to perform decontamination procedures. However, it is unlikely that such an event could occur at this site that would require workers to evacuate the site without first performing decontamination procedures. Site personnel are not authorized to perform emergency first aid.

2.7 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

Since Halliburton NUS personnel will be working in close proximity to each other, hand signals and voice commands, and 2-way radio will be sufficient to alert site personnel of an emergency.

If an accident occurs on Base, the following procedures are to be initiated:

Call (516) 953-6611 or On Base Emergency Access Extension 3333 for Base Security and report the emergency. All personnel initiating emergency notification procedures shall provide the following information

- Give the emergency operator/dispatcher
 - Your name;
 - The location of the emergency;
 - Brief description of what has occurred;
 - The number of personnel involved;
 - The types of injuries, or assistance needed.

- Follow the instructions given by the emergency operator/dispatcher. Emergency services will be notified by Base Security, who will in turn, direct them to your location upon their arrival.

All emergency notification shall be directed through Base Security. Failure to do so may result in the emergency services arriving at the gate being denied access.

2.8 PPE AND EMERGENCY EQUIPMENT

A first-aid kit, stretcher, fire extinguishers (strategically placed), portable eyewash, and fire blanket will be maintained on site and immediately available for use in the event of an emergency.

2.9 EMERGENCY CONTACTS

Prior to performing work at any of the sites, all personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. A phone shall be available on site at the work trailer area.

Note: The numerical designation beside the reference designation establishes the notification sequence.

**EMERGENCY REFERENCE
Calverton NWIRP - Suffolk County, New York**

AGENCY		TELEPHONE
1)	EMERGENCY: Ambulance Police Fire Department	(516)953-6611 Base Security Base Emergency Access Ext. 3333
2a)	David Brayack, P.E. Project Manager	(412) 921-8375
2b)	Jim Colter, RPM	(610) 595-0567 Ext. 163
2c)	Abe Kern, Base Contact	(516) 575-6192
3)	Thomas M. Dickson Project HSO/SSO	(412) 921-8457
4)	Matthew M. Soltis, CIH, CSP CLEAN Health & Safety Manager (HSM)	(412) 921-8912
	Central Suffolk Hospital (Riverhead)	(516)548-6000
	National Response Center	(800) 424-8802

FOL: Post emergency numbers at the telephone communications locations.

2.10 EMERGENCY ROUTE TO HOSPITAL

The Base Security will make all arrangements for transportation in the event of a medical emergency. The Base Security will be contacted as per instruction provided in Section 2.7, Emergency Alerting and Action Response Procedures.

However, should site personnel need access to the hospital outside of an emergency situation, personnel are directed to:

Proceed to the north gate, turn right traveling east on Route 25 (Middle County Road). Route 25 turns into Route 58. Proceed to traffic circle. The hospital is on the left. The hospital is approximately 10 minutes from the site.

3.0 SITE BACKGROUND

Naval Weapons Industrial Reserve Plant (NWIRP) Calverton is located at the eastern end of Long Island, in Suffolk County, New York. It covers almost 6,000 acres, a portion in the town of Riverhead and the remaining part is in Brookhaven. Refer to Figures 3-1 and 3-2.

3.1 ACTIVITY MISSION AND HISTORY

The mission of NWIRP Calverton is to assemble, develop, and flight-test aircraft for the U.S. military. (NWIRP Bethpage manufactures many of the components assembled and tested at NWIRP Calverton.)

NWIRP Calverton was built during the Korean War. Construction was completed in 1954. Its mission continues to be the assembly, testing, refitting, and retrofitting of Naval aircraft. The Department of Navy personnel oversees the work done by civilian experts and technicians employed by Grumman Aerospace Corporation (Grumman).

NWIRP Calverton is a Government Owned Contractor Operated (GOCO) activity operated by the Grumman Aerospace Corporation. The facility covers 11 square miles, most of which is owned by the Navy. Plant 08 (an avionics test building) and its guard booth are the only structures situated on land owned by Grumman.

3.2 AREA OF OPERATION

NWIRP Calverton as the subject of previous investigations was divided up into areas of concern to determine location and extent of contamination. The planned sampling and installation of the AS/SVE remediation system will take place at the location formerly identified as Site 2: Fire Training Area. This area (Figure 3-2) has been used exclusively by the Grumman Crash Crew and other fire fighting personnel at NWIRP Calverton since 1952.

3.2.1 Site 2: Fire Training Area

Fire Training Area appears to be a bermed ring created from site soils. This early gaining ring was

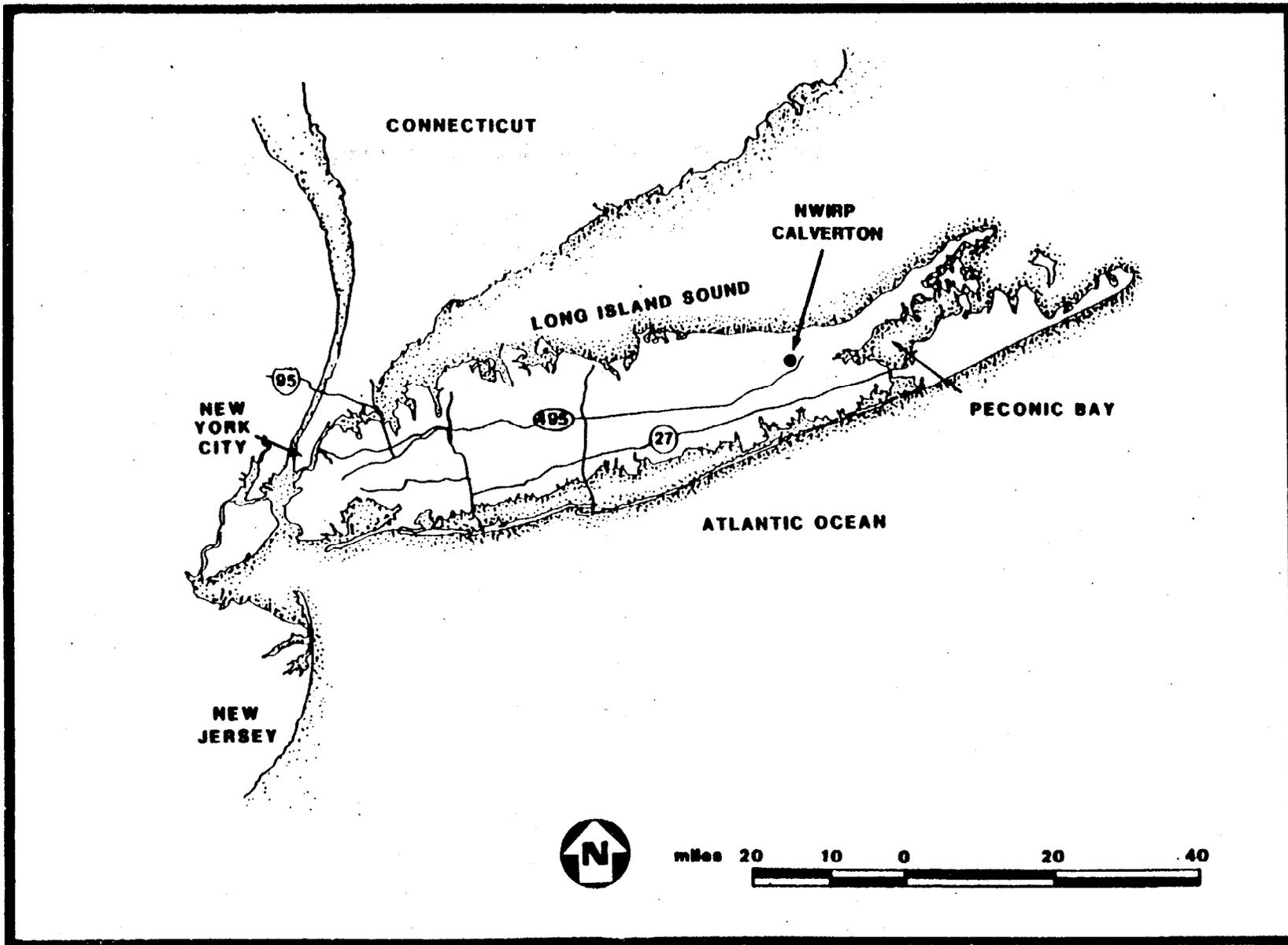
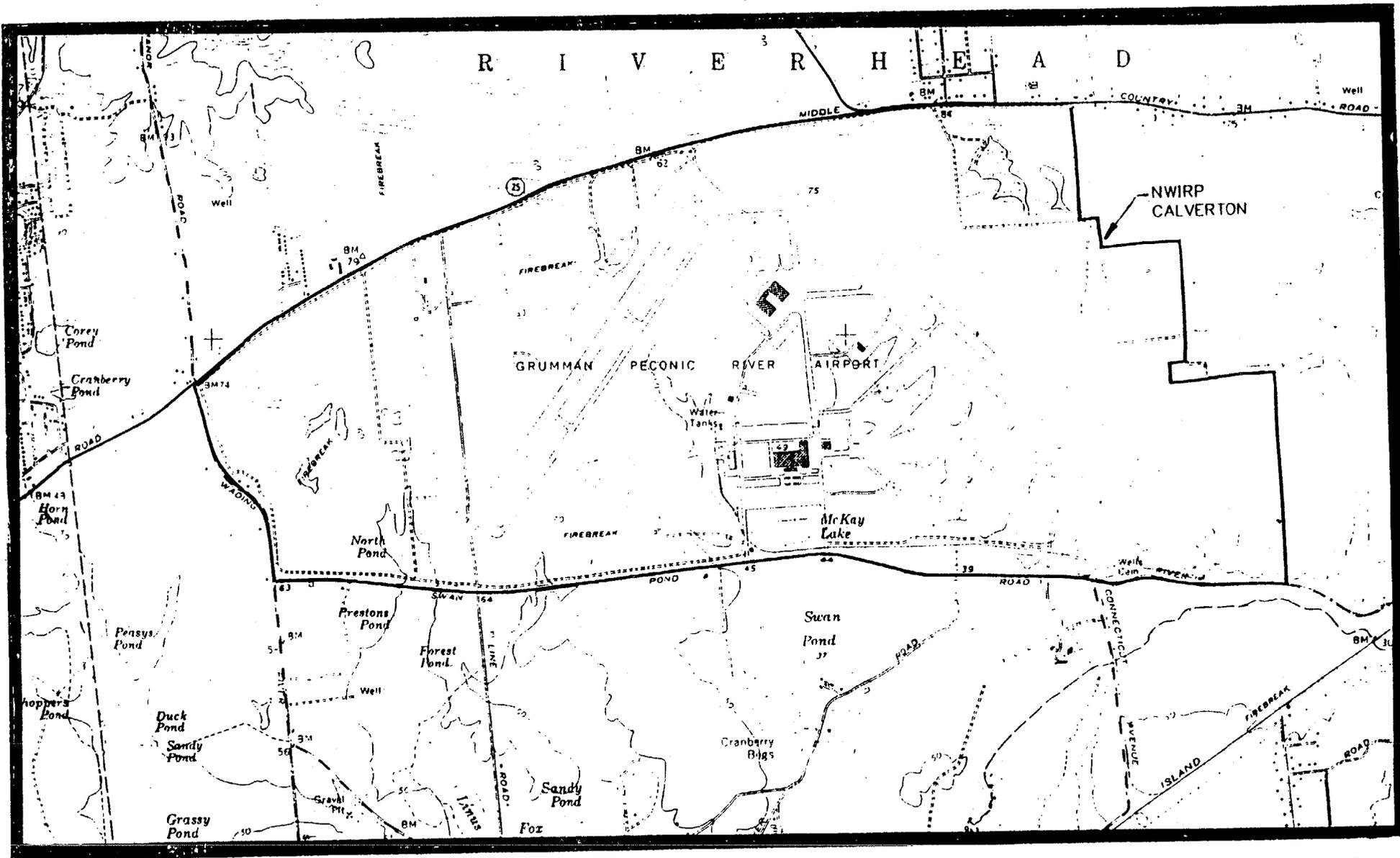


FIGURE 3-1

GENERAL LOCATION MAP
NWIRP, CALVERTON, NEW YORK

C.F. BRAUN



3-3

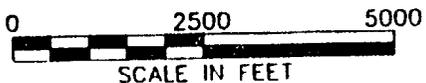
USGS QUADRANGLE: WADING RIVER 1967

FIGURE 3-2

SITE LOCATION



C.F. BRAUN



NWIRP, CALVERTON, NEW YORK

unlined. For training exercises, this ring was partially filled with water and a layer of fuel was floated on top of the water. This fuel layer was ignited to provide fire fighting practice. An estimated 450 gallons per year of solvent [including toluene, methyl ethyl ketone (MEK), and lacquer thinner] were disposed of in this manner from 1953 to 1975. An estimated 1,500 to 2,000 gallons per year of waste fuel oils were mixed with the disposed solvents and burned at the site. This practice was stopped in 1975. Reportedly, since 1975 personnel have burned only clean (unmixed) fuel.

Two spills of fuel oil occurred in 1982 and 1983. One spill originated from a 6,000-gallon underground oil supply tank used for the exercises; and the other spill (1983) involved 300 gallons from another storage tank in this area.

The entire Fire Training Area has been upgraded with concrete berms installed to contain the oil and water used in the training exercises. The piping was modified to prevent spills and a direct line was installed between the storage tank and the training area. The underground 6,000-gallon tank was removed and replaced by an aboveground 1,000-gallon tank.

Hazardous wastes potentially present at the site include petroleum oil lubricants (POLs), toluene, and methyl ethyl ketone and soluble leads from gasoline burned during the exercises.

The presence of contaminated soil and groundwater at Site 2 was confirmed in the Site Investigation. Primary contaminants are chlorinated and nonchlorinated volatile organics with lesser concentrations of semivolatile organics and inorganics. Low concentrations of PCBs and pesticides were also found.

4.0 SCOPE OF WORK

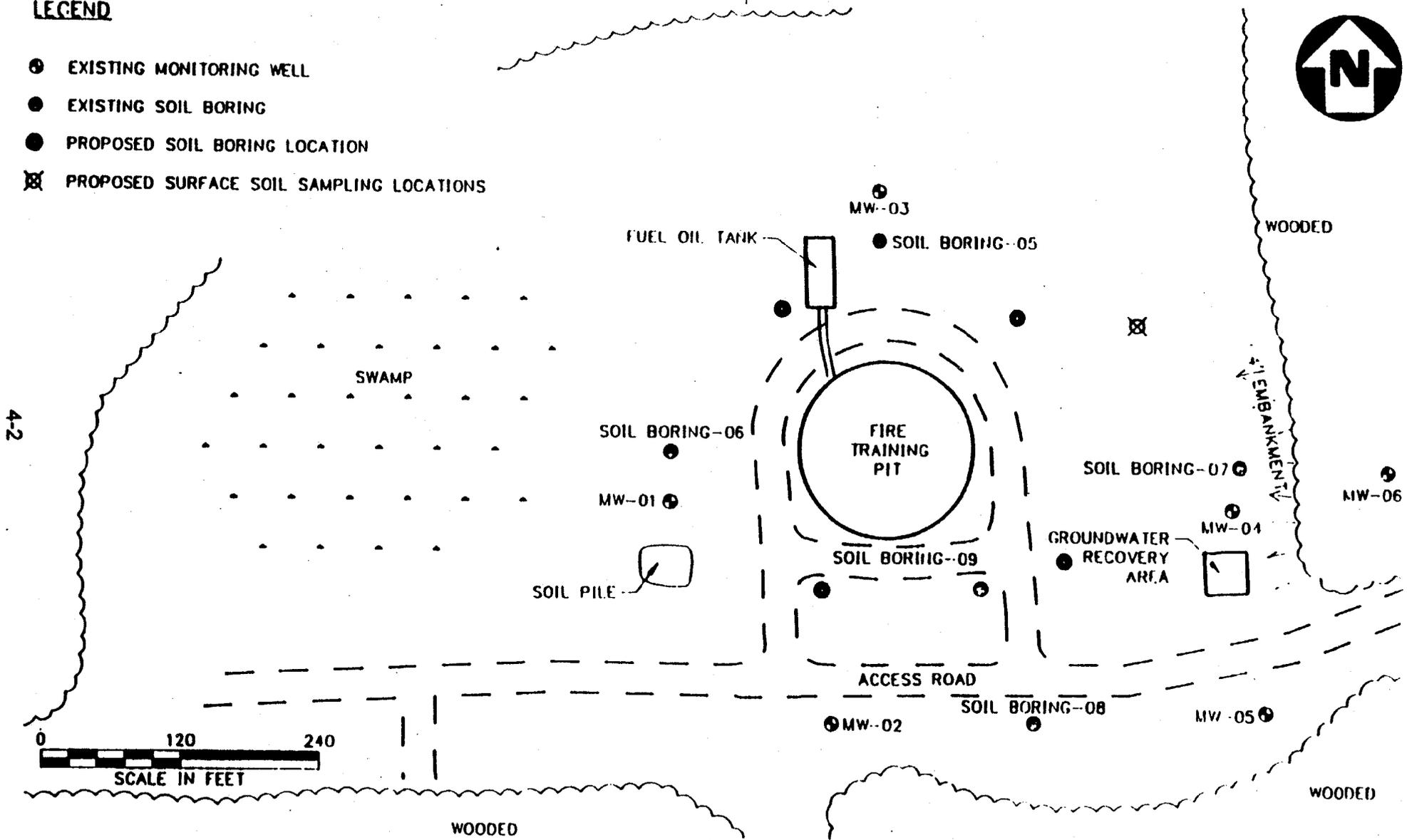
This project is a multi-task operation including a pre-characterization of Site 2 to verify the extent of contamination, soil properties, and types and quantities of contamination at Site 2 and to provide adequate information for the location of the AS/SVE system installation. This soils/contaminant characterization investigation will be performed prior to installation of the pilot system to verify that the location of the pilot system is within an area of contamination. Soil borings will be installed to the water table at three locations before the installation of the AS/SVE system as identified in Figure 4-1. Three additional soil borings will be drilled at the end of the 4 month operation period of the pilot remediation system to determine any impact on the contaminant plume. From all soil borings, samples will be extracted at predetermined intervals of 1-2 feet and at the ground water interface using a split-spoon. During the installation of the boring lithological descriptions will be included.

The installation of the Air Sparging/Soil Vapor Extraction (AS/SVE) remedial systems within predetermined locations at Site 2 were determined as part of the RFI. Minor modifications may take place pending the initial characterization. This operation will include the following items:

- Excavation, transportation, and disposal of potentially contaminated soils and the associated construction debris generated from the installation of the AS/SVE remedial system.
- Installation of 32 air extraction wells and 16 air injection wells.
- Installation of a complete AS/SVE Remedial System including blowers, piping, extraction nests, separators, valves, gages, etc.
- AS/SVE Pilot Test, and the operation of the AS/SVE system for a 4 month period.
- Demolition of concrete/asphalt areas included in the areas of installation. Backfilling of disturbed areas and site restoration will also occur.

LEGEND

- ⊕ EXISTING MONITORING WELL
- EXISTING SOIL BORING
- PROPOSED SOIL BORING LOCATION
- ⊗ PROPOSED SURFACE SOIL SAMPLING LOCATIONS



**PROPOSED SOIL BORING AND SURFACE SOIL SAMPLING LOCATIONS
 SITE 2 - FIRE TRAINING AREA
 NWIRP, CALVERTON, NY**

Figure 4-1

C.F. BRAUN

- **Multi media sampling including air, water (ground and surface), soils, decontamination, and purge waters. Personal samples will be collected on personnel representing at-risk job classifications during this action.**

The above listings represent a summarization of the identified tasks as they apply to the scope and application of this HASP. For a more detailed description of the associated tasks see the Sampling and Analyses Plan (SAP) (Halliburton NUS, June 1995) and the Pilot-scale Work Plan (Halliburton NUS June 1995).

Other tasks will occur under this contract order, however, they do not apply to the scope and application of this HASP and will not be addressed in this plan.

5.0 TASKS/HAZARDS/ASSOCIATED CONTROL MEASURES SUMMARIZATION

Table 5-1 identifies the tasks to be performed as stated in Section 4.0, "Scope of Work". Based on these tasks, the anticipated hazards, recommended control measures, air monitoring recommendations, recommended PPE, and decontamination measures that were selected are identified. Should the scope, or other conditions change, this table and control measures will require modification.

Accompanying this site-specific HASP is the Health and Safety Guidance Manual. This manual is designed to further explain supporting elements for any site-specific operations as required by 29 CFR 1910.120.

**TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM
FOR
CALVERTON NWIRP AS/SVE REMEDIATION PROJECT**

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Air Monitoring Type/Action Levels	Personal Protective Equipment	Decontamination Procedures
Mobilization/ Demobilization	<p>Physical hazards including</p> <ol style="list-style-type: none"> 1) Lifting (muscle strains and pulls) 2) Pinches and compressions 3) Slip, trips, and falls 4) Moving machinery 5) Biological hazards (Insect/animal bites and stings) 6) Vehicular and foot traffic <p>These hazards may also be associated with the other operations identified in this HASP however they will not be repeated.</p>	<ol style="list-style-type: none"> 1) Employ machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 2) Use pinch bars or other equipment to remove hands from the point of operation. 3) Preview work locations for unstable/uneven terrain. Barricade all excavations deeper than 2 feet from access closer than two feet from the edge. 4) All equipment to be employed will be: <ul style="list-style-type: none"> - Inspected in accordance with OSHA, and manufacturers design. - Operated by Certified operators, and knowledgeable ground crew, as applicable. - Operated only in established safe zones of approach (i.e. Boom + 3 feet). - Maintained to secure all loose articles to avoid possible entanglement. 5) Avoid nesting areas, employ repellants (Do NOT use repellants during sampling activities). Report potential hazards to the SSO. Frequently inspect clothing and person during and after activities in wooded areas. 6) Identify all access/egress routes and locations, hours of clearance, and base contacts, in addition to the badge clearance and associated requirements for base clearance. 	Not required	<p>Level D - (Minimum Requirements)</p> <ul style="list-style-type: none"> - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Safety glasses - Hardhat (when overhead hazards exists, or identified as a operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, or as directed on an operation by operation scenario. 	<p>Not required</p> <p>Equipment will be decontaminated as described in Excavating task prior to demobilization from site.</p> <p>All equipment brought on site will be inspected to ensure cross contamination from contaminants brought on site does not occur. Equipment found in dirty condition will not be accepted for work at this site. The FOL or SSO will be responsible for this task.</p>
Maintenance/ Operation of the AS/SVE System	<p>Chemical hazards</p> <ol style="list-style-type: none"> 1) Air/particulate Water borne contaminants - Chlorinated hydrocarbons, hydrocarbons, and metals 2) Physical hazards - Energized Systems 	<ol style="list-style-type: none"> 1) Use real-time monitoring instruments, action levels, personal sampling, and identified PPE to monitor and control potential exposures. 2) Utilize accepted energy control measures as defined in OSHA 29 CFR 1910.147 to control potential energy sources during maintenance. <p>NOTE: Process review in accordance with protocol established in OSHA 29 CFR 1910.119 Process Safety Management is recommended. Although the contaminants of question are not identified as applicable to this standard, this action will aid in minimizing potential hazards and releases through systems failure, fire, or explosion.</p>	<ol style="list-style-type: none"> 1) Personal air sampling will be utilized to characterize potential exposures and appropriate PPE. <p>Utilize personal sampling NOISH methods: 1501 Aromatic Hydrocarbons 1003 Chlorinated Hydrocarbons</p> <p>All monitoring instrument results will be recorded on the Direct Reading Instrument Response Data Sheet included in the Health and Safety Guidance Manual (section 1).</p> <p>All calibration of monitoring instruments will be recorded on the Direct Reading Instrument Calibration Sheet also included in the Health and Safety Guidance Manual (section 1).</p>	<p>Selections for PPE should be made in accordance with the results of the personal sampling and the process safety review findings.</p> <p>At a minimum, the Level D protection, as define in the mobilization/demobilization section will be observed.</p>	<p>Anytime the maintenance personnel or operator of the system may encounter potential contaminants, PPE and decontamination procedures such as those described in the excavation or drilling task will be utilized.</p>

**TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR
CALVERTON NWIRP AS/SVE REMEDIATION PROJECT**

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Air Monitoring Type/Action Levels	Personal Protective Equipment	Decontamination Procedures
Excavation of the Piping Trenches.	<p>1) Air/particulate borne contaminant - chlorinated hydrocarbons, hydrocarbons, and metals (see Table 6-1)</p> <p>2) Cross contamination</p> <p>Physical hazards</p> <p>3) Moving machinery</p> <p>4) Collapse of the excavation/trench</p> <p>5) Energized systems</p> <p>6) Noise</p>	<p>1) Employ real-time monitoring instrumentation, action levels, personal sampling, and identified PPE to monitor and control exposures to potentially contaminated medias (e.g. air, water, soils).</p> <p>2) Restrict the cross use of equipment and supplies from performing remedial activities, to handling clean fill, and construction services without first going through a suitable decontamination.</p> <p>3) All equipment to be employed will be:</p> <ul style="list-style-type: none"> - Inspected in accordance with Federal safety and transportation guidelines, OSHA (1926.600, .601, .602), and manufacturer's design. - Operated by Certified operators, and knowledgeable ground crew, as applicable. - Operated only in established safe zones of approach (i.e. Boom + 3 feet). - Maintained to secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - All personnel working in amongst equipment traffic are required to wear reflective vests for high visibility <p>4) All excavations and trenching shall be in conformance with requirements established under 29 CFR 1926.650 - .652 concerning sloping, shoring, storage, and movement on and over trenches and excavations. It is not anticipated that trenches will exceed 3 feet in total depth. No personnel associated with this field effort will enter trenches or excavations greater than 3 feet in depth. All supplies, clean fill, vehicular traffic will be maintained at a distance of 3 feet from the excavation, or 2 feet if a restraining device is employed.</p> <p>5) All utility clearances shall be obtained prior to any excavation. Where the clearance can not be obtained in a reasonable period, or not located, excavation shall proceed with extreme caution and proceed using cable and piping locators.</p> <p>6) Excessive noise levels will be mitigated through the use of hearing protection. Anticipated excessive noise level operations include the following:</p> <ul style="list-style-type: none"> • Heavy equipment operation including backhoes, concrete saws, and drill rigs. • Portable hand tools (circular saws), pneumatic hammers, generators, etc. <p>Any piece of equipment or operation that has the potential to generate excessive noise levels (General rule of thumb: Excessive noise levels exist if you must raise your voice to speak to someone standing within two feet of you) will require hearing protection until sampling may be conducted to quantify the associated noise levels.</p>	<p>Photoionization Detector w/ 11.7 eV UV lamp source to be employed in the following manner:</p> <p>1) Source monitoring will be conducted at regular intervals to be determined by the SSO. Positive sustained results at a source location which may impact operations crew will require the following actions</p> <p>1) Monitor the breathing zone of at-risk employees. Any sustained reading above background in the breathing zone of the at-risk employees requires the person (SSO/sampler, etc.) monitoring to:</p> <p>Sample-Colorimetric detector tube, Vinyl Chloride 1/a to verify the presence or absence of this compound</p> <p>Vinyl chloride 1/a requires 5-20 strokes or pumps of the bellows. Rxn: Light gray to yellow orange discoloration.</p> <p>This substance was chosen based on controlling toxicity.</p> <p>Positive I.D. of vinyl chloride up to 5 ppm - Level C Protection suitable for vinyl chloride canister designation of vcm-ss for 4-hrs use only, for a maximum concentration of 25 ppm. Exceedances over 25 ppm require the use of a positive pressure airline respirator.</p> <p>Sample-Colorimetric detector tube, Perchloroethylene 10/b. This tube was selected due to its sensitivity to this compound and halogenated hydrocarbons in general.</p> <p>Perchloroethylene 10/b requires 3 strokes or pumps of the bellows. Rxn: Gray to orange discoloration.</p> <p>Positive indication - Level C, organic vapor/acid gas cartridges.</p> <p>Perchloroethylene 50/a-1 Long term tube with supported air pump (4-hr usage limit). This tube is recommended for use where early indication indicates a possible presence of a chlorinated hydrocarbon.</p> <p>Note: Petroleum hydrocarbon vapors will reduce PCE reading indications.</p> <p>Where positive confirmation of a substance cannot be obtained and 5 ppm is maintained in the workers breathing zone, Level B protection will be utilized, until positive identification takes place.</p> <p>1) CGI/O₂ Survey Meter. LEL readings of 0-10% Continue to work, continue to monitor 10-20% Continue to work, continue to monitor, remove all potential ignition sources > 20% Evacuate until levels may be stabilized</p> <p>1) O₂ readings of < 19.5 employ SCBA or airline > 23.5 evacuate until levels may be stabilized</p> <p>Employment of this monitoring will take place in the Piping trench, prior to anyone entering.</p> <p>1) Personal Sampling NIOSH Method 1501 See Attachment A 1) Personal Sampling NIOSH Method 1003 See Attachment A</p> <p>Personnel are strictly prohibited from entering trenches in access of 3 feet deep.</p> <p>All monitoring instrument results will be recorded on the Direct Reading Instrument Response Data Sheet included in the Health and Safety Guidance Manual (section 1).</p> <p>All calibration of monitoring instruments will be recorded on the Direct Reading Instrument Calibration Sheet also included in the Health and Safety Guidance Manual (section 1).</p>	<p>Level D - (Minimum Requirements)</p> <ul style="list-style-type: none"> - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Safety glasses - Hardhat (when overhead hazards exists, or identified as a operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, or as directed on an operation by operation scenario. <p>Level C protection (in addition to Level D requirements) the following PPE is required: Air-Purifying Respirator (APR) with organic vapor/acid gases cartridges for</p> <ul style="list-style-type: none"> - chlorinated hydrocarbons, hydrocarbons <p>Level C protection with an APR and Type N Canister:</p> <ul style="list-style-type: none"> - Vinyl chloride (VCM-SS) (4-Hr use limit) <p>Level C chemical protective clothing will consist of impermeable boot covers, nitrile gloves with a cotton liner, tyvek coveralls (unless free phase product is encountered). Free phase product or splash potential will require the use of PVC splash suit.</p> <p>Level B protection Self-Contained Breathing Apparatus (SCBA), or airline respiratory protection will be used for</p> <ul style="list-style-type: none"> - unidentified concentrations of up to 5 ppm sustained in the breathing zone - positive vinyl chloride confirmation over 25 ppm. - IDLH concentrations of the indicator compounds - O₂ readings <19.5; >23.5 <p>Ascension to Level B protection requires immediate notification of the PM, and Manager of Health Sciences (Pgh. Office)</p> <p>As contaminant concentrations and conditions may change radically the following emergency equipment will be maintained during all on site activities</p> <ul style="list-style-type: none"> • Fire Extinguishers (Strategically placed) • Basket stretcher, blankets, and first-aid kit • SCBA, lifelines 	<p>Personnel Decontamination will consist of a soap/water wash and rinse for outer protective equipment (e.g. boots, gloves, PVC splash suits, etc.). This function will take place at an area adjacent to the remedial activities. This procedure will consist of</p> <ul style="list-style-type: none"> - Equipment drop - Soap/water wash and rinse of outer boots and gloves <p>Note: For PPE Levels B or C tank or cartridge change out would take place at this point, if necessary.</p> <ul style="list-style-type: none"> - Soap/water wash and rinse of the outer splash suit, as applicable - Outer suit, boot covers, outer glove removal - Respiratory (face mask) protection removal - Wash hands and face, leave contamination reduction zone <p>Equipment Decontamination - All equipment decontamination will take place at a centralized decontamination pad utilizing steam or pressure washers. Heavy equipment such as drill rigs, backhoes, skid loaders, etc. will have the wheels and tires cleaned of any loose debris removed prior to transporting to the central area. All site vehicles will be restricted or also have their wheels/tires sprayed off as not to track mud onto the roadways servicing the base. Roadways shall be monitored to pick up any debris resulting from the on site activity.</p> <p>All equipment used in the exclusion zone will require a complete decontamination between locations and prior to removal from the site. The FOL or the SSO will be responsible for evaluating equipment arriving onsite and that which is to leave the site. No equipment will be authorized access or exit without this authorization.</p>

**TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR
CALVERTON NWIRP AS/SVE REMEDIATION PROJECT**

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Air Monitoring Type/Action Levels	Personal Protective Equipment	Decontamination Procedures
<p>Drilling/Well Installation of 48 (16 injection, 32 recovery) wells</p> <p>Soil borings: (3 pre-installation of the pilot remediation system; 3 post-remediation system)</p>	<p>1) Air/particulate borne contaminant - Chlorinated hydrocarbons, hydrocarbons, and metals (See Table 6-1).</p> <p>2) Cross contamination</p> <p>Physical hazards</p> <p>3) Rotating machinery</p>	<p>1) Employ real-time monitoring instrumentation, action levels, personal sampling, and identified PPE to control exposures to potentially contaminated medias (e.g. air, water, soils, etc.).</p> <p>2) Restrict the cross use of equipment and supplies between drilling events without first going through the designated decontamination process.</p> <p>3) All equipment to be employed will be</p> <ul style="list-style-type: none"> - Inspected in accordance with Federal safety and transportation guidelines, OSHA (1926.600, .601, .602), and manufacturers design. - Operated by Certified operators, and knowledgeable ground crew, as applicable. - Establish safe zones and routes of approach to the operation (personnel should remain cognizant that this is a multi-task operation with many active simultaneously). - Restrictions at the operation (All personnel not directly supporting the drilling operation will remain at least 25 feet from the point of operation). - No drilling or any other operation which will bring a drill mast or any other projecting device within 20 feet in any direction of overhead power lines will be permitted. - Hand signals with the driller will be established prior to the commencement of drilling activities. - The driller and the helper shall not simultaneously handle moving augers or flights unless there is a standby person to activate the emergency stop device. - The driller must never leave the controls while tools are rotating unless all personnel are clear of the rotating equipment. - A long handled shovel or the equivalent shall be used to clear away drill cuttings from the hole and rotating equipment. Hands or feet shall not be used for this purpose. - A remote sampling device must be used to sample drill cuttings near rotating tools. The driller shall shutdown operations if the sampler must near the tools to obtain samples. - Only manufacturer approved equipment may be used in conjunction with site equipment (i.e. pins for auger flights etc.). Pins or other protruding items from rotating equipment shall not be permitted. - No person shall climb a drill mast while equipment is rotating. - No person shall climb a drill mast without use of ANSI approved fall protection (i.e. belts, lanyards and a fall protection slide rail) or portable ladders which meet OSHA's requirements. - Work areas will be kept clear of clutter. - Secure all loose articles to avoid possible entanglement. - All equipment shall be equipped with movement warning systems. - All personnel working in amongst equipment traffic are required to wear reflective vests for high visibility - All personnel will be instructed in the location and operations of the emergency shut off device(s). This device will be tested initially (and then periodically) to insure its operational status. 	<p>Photoionization Detector w/ 11.7 eV UV lamp source</p> <p>1) Source monitoring will be conducted at regular intervals to be determined by the SSO. Positive sustained results at a source location which may impact operations crew will require the following actions</p> <p>1) Monitor the breathing zone of at-risk employees. Any sustained reading above background in the breathing zone of the at-risk employees requires the person (SSO/sampler, etc.) monitoring to:</p> <p>Sample-Colorimetric detector tube, Vinyl Chloride 1/a, to verify the presence or absence of this compound</p> <p>Vinyl chloride 1/a requires 5-20 strokes or pumps of the bellows. Rxn: Light gray to yellow orange discoloration.</p> <p>Positive I.D. of vinyl chloride up to 5 ppm - Level C Protection suitable for vinyl chloride canister designation of vcm-ss for 4-hrs use only, for a maximum concentration of 25 ppm. Exceedances over 25 ppm require the use of a positive pressure airline respirator.</p> <p>This substance was chosen based on controlling toxicity.</p> <p>Sample-Colorimetric detector tube, Perchloroethylene 10/b.</p> <p>Perchloroethylene 10/b requires 3 strokes or pumps of the bellows. Rxn: Gray to orange discoloration.</p> <p>Positive indication - Level C, organic vapor/acid gas cartridges.</p> <p>Perchloroethylene 50/a-I Long term tube with supported air pump (4-hr usage limit). This tube is recommended for use where early indication indicates a possible presence of a chlorinated hydrocarbon.</p> <p>Petroleum hydrocarbon vapors will reduce PCE reading indications.</p> <p>1) Where positive confirmation of a substances identity cannot be obtained and 5 ppm is sustained in the breathing zone, Level B protection will be utilized, until positive identification takes place.</p> <p>1) CGI/O₂-Survey Meter. LEL readings of 0-10% Continue to work, continue to monitor 10-20% Continue to work, continue to monitor, remove all potential ignition sources > 20% Evacuate until levels may be stabilized</p> <p>1) O₂ readings of < 19.5 employ SCBA or airline > 23.5 evacuate until levels may be stabilized.</p> <p>Employment of this monitoring will take place in the Piping trench, prior to anyone entering.</p> <p>Personnel are strictly prohibited from entering trenches in access of 3 feet deep. Level D protection with Hardhat, safety glasses, reflective vest, impermeable boot covers, and earplugs or muffs.</p> <p>Level C protection Air-Purifying Respirator (APR) with organic vapor/acid gases cartridges for positive chlorinated hydrocarbon</p> <p>Level C protection with an APR and Type N Canister: - Vinyl chloride (VCM-SS) (4-Hr use limit)</p> <p>If personal sampling data indicates concentrations > 25 ppm for the site contaminants sampled.</p> <p>Chemical protective clothing will consist of impermeable boot covers, nitrile gloves with a cotton liner, tyvek coveralls (unless free phase product is encountered). Free phase product or splash potential PVC splash suit.</p>	<p>Level D - (Minimum Requirements)</p> <ul style="list-style-type: none"> - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Safety glasses - Hardhat (when overhead hazards exists, or identified as a operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, or as directed on an operation by operation scenario. <p>Level C protection Air-Purifying Respirator (APR) with organic vapor/acid gases cartridges for</p> <ul style="list-style-type: none"> - chlorinated hydrocarbons, hydrocarbons <p>Level C protection with an APR and Type N Canister:</p> <ul style="list-style-type: none"> - Vinyl chloride (VCM-SS) (4-Hr use limit) <p>Chemical protective clothing will consist of impermeable boot covers, nitrile gloves with a cotton liner, tyvek coveralls (unless free phase product is encountered). Free phase product or splash potential PVC splash suit.</p> <p>Level B protection Self-Contained Breathing Apparatus (SCBA), or airline respiratory protection will be used for</p> <ul style="list-style-type: none"> - positive vinyl chloride confirmation over 25 ppm. - 5 ppm workers breathing zone unidentified contaminant - IDLH concentrations of the indicator compounds (See chlorinated hydrocarbons identified in the air monitoring section) - O₂ readings < 19.5; > 23.5 <p>Ascension to Level B protection requires immediate notification of the PM, and Manager of Health Sciences (Pgh Office)</p> <p>As contaminant concentrations and conditions may change radically the following equipment will be maintained during all on site activities</p> <ul style="list-style-type: none"> • Fire Extinguishers (Strategically placed) • Basket stretcher, blankets, and first-aid kit • SCBA, lifelines 	<p>Personnel Decontamination - Personnel decontamination will consist of a soap/water wash and rinse for outer protective equipment (e.g. boots, gloves, PVC splash suits, etc.). This function will take place at an area adjacent to the drilling operations bordering the support zone. This decontamination procedure will consist of</p> <ul style="list-style-type: none"> - Equipment drop - Soap/water wash and rinse of outer boots and gloves - Soap/water wash and rinse of the outer splash suit, as applicable <p>Note: For PPE Levels B or C tank or cartridge change out would take place at this point, if necessary.</p> <ul style="list-style-type: none"> - Outer suit, boot covers, outer glove removal - Respiratory (face mask) protection removal - Wash hands and face, leave contamination reduction zone <p>Equipment Decontamination - All equipment decontamination will take place at a centralized decontamination pad utilizing steam or pressure washers. Heavy equipment such as drill rigs, backhoes, skid loaders, etc. will have the wheels and tires cleaned along with any loose debris removed, prior to transporting to the central decontamination area. All site vehicles will be restricted access to exclusion zones, or also have their wheels/tires sprayed off as not to track mud onto the roadways servicing the base. Roadways shall be monitored to pick up any debris resulting from the onsite activity.</p> <p>All equipment used in the exclusion zone will require a complete decontamination between locations and prior to removal from the site. The FOL or the SSO will be responsible for evaluating equipment arriving onsite and that which is to leave the site. No equipment will be authorized access or exit without this authorization.</p>

**TABLE 5-1
TASKS/HAZARDS/CONTROL MEASURES COMPENDIUM FOR
CALVERTON NWIRP AS/SVE REMEDIATION PROJECT**

Tasks/Operation/ Locations	Anticipated Hazards	Recommended Control Measures	Air Monitoring Type/Action Levels	Personal Protective Equipment	Decontamination Procedures
Drilling/Wells Soil borings (continued)	Physical hazards (continued) 4) Noise 5) Energized systems	4) Due to operations generated noise levels, excessive noise control will be facilitated through the use of hearing protection. 5) Prior to any subsurface investigations, the locations of all underground utilities will be identified and marked prior to initiating any subsurface activity. Obtain written permit clearance prior to all subsurface investigations. As stated above all drill rig masts will be restricted from within 20 feet of any overhead energy sources.	4) The SSO will perform noise dosimetry to ensure the operational activities, and any contributory levels associated with the operation do not surpass the noise attenuation factors associated with the hearing protection selected. 5) None required All monitoring instrument results will be recorded on the Direct Reading Instrument Response Data Sheet included in the Health and Safety Guidance Manual (section 1). All calibration of monitoring instruments will be recorded on the Direct Reading Instrument Calibration Sheet also included in the Health and Safety Guidance Manual (section 1).	Same as above.	Same as above.
Multi-media sampling including soils (surface and subsurface); water (subsurface); air (personal and area)	1) Air/particulate borne contaminant - Chlorinated hydrocarbons, hydrocarbons, and metals (See Table 6-1) 2) Cross contamination Physical hazards 3) Noise 4) Lifting (muscle strains and pulls) 5) Pinches and compressions 6) Slip, trips, and falls 7) Biological hazards (Insect/animal bites and stings)	1) Employ real-time monitoring instrumentation, action levels, personal sampling, and identified PPE to control exposures to potentially contaminated medias (e.g. air, water,soils). 2) Restrict the cross use of equipment and supplies from location to location without first going through a suitable decontamination. 3) Due to operational and contributory activities generated noise levels, excessive noise control will be facilitated through the use of hearing protection. 4) Employ machinery or multiple personnel for heavy lifts. Use proper lifting techniques. 5) Use pinch bars or other equipment to remove hands from the point of operation. 6) Preview work locations for unstable/uneven terrain. Barricade all excavations deeper than two feet from access closer than two feet from the edge. 7) Avoid nesting areas, employ repellants (Do NOT use repellants during sampling activities). Report potential hazards to the SSO. Identify all access/egress routes and locations, hours of clearance, and base contacts, in addition to the badge clearance and associated requirements for base clearance.	Monitoring instrumentation will be employed as specified in the Sampling and analyses plan to bias samples. Surface soils, sediments, ground and surface waters will not require monitoring as part of sample acquisition. Wells to be sampled will require opening to allow venting and equilibration prior to sampling. Subsurface soils monitoring direction and action levels will proceed in the following manner. Photoionization Detector w/ 11.7 eV UV lamp source 1) Source monitoring will be conducted at regular intervals to be determined by the SSO. Positive sustained results at a source location which may impact operations crew will require the following actions • Monitor the breathing zone of high risk employees. Concentrations above background in the breathing zone is not anticipated during this activity. 1) Personal Sampling NOISH Method 1501 1) Personal Sampling NIOSH Method 1003 All monitoring instrument results will be recorded on the Direct Reading Instrument Response Data Sheet included in the Health and Safety Guidance Manual (section 1). All calibration of monitoring instruments will be recorded on the Direct Reading Instrument Calibration Sheet also included in the Health and Safety Guidance Manual (section 1).	Level D - (Minimum Requirements) - Standard field attire (Long sleeve shirt; long pants) - Safety shoes (Steel toe/shank) - Safety glasses - Hardhat (when overhead hazards exists, or identified as a operation requirement) - Reflective vest for high traffic areas - Hearing protection for high noise areas, or as directed on an operation by operation scenario. If action levels identified under the Air Monitoring Section are surpassed protective measures and levels will be employed as identified under the drilling task.	Disposable gloves (surgeons).

6.0 CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA

Table 6-1 represents potential chemical contaminants which may be encountered during the onsite activities, as defined in Section 4.0 "Scope of Work".

In addition to the potential chemical contaminants, this table provides air monitoring/sampling information, exposure limits, warning properties, physical properties, and health hazard information. This table is included to educate onsite personnel of the potential chemical hazards, which may be encountered.

TABLE 6-1

**CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
FOR
CALVERTON NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information			Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Benzene	71-43-2	I.P. 9.24 eV, 100% response with PID and 10.2 eV lamp	150% response with FID	Air sample using charcoal tube and carbon disulfide desorption, OSHA 07	1 ppm OSHA 10 ppm ACGIH 0.1 ppm NIOSH	Inadequate - Odor threshold 34-199 ppm. OSHA accepts the use of air-purifying respirators with organic vapor cartridge up to 10 ppm despite the inadequate warning properties Recommended gloves: Nitrile	Boiling Pt: 176°F; 80°C Melting Pt: 42°F; 5.5°C Solubility: 0.07% Flash Pt: 12°F; -11°C LEL/LFL: 1.3% UEL/UFL: 7.9% Vapor Density: 2.77 Vapor Pressure: 75 mmHg Specific Gravity: 0.88 Incompatibilities: Strong oxidizers, perchlorates, acids Appearance and Odor: Colorless to a light yellow liquid with an aromatic odor	Overexposure may result in irritation to the eyes, nose, throat, and respiratory system. CNS effects include giddiness, lightheadedness, headaches, staggered gait, fatigue, and lassitude and depression. Additional effects may include nausea. Long duration exposures may result in respiratory collapse. Regulated as an OSHA carcinogen. May cause damage to the blood forming organs and may cause a form of cancer called leukemia.
Chlorobenzene	108-90-7	I.P. 9.07 eV, High response with PID and 10.2 eV lamp	200% response with FID	Air sample using charcoal sorbent tube and carbon disulfide desorption with gas chromatography-flame ionization detector, OSHA 07, NIOSH 1003	75 ppm TWA, OSHA, NIOSH 10 ppm TWA, ACGIH	Adequate - Odor threshold 1.3 ppm. Can use air-purifying respirator with organic vapor cartridge up to 500 ppm Recommended glove: nitrile	Boiling Pt: 268°F; 131°C Melting Pt: -49°F; -45°C Solubility: 0.05% Flash Pt: 84°F; 29°C LEL/LFL: 1.3% UEL/UFL: 9.6% Vapor Density: 3.88 Vapor Pressure: 10 mmHg @ 72°F; 22°C Specific Gravity: 1.11 Incompatibilities: Strong oxidizers Appearance and Odor: Colorless liquid with an almond-like odor.	Regulated primarily because of its potential to cause sleepiness and incoordination. Irritating to the eyes, nose, and skin. Chronic exposure may cause liver, kidney, and lung damage.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information			Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Chloroform	67-66-3	I.P. 11.42 eV	100% response with FID	Air sample using charcoal sorbent tube and carbon disulfide desorption with gas chromatography-flame ionization detector; NIOSH 1003	OSHA 50 ppm (ceiling); NIOSH 2 ppm; ACGIH 10 ppm ~ IDLH 1000 ppm	Inadequate - Odor threshold 133 - 276. Chloroform has poor warning properties but will adhere to organic vapor cartridges. Supplied air respirators are recommended. Recommended glove: Polyvinyl Alcohol	Boiling Pt: 143°F; 62°C Melting Pt: N/A Solubility: 0.5% Flash Pt: N/A LEL/LFL: None established UEL/UFL: None established Vapor Density: Not available Vapor Pressure: 160 mmHg @ 68°F; 20°C Specific Gravity: 1.48 Incompatibilities: Strong caustics, chemically active metals such as aluminum or magnesium powder, sodium and potassium, strong oxidizers Appearance and Odor: Colorless liquid with a pleasant odor.	Overexposure to this substance may cause dizziness, mental dullness, nausea, headache, fatigue, anaesthesia, and irritation of the skin and eyes. Chronic overexposure may result in damage to the liver, kidneys, heart, eyes and skin.
1,1-Dichloroethane	75-34-3	I.P. 11.06 eV	80% Relative Response with FID	Air sample using charcoal tube and carbon disulfide desorption, OSHA 07-B / NIOSH 1003	OSHA, NIOSH and ACGIH have established a TWA of 100 ppm IDLH 4000 ppm	Questionable warning properties - Odor threshold 49 - 1359 ppm. APRs may be employed for escape only. Exceedances over the exposure limits are recommended to use airline or airline/APR combination type respirator. Recommended glove: Butyl; Polyvinyl alcohol; Viton	Boiling Pt: 135°F; 57°C Melting Pt: -143°F; -97°C Solubility: 0.6% Flash Pt: 2°F; -17°C LEL/LFL: 5.6% UEL/UFL: 11.4% Vapor Density: NA Vapor Pressure: 182 mmHg Specific Gravity: 1.18 Incompatibilities: Strong oxidizers, strong caustics Appearance and odor: Colorless, oily liquid with a chloroform-like odor.	Overexposure may result in CNS depression, skin and eye irritation, and damage to the liver, kidneys, and lungs.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information			Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
1,2-Dichloroethane	107-06-2	I.P. 11.05 eV	80% response with FID	Air sample using charcoal sorbent tube and carbon disulfide desorption with gas chromatography-flame ionization detector; NIOSH 1003	OSHA 50 ppm; ACGIH 10 ppm; NIOSH 1 ppm IDLH ~ 1000 ppm	Inadequate - This compound has poor warning properties OSHA allows the use of organic vapor cartridges in certain circumstances. Recommended glove - Polyvinyl alcohol	Boiling Pt: 182°F; 83°C Melting Pt: N/A Solubility: 0.9% Flash Pt: 56°F; 13°C LEL/LFL: 6.2% UEL/UFL: 16% Vapor Density: Not available Vapor Pressure: 64 mmHg @ 68°F; 20°C Specific Gravity: 1.24 Incompatibilities: Strong oxidizers and caustics, chemically active metals such as aluminum or magnesium powder, sodium and potassium. Appearance and Odor: Colorless liquid with a pleasant, chloroform-like odor.	Exposure to this substance may cause CNS depression, nausea, vomiting, dermatitis, and irritation of the eyes. Chronic overexposure may result in damage to the kidneys, liver, eyes, skin and CNS.
1,2-Dichloroethylene	540-59-0	I.P. 9.65 eV, High response with PID and 10.2 eV lamp	50% response with FID	Air sample using charcoal tube and carbon disulfide, OSHA 07; NIOSH Method 1003	OSHA, NIOSH, ACGIH 200 ppm TWA,	Adequate- odor threshold 0.085-17 ppm. Use organic vapor/acid gas cartridges for exceedances above the TWA up to 1,000 ppm. >1,000 ppm should use pressure-demand supplied air respirator above exposure limits. Recommended glove: nitrile	Boiling Pt: 117°F; 47°C Melting Pt: 7°F; -13.8°C Solubility: 0.4% Flash Pt: 38°F; 2.2°C LEL/LFL: 5.6% UEL/UFL: 12.8% Vapor Density: 2.0 Vapor Pressure: 180-260 mmHg Specific Gravity: 1.27 @ 90°F; 32°C Incompatibilities: Strong oxidizers, alkalis, potassium hydroxide, and copper. When heated to decomposition temperatures will emit toxic fumes of phosgene. Appearance and Odor: Colorless liquid with an acrid odor.	Overexposure may result in CNS depression potential to cause sleepiness, hallucinations, distorted perceptions, and stupor (narcosis). Systemically, symptoms may result in nausea, vomiting, weakness, tremors, and cramps. May also irritate the eyes, skin, and mucous membranes. Chronic exposures may result in dermatitis, liver, kidney, and lung damage.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information			Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
		Components of this substance will be detected readily however no documentation exists as to the relative response	Components of this substance will be detected readily however no documentation exists as to the relative response					
Diesel Fuel No.2-D	Mixture	Components of this substance will be detected readily however no documentation exists as to the relative response	Components of this substance will be detected readily however no documentation exists as to the relative response		OSHA NIOSH ACGIH 5 mg/m ³ as mineral oil mist. In addition NIOSH and ACGIH establish 10 mg/m ³ as a STEL.	Kerosene odor Recommended gloves: Nitrile Recommended Air Purifying cartridges: Organic vapor	Boiling Pt: <170-400°F; 77-204°C Melting Pt: N.A. Solubility: Negligible Flash Pt: 125°F; 52°C LEL/LFL: 0.6% UEL/UFL: 7.5% Vapor Density: >5 Vapor Pressure: <1 mmHg @ 70°F; 21°C Specific Gravity: 0.86 Incompatibilities: strong oxidizers, halogens, and hypochlorites Appearance and odor: Colorless to amber with a kerosene odor	Prolonged or repeated exposures to this product may cause skin and eye irritation. Due to the defatting capabilities this exposure may lead to a dermatitis condition. High vapor concentrations are irritating to the eyes and respiratory tract. Exposure to high airborne concentrations may result in narcotic effects including dizziness, headaches, and anesthetic to unconsciousness. High concentrations in a confined space may adequately displace oxygen thereby resulting in suffocation.
Ethylbenzene	100-41-4	I.P 8.76, High response with PID and 10.2 eV lamp	100% response with FID	Air sample using charcoal tube and carbon disulfide desorption, OSHA 07	OSHA, ACGIH, & NIOSH 100 ppm TWA 125 ppm STEL	Adequate - Can use air-purifying respirator with organic vapor cartridge up to 1,000 ppm Recommended gloves: Neoprene or nitrile w/ silver shield when potential for saturation	Boiling Pt: 277°F; 136°C Melting Pt: -139°F; -95°C Solubility: 0.01% Flash Pt: 55°F; 13°C LEL/LFL: 1.0% UEL/UFL: 6.7% Vapor Density: 3.66 Vapor Pressure: 10 mmHg @ 79°F; 28°C Specific Gravity: 0.87 Incompatibilities: Strong oxidizers Appearance and odor: Colorless liquid with an aromatic odor. Odor Threshold of 0.092- 0.60.	Regulated primarily because of its potential to irritate the eyes and respiratory system. In addition, effects of overexposure may include headaches, narcotic effects, CNS changes (i.e., coordination impairment, impaired reflexes, tremoring) difficulty in breathing, possible chemical pneumonia, and potentially respiratory failure.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information			Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
Methylene chloride	75-09-2	I.P. 11.32 eV, High response with PID and 11.7 eV lamp	100% response with FID	Air sample using charcoal or Anasorb CMS sorbent tube and carbon disulfide desorption with gas chromatography- flame ionization detector; OSHA 59 or 80, NIOSH 1005	OSHA 50 ppm TWA, 100 ppm ceiling, ACGIH 50 ppm TWA, NIOSH Lowest feasible concentration,	Inadequate - Odor threshold 160 ppm. Use a gas mask with a Type N canister for concentrations up to 25 ppm. In excess of 25 ppm, use a supplied air respirator (airline respirator with emergency escape cylinder or a Self- Contained Breathing Apparatus - SCBA) Recommended gloves: Nitrile rubber latex glove, supported Polyvinyl alcohol glove, unsupported	Boiling Pt: 104°F; 39.8°C Melting Pt: -141°F; -96°C Solubility: 2% Flash Pt: N.A. LEL/LFL: 15.5% UEL/UFL: 66.4% Vapor Density: 2.93 Vapor Pressure: 380 mmHg @ 72°F; 22°C Specific Gravity: 1.33 Incompatibilities: Strong oxidizers, caustics, metals (i.e. aluminum, magnesium, potassium, sodium, lithium), and concentrated acids Appearance and Odor: Colorless liquid with a chloroform- like odor. (Note: A gas above 104°F).	Effects of overexposure may include CNS effects - cause sleepiness, fatigue, weakness, lightheadedness, numbness of the limbs, altered cardiac rate and Incoordination. These signs and symptoms may be accompanied by nausea, gastric and pulmonary irritation leading possibly to pulmonary edema. In addition to the narcosis long term effects may include liver injury. Listed as possessing carcinogenic properties by NTP, IARC, and ACGIH.
Sulfuric Acid	7664-93-9	pH paper	This substance is unable to be detected by PID/FID	NIOSH Method # 7903	OSHA & NIOSH 1 mg/m ³ ACGIH 1 mg/m ³ 3 mg/m ³ Ceiling NIOSH 1 mg/m ³ IDLH 15 mg/m ³	Adequate - Irritating, tingling sensation. Odor threshold 0.15 ppm. Recommended APR Cartridge: Suitable for acid gases and dusts and mists for concentrations less than 80 mg/m ³ . Recommended gloves: Nitrile has been the one most widely used for the other substances and is acceptable for this substance. Other options include butyl rubber, neoprene, and Viton.	Boiling Pt: 554°F; 290°C Melting Pt: 51°F; 10°C Solubility: Miscible Flash Pt: N.A. LEL/LFL: N.A. UEL/UFL: N.A. Vapor Density: N.A. Vapor Pressure: 1 mmHg @ 295°F; 146°C Specific Gravity: 1.84 Incompatibilities: Organic materials, chlorates, carbides, fulminates, water, and powdered metals. Liberates excessive heat when mixed with water. Appearance and odor: Colorless, oily liquid, odorless	This substance is corrosive at all points of contact. Severe exposure may result in burns, chemical pneumonitis, conjunctivitis, stomatitis, and erosion of the teeth. Depending on the severity shock and collapse may result.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information	
1,1,2,2-Tetrachloroethane	79-34-5	I.P. 11.1 eV	100% response with FID	Air sample using charcoal tube and carbon disulfide desorption, OSHA 07, or NIOSH method 1003	<p>OSHA, ACGIH, and NIOSH 1 ppm TWA</p> <p>Exposure to this substance may be contributed through skin absorption</p> <p>IDLH ~100 ppm</p>	<p>Odor threshold for this substance is 7.3 ppm. This level in comparison to the TLV is considered poor. Air purifying elements (organic vapor/acid gas) are recommended for escape purposes only.</p> <p>Combination units (APR/airline respirator) are recommended for working in concentrations in excess of the TLV.</p> <p>Recommended glove: Butyl rubber, solvent dipped, unsupported. PV alcohol Teflon Viton</p>	<p>Boiling Pt: 296°F; 147°C Melting Pt: -33 to -47°F; -36 to -43.8°C Solubility: 0.3% Flash Pt: N/A LEL/LFL: N/A UEL/UFL: N/A Vapor Density: Not available Vapor Pressure: 9 mmHg @ 86°F; 30°C Specific Gravity: 1.59 @ 77°F; 25°C Incompatibilities: Strong oxidizers, alkalis, fuming sulfuric acid, and chemically active metals. When heated to decomposition temperatures will emit toxic fumes of chlorine. Appearance and Odor: Colorless to pale yellow liquid with a pungent chloroform like odor.</p>	<p>Overexposure may result in CNS effects including depression, sleepiness, hallucinations, distorted perceptions, tremors(fingers), and stupor (narcosis). Systemically, symptoms may result in nausea, vomiting, abdominal pains, and cramps. May also irritate the eyes, skin, and mucous membranes. Chronic exposures may result in dermatitis, enlarged tender liver, jaundice, hepatitis, kidney, and lung damage.</p>

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information	
<p>Tetrachloroethylene See also Perchloroethylene PERK PCE</p>	127-18-4	I.P. 9.32 eV	70% relative response ratio with a FID	Air sample using charcoal tube and carbon disulfide desorption, OSHA 07, or NIOSH method 1003	<p>ACGIH TLV-TWA 25 ppm</p> <p>OSHA 100 ppm PEL; 200 ppm Ceiling; 300 ppm 5-minute max peak in any 3-hr period.</p> <p>IDLH - 150 ppm (NIOSH)</p>	<p>Odor threshold for this substance has been determined to be at airborne concentrations of approximately 47 ppm, which is considered adequate. APR with organic vapor/acid gas cartridges should be used for escape purposes only. Exceedances over the recommended exposure limits requires the use of airline or airline/APR combination units.</p> <p>Recommended glove: Viton, PV alcohol, silver shield, and Nitrile in that order. The breakthrough time for the nitrile glove ranges between 1.5 - 5.5 hrs. during complete immersion.</p>	<p>Bolling Pt: 250°F; 121°C Melting Pt: -2°F; -17°C Solubility: 0.02% Flash Pt: Not available LEL/LFL: Not available UEL/UFL: Not available Vapor Density: Not available Vapor Pressure: 14 mmHg @ 77°F; 25°C Specific Gravity: 1.62 @ 77°F; 25°C Incompatibilities: Strong oxidizers, alkalis, fuming sulfuric acid, and chemically active metals. When heated to decomposition temperatures will emit toxic fumes of chlorine. Appearance and Odor: Colorless liquid with a mild chloroform like odor.</p>	<p>Overexposure may result in irritation to eyes, nose, throat, and skin. Potential CNS effects including sleepiness, incoordination, headaches, hallucinations, distorted perceptions, and stupor (narcosis). Systemically, symptoms may result in nausea, vomiting, weakness, tremors, and cramps. Chronic exposures may result in dermatitis, enlarged tender liver, kidney, and lung damage. This material is considered a animal carcinogen (liver tumors), however, inadequate evidence exists concerning carcinogenic potential in humans.</p>
Toluene	108-88-3	I.P. 8.82 eV, High response with PID and 10.2 eV lamp	110% response with FID	Air sample using charcoal tube and carbon disulfide desorption, OSHA 07, or NIOSH Method 1500	<p>OSHA 100 ppm 150 ppm STEL ACGIH 50 ppm</p> <p>NIOSH 100 ppm REL 150 ppm STEL</p> <p>IDLH 500</p>	<p>Adequate - Odor threshold 1.6 ppm is considered good. Can use air-purifying respirator with organic vapor cartridge up to 1,000 ppm</p> <p>Recommended gloves: Teflon, Viton, silver shield, supported nitrile (Useable time limit 0.5 hr, complete submersion for the nitrile selection)</p>	<p>Bolling Pt: 232°F; 111°C Melting Pt: -139°F; -95°C Solubility: 0.05% (61°F; 16°C) Flash Pt: 40°F; 4°C LEL/LFL: 1.2% UEL/UFL: 7.1% Vapor Density: 3.14 Vapor Pressure: 20 mmHg @ 65°F; 18°C Specific Gravity: 0.87 Incompatibilities: Strong oxidizers Appearance and odor: Colorless liquid with a sweet pungent aromatic odor.</p>	<p>Overexposure to this substance may result in mild to moderate irritation at all points of contact, and CNS changes including euphoria, confusion, nervousness, and possibly paresthesia characterized by an abnormal burning sensation, pricking, or numbness. At 200-500 ppm exposure has resulted in headaches, nausea, eye irritation, loss of appetite, bad taste, impair coordination, fatigue, and weariness. Chronically, toluene overexposure may result in dermatitis, liver, and kidney damage.</p>

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information			Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
1,1,2-Trichloroethane	79-00-5	I.P. 11.0 eV,	85% response with FID	Air sample using charcoal sorbent tube and carbon disulfide desorption with gas chromatography-flame ionization detector; OSHA 07, NIOSH 1003	OSHA, NIOSH, ACGIH 10 ppm TWA Exposure contribution may also occur through skin absorption. IDLH ~100 ppm	No information was found concerning odor threshold limits. The use of air-purifying respirator with organic vapor cartridge for <500 ppm for escape purposes is permitted. Exceedances above the exposure limits will require the use of airline or airline/APR combination units. Recommended glove: Butyl rubber, solvent dipped, unsupported; PV alcohol; Teflon; Viton	Boiling Pt: 237°F; 114°C Melting Pt: -31°F-35°C Solubility: 0.6% Flash Pt: N/A LEL/LFL: 6% UEL/UFL: 15.5% Vapor Density: Not available Vapor Pressure: 19 mmHg @ 68°F; 20°C Specific Gravity: 1.44 Incompatibilities: Acids, acid fumes, oxidizers, caustics, and chemically active metals such as aluminum, magnesium, sodium, potassium, etc. Appearance and Odor: Colorless liquid with a sweet chloroform-like odor.	Overexposure to this substance may cause irritation to the eyes, skin, and mucous membranes of the respiratory and gastrointestinal tract. CNS effects may include sleepiness, incoordination, depression similar to a narcotic. Chronic exposure may cause liver, kidney and lung damage.
Trichloroethylene	79-01-6	I.P. 9.45 eV, High response with PID and 10.2 eV lamp	70% Response with FID	Air sample using charcoal tube and carbon disulfide desorption, OSHA 07, or NIOSH Method 1022 or 1003	OSHA 50 ppm PEL 200 ppm STEL ACGIH 50 ppm TLV-TWA 100 ppm STEL NIOSH 25 ppm REL IDLH~ 1000 ppm	Inadequate - Odor threshold 82 ppm. APRs with organic vapor/acid gas cartridges may be used for escape purposes. Exceedances over the exposure limits require the use of positive pressure-demand supplied air respirator. Recommended gloves: PV Alcohol unsupported; Silver shield; Teflon; or Viton	Boiling Pt: 188°F; 86.7°C Melting Pt: -99°F; -73°C Solubility: 0.1% @ 77°F; 25°C Flash Pt: 80°F; 32°C LEL/LFL: 8% @ 77°F; 25°C UEL/UFL: 10.5 @ 77°F; 25°C Vapor Density: 4.53 Vapor Pressure: 100 mm @ 32°C Specific Gravity: 1.46 Incompatibilities: Strong caustics and alkalis, chemically active metals (barium, lithium, sodium, magnesium, titanium, and beryllium) Appearance and Odor: Colorless liquid with a chloroform type odor. Combustible liquid, however, burns with difficulty.	Central nervous system effects including euphoria, analgesia, anesthesia, paresthesia, headaches, tremors, vertigo, and somnolence. Damage to the liver, kidneys, heart, lungs, and skin have also been reported. Contact may result in irritation to the eyes, skin, and mucous membranes. Ingestion may result in GI disturbances including nausea, and vomiting NIOSH lists this substance a potential human carcinogen.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information	
Vinyl chloride	75-01-4	I.P. 9.99 eV, High response with PID and 10.2 eV lamp	40% response with FID	Air sample using charcoal or Anasorb CMS sorbent tube and carbon disulfide desorption with gas chromatography-flame ionization detector; NIOSH 1007, OSHA 75	OSHA 1.0 ppm PEL 5.0 ppm Ceiling. ACGIH 5 ppm TLV-TWA, NIOSH Lowest Feasible Concentration	Inadequate - Odor threshold 10-20 ppm. Gas Mask with a vinyl chloride Type N canister may be employed for concentrations up to 25 ppm. Canisters employed must have a minimum service life of 4-hrs. Exceedances over 25 ppm, must use a positive pressure demand, open-circuit, self-contained breathing apparatus, pressure demand type, with full facepiece. Refer to 29 CFR 1910.1017(g) for specific requirements based on atmospheric concentrations of vinyl chloride. Recommended gloves: Silver shield, nitrile, or Viton	Boiling Pt: 7°F; -13.9°C Melting Pt: -258°F; -160°C Solubility: 0.1% @ 77°F; 25°C Flash Pt: 18°F; -8°C LEL/LFL: 3.6% UEL/UFL: 33% Vapor Density: 2.21 Vapor Pressure: 3.3 atm Specific Gravity: N.A. Incompatibilities: Oxidizers, copper, aluminum, peroxides, iron, steel, Appearance and Odor: Colorless gas or liquid (below 56°F) with a pleasant odor at high concentrations.	A severe skin, eye, and mucous membrane irritant(Liquid: frostbite). Narcotic effect causing weakness, abdominal pains, GI bleeding, and pallor skin or cyanosis. Chronic exposure has been linked to the formation of malignant tumors originating from blood lymphatic vessels in the liver (associated enlargement of the liver), and kidneys (angiosarcoma and nephroblastoma), Listed as a carcinogen by NTP, IARC and ACGIH.
Xylene All isomers o-, m-, p-	1330-20-7	I.P. 8.56 eV, High response with PID and 10.2 eV lamp	110% response with FID	Air sample using charcoal tube and carbon disulfide desorption, OSHA 07, or NIOSH Method 1500	ACGIH, & NIOSH 100 ppm TWA 150 ppm STEL OSHA 100 ppm PEL IDLH 900 ppm	Adequate - Odor thresholds for the following isomers: 0.6 m-; 5.4 p-; 20 o- ppm. Can use air-purifying respirator with organic vapor cartridge up to 1,000 ppm Recommended gloves: PV Alcohol; Viton; Silver shield; Nitrile is acceptable for limited operations and contact	Boiling Pt: 269-281°F; 132-138°C Melting Pt: -13o/-54m/56p°F; -25o/-48m/13p °C Solubility: 0.02 % Flash Pt: 81-90°F;27-32°C LEL/LFL: 0.9% UEL/UFL: 7.0% Vapor Density: 3.66 Vapor Pressure: 7-9 mmHg @ 70°F; 21°C Specific Gravity: 0.88-0.88 Incompatibilities: Strong oxidizers and strong acids Appearance and odor: Colorless liquid with an aromatic odor.	Effects may of overexposure include irritation at all points of contact, CNS changes (i.e. dizziness, excitement, drowsiness, incoherent, staggering gait), difficulty in breathing, pulmonary edema, and possibly respiratory failure. Chronic effects may include dermatitis and cornea vacuolization.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information		Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information	
Cadmium	7440-43-9	Substance is not volatile. Unable to be easily detected by PID or FID.	Not detected by FID.	Air sample using a mixed cellulose-ester filter / acid desorption and analysis by atomic absorption-flame; NIOSH 7300 or 7048.	<p>OSHA 2 $\mu\text{g}/\text{m}^3$ (0.002 mg/m^3) PEL</p> <p>ACGIH 0.01 mg/m^3 TLV-TWA (total particulate) 0.002 mg/m^3 (respirable particulate)</p>	The use of an air purifying, full face-piece respirator with a high efficiency particulate air filter for concentrations up to 0.25 mg/m^3 .	<p>Boiling Pt: 1412°F; 767°C Melting Pt: 610°F; 321°C Solubility: Insoluble Flash Pt: Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not applicable UEL/UFL: Not applicable Vapor Density: N.A. Vapor Pressure: 1 mm @ 741°F; 394°C Specific Gravity: 8.65 @ 90°F; 32°C Incompatibilities: Strong oxidizers, elemental sulfur, selenium, tellurium, zinc, nitric acid, and hydrazoic acid Appearance and Odor: Metal: Silver-white, blue-tinged lustrous, odorless solid. Fume: yellow-brown, finely divided particulate dispersed in air.</p>	Overexposure to this substance may result in irritation to the respiratory tract, dyspnea, tightness in the chest, coughing, possibly pulmonary edema. Overexposure to fumes causes symptoms characteristic of the flu (headaches, chills, muscle aches, nausea, vomiting, diarrhea). Chronic exposure may result in damage to the lungs, kidneys and liver. This substance has been identified as a confirmed animal; potential human carcinogen by IARC and NTP.
Chromium Compounds	7440-47-3 (Element)	Properties vary depending upon the specific compounds. Not detectable by PID.	Not detectable by FID.	Air sample using mixed cellulose-ester filter / acid desorption and analysis by atomic absorption; NIOSH 7024.	<p>OSHA & NIOSH (Chromium II, III) 0.5 mg/m^3 TWA (Chromium VI) 0.1 mg/m^3 ceiling</p> <p>ACGIH 0.5 mg/m^3 TLV-TWA (Chromium II, III compounds) 0.05 mg/m^3 (Chromium VI compounds)</p> <p>IDLH 30 mg/m^3 (Chromium VI compounds)</p>	The use of a air purifying, full face-piece respirator with a high efficiency particulate filter for concentrations up to 0.1 mg/m^3 .	<p>Boiling Pt: 4788°F; 2642°C Melting Pt: 3452°F; 1900°C Solubility: Insoluble Flash Pt: Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not applicable UEL/UFL: Not applicable Vapor Density: N.A. Vapor Pressure: 0 mmHg Specific Gravity: 7.14 Incompatibilities: Strong oxidizers, peroxides, and alkalis Appearance and Odor: Appearance and odor vary depending upon the specific compound.</p>	Health hazards are characterized normally through chronic exposure manifesting as histologic fibrosis of the lungs and ulceration of the nasal septum and skin. IARC, NTP and ACGIH list various chromium compounds as possessing carcinogenic properties.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWIRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information			Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
		Substance is not volatile. Unable to be detected by either PID or FID.	Unable to be detected by FID.	Air sample using a mixed cellulose ester filter / HNO ₃ or H ₂ O ₂ desorption / Atomic absorption; NIOSH 7082 or 7300.				
Lead	7439-92-1	Substance is not volatile. Unable to be detected by either PID or FID.	Unable to be detected by FID.	Air sample using a mixed cellulose ester filter / HNO ₃ or H ₂ O ₂ desorption / Atomic absorption; NIOSH 7082 or 7300.	OSHA 0.05mg/m ³ PEL ACGIH 0.15mg/m ³ TLV-TWA NIOSH 0.10mg/m ³ REL IDLH 100 mg/m ³ as lead	The use of a air purifying, full-face respirator with high efficiency particulate air filter for up to 2.5 mg/m ³ . Recommended gloves: This is in the particulate form. Therefore any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances).	Boiling Pt: 3164°F; 1740°C Melting Pt: 621°F; 327°C Solubility: Insoluble Flash Pt: Not applicable (Airborne dust may burn or explode when exposed to heat, flame, or incompatible chemicals) LEL/LFL: Not applicable UEL/UFL: Not applicable Vapor Density: N.A. Vapor Pressure: 0 mmHg Specific Gravity: 11.34 Incompatibilities: Strong oxidizers, peroxides, sodium acetylide, zirconium, and acids Appearance and Odor: Metal: A heavy ductile, soft gray solid.	Overexposure to this substance via ingestion or inhalation may result in metallic taste in the mouth, dry throat, thirst, Gastrointestinal disorders (burning stomach pain, nausea, vomiting, possible diarrhea sometimes bloody or black, accompanied by severe bouts of colic), CNS effects (muscular weakness, pain, cramps, headaches, insomnia, depression, partial paralysis possibly coma and death. Extended exposure may result in damage to the kidneys, gingival lead line, brain, and anemia.
Aroclor-1260 (Polychlorinated Biphenyl, PCB) It should be noted that this substance is representative of the more common isomers Aroclor - 1242, 1254, which may be encountered.	11096-82-5	Substance is not volatile (VP=0.00006 mmHg), no I.P. exists, therefore PID will not detect substance	Substance is non combustible and as a result will not be detected by FID	Air sample using a Florisil sorbent tube with glass fiber filter. Hexane desorption and gas chromatography-electron capture detector, NIOSH 5503	OSHA& ACGIH 0.5 mg/m ³ TWA NIOSH 0.001 mg/m ³ REL	Inadequate - However due to the low volatility it is assumed unless agitated this substance does not present a volatile vapor or gas respiratory threat. For dusty conditions where this material may cling to particulates, use a HEPA filter. Recommended glove: Butyl rubber; Neoprene rubber; Silver shield or Viton (for pure product). Nitrile will be acceptable for incidental contact.	Boiling Pt: distillation range 689-734°F; 365-390°C Melting Pt: -2 to 50°F; -19 to 10°C Solubility: Insoluble Flash Pt: Not applicable LEL/LFL: Not applicable UEL/UFL: Not applicable Nonflammable liquid, however, exposure to fire results in black soot containing PCBs, dibenzofurans, & chlorinated dibenzo-p-dioxins Vapor Density: N.A. Vapor Pressure: 0.00006 - 0.001 mmHg Specific Gravity: 1.566 @ 80°F; 15.5°C Incompatibilities: Strong oxidizers Appearance and Odor: Colorless to pale yellow, viscous liquid or solid (Aroclor 54 below 50°F) with a mild, hydrocarbon odor	This substance is irritating to the eyes and skin. Chronic effects of overexposure may include potential to cause liver damage, chloracne, and reproductive effects. Recognized as possessing carcinogenic properties by NIOSH, and NTP.

**TABLE 6-1
CHEMICAL, PHYSICAL, AND TOXICOLOGICAL DATA
CALVERTON, NWRP, NEW YORK**

Substance	CAS No.	Air Monitoring/Sampling Information			Exposure Limits	Warning Property Rating	Physical Properties	Health Hazard Information
<p>Waste Oils</p> <p>All information is based on mineral oil</p>	<p>N.E. 8012-95-1 for mineral oil</p>	<p>varies between fractions however waste oils tend to be less volatile</p>	<p>varies between fractions however waste oils tend to be less volatile. This instrument tends to handle the longer chained aliphatic hydrocarbons more efficiently than its PID counterpart</p>	<p>#5026 is the recommended method for mineral oil mist</p>	<p>ACGIH & NIOSH 5 mg/m³ (Oil mists) 10 mg/m³ STEL</p> <p>OSHA 5 mg/m³ (Oil mists)</p>	<p>Non-volatile substance, therefore no respiratory protection is required. In an aerosol form dust and mist respirator would be considered acceptable for up to 500 mg/m³.</p> <p>Recommended gloves: Any glove suitable to prevent skin contact (Nitrile has been the one most widely used for the other substances, and will be acceptable).</p>	<p>Boiling Pt: 360°C Melting Pt: N.A. Solubility: Insoluble Flash Pt: 275-500°F depends on the distillation fraction LEL/LFL: N.A. UEL/UFL: N.A. Vapor Density: N.A. Vapor Pressure: <0.5 mmHg Specific Gravity: 0.90 Incompatibilities: None reported Appearance and odor: Colorless, oily, with an odor of burned lubricating oil.</p>	<p>Minor irritation to the eyes, skin, and respiratory system.</p>
<p>Cyanides (as CN)</p>	<p>varies depending of compound</p>	<p>Unable to be detected by PID</p>	<p>Unable to be detected by FID</p>	<p>Air sample using filter; analyze using specific ion electrode</p>	<p>OSHA, ACGIH, & NIOSH(ceiling) 5 mg/m³</p> <p>IDLH 50 mg/m³</p>	<p>Inadequate warning properties; recommend the use of supplied air respirators</p>	<p>Boiling Pt: 2725°F; 1496°C Melting Pt: 1047°F; 564°C Solubility: 58% Flash Pt: NA LEL/LFL: NA UEL/UFL: NA Vapor Density: NA Vapor Pressure: 0 mm (approx) Specific Gravity: 1.6 Incompatibilities: Strong oxidizers, acids, acid salts, chlorates, and nitrates Appearance and odor: KCN and NaCN are white granular or crystalline solids with a faint almond-like odor</p>	<p>Overexposure may result in chemical asphyxiation and death. Symptoms of exposure include weakness, headache, confusion, nausea, vomiting, increased respiratory rate, slow gasping respirations, irritation of the eyes and skin. Target organs are listed as Cardiovascular system, Central nervous system, liver, kidneys, and skin.</p>

7.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

7.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

7.1.1 Requirements for Halliburton NUS Personnel

All Halliburton NUS personnel must complete 40 hours of introductory hazardous waste site training in accordance with OSHA 29 CFR 1910.120(e) prior to performing work at Calverton NWIRP. Additionally, Halliburton NUS personnel who have had introductory training more than 12 months prior to site work must have completed 8 hours of refresher training within the past 12 months before being cleared for site work. 8-hour Supervisory Training in accordance with OSHA 29 CFR 1910.120(e)(4) will be required for site supervisory personnel charged with the responsibility of directing others engaged in hazardous waste operations.

Documentation of Halliburton NUS Health and Safety Training will be maintained at the project site. Copies of certificates or other official documentation will be used to fulfill this requirement.

7.1.2 Requirements for Subcontractors

All Halliburton NUS subcontractor personnel must have completed introductory hazardous waste site training or equivalent work experience as defined in OSHA Standard 29 CFR 1910.120(e) and 8 hours of refresher training, as applicable, meeting the requirements of 29 CFR 1910.120(e)(8) prior to performing field work at Calverton NWIRP. Halliburton NUS subcontractors must certify that each employee has had such training by sending Halliburton NUS a letter, on company letterhead, containing the information in the example letter provided in the Health and Safety Guidance Manual, or some other mutually acceptable means of confirmation. Copies of the workers training certificates shall accompany that letter.

7.2 SITE-SPECIFIC TRAINING

Halliburton NUS will provide site-specific training to all Halliburton NUS employees and subcontractor personnel who will perform work on this project. Site-specific training will include:

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards

- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- The contents of the site-specific health and safety plan
- Emergency response procedures (evacuation and assembly points)
- Review the contents of relevant Material Safety Data Sheets
- Items which remain unchanged in the original HASP CTO 0090, July 1993

7.3 MEDICAL SURVEILLANCE

7.3.1 Medical Surveillance Requirements For Halliburton NUS Personnel

All Halliburton NUS personnel participating in project field activities will have had a physical examination meeting the requirements of Halliburton NUS' medical surveillance program and will be medically qualified to perform hazardous waste site work using respiratory protection.

Documentation for medical clearances will be maintained in the Halliburton NUS Pittsburgh office and made available as necessary.

7.3.2 Medical Surveillance Requirements For Subcontractors

Subcontractors are required to obtain a certificate of their ability to perform hazardous waste site work and to wear respiratory protection. The "Subcontractor Medical Approval Form" located in the Health and Safety Guidance Manual can be used to satisfy this requirement providing it is properly completed and signed by a licensed physician.

Subcontractors who have a company medical surveillance program meeting the requirements of paragraph (f) of OSHA 29 CFR 1910.120 (f) can substitute "Subcontractor Medical Approval Form" with a letter, on company letterhead, containing all of the information in the example letter presented in the Halliburton NUS Health and Safety Guidance Manual.

7.3.3 Requirements For All Field Personnel

Each field team member (including subcontractors) shall be required to complete and submit a copy of the Medical Data Sheet found in the Halliburton NUS Health and Safety Guidance Manual. This shall be provided to the SSO prior to participating in site activities.

7.4**SUBCONTRACTOR EXCEPTION**

Subcontractors who will not enter the exclusion zone during intrusive activities and whose activities involve no potential for exposure to site contaminants, will not be required to meet the requirements for training/medical surveillance, other than site-specific training as stipulated in Section 7-1.

8.0 SPILL CONTAINMENT PROGRAM

8.1 SCOPE AND APPLICATION

It is anticipated that bulk hazardous materials (over 55-gallons) will be handled at a given time as part of this scope of work. It is also anticipated that such spillage could constitute a danger to human health or the environment. Additionally, as the job progresses, the potential for accumulating decontamination fluids, soil cuttings, etc. in the central staging area exists. Once characterized these fluids can be removed from this area and disposed of. While these fluids and soils remain uncharacterized in the staging area, this spill containment program will be developed and instituted as part of this HASP.

8.2 POTENTIAL SPILL AREAS

Potential spill areas will be monitored in an ongoing attempt to prevent and control further potential contamination of the environment. Currently, there is limited areas vulnerable to this hazard including the area used for the central staging and decontamination for potentially contaminated soils and decontamination fluids. Additionally, the handling, loading and unloading areas present limited potential for leak or spill. At this junction it is anticipated all decontamination fluids generated, as a result of this scope of work, will be containerized, labeled, and staged to await chemical analyses. The results of these analyses will determine whether the fluids will be disposed of in the Industrial Waste Water Treatment Facility (IWWTF) as nonhazardous, or go offsite as hazardous to a treatment facility. During the turn around for the chemical analyses there exists a possibility to accumulate multiple drums of fluid and solids.

8.2.1 55-Gallon Drums

All drums containing liquids or solids will be staged within a centralized area. All drums will be staged 4 to a pallet with a minimum of a 5 feet between each palleted row. Pallets holding drums will not be stacked.

8.3 LEAK AND SPILL DETECTION

To establish an early detection of potential spills or leaks, a periodic walk around by personnel staging or disposing of drums will be conducted during working hours to visually determine that containers are not leaking. If a leak is detected the drum contents will be transferred using a hand pump into a new 55-gallon drum (or using a shovel for solid materials). Liquid leaks will be collected and contained using absorbents

such as Oil-dry, vermiculite, or sand, stored at the staging area in a drum conspicuously marked. This material once used, will be containerized for disposal pending analyses. All inspections will be documented in the Project Logbook.

8.4 PERSONNEL TRAINING AND SPILL PREVENTION

All personnel will be instructed on the procedures for spill prevention, containment, and collection of hazardous materials in the site-specific training. The FOL and the SSO will serve as the Spill Response Coordinator for this operation should the need arise.

8.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the minimum equipment which will be maintained at the staging area at all times for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other noncombustible absorbent (oil-dry);
- Drums (55-gallon U.S. DOT 17-E or 17-H)
- Shovels, rakes, and brooms
- Hand operated drum pump with hose
- Labels
- Drum Patch kit

8.6 SPILL CONTROL PLAN

This section describes the procedures the Halliburton NUS field crew members will employ upon the detection of a spill or leak.

- 1) Notify the SSO or FOL immediately upon the detection of a leak or spill.
- 2) Employ the personnel protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the drum or raising the leak to the highest point. Spread the absorbent material in the area of the spill covering completely.
- 3) Transfer the material to a new drum, collect and containerize the absorbent material. Label the new drum appropriately. Await analyses for treatment or disposal options.
- 4) Solid spills will be recontainerized with 2-inches of top cover (spills on earthen materials),

and await for test results for treatment or disposal options.

It is not anticipated that a spill will occur in which the field crews cannot handle. Should this occur Hazardous Materials Teams will be contacted through Base Security to support this action.

9.0 CONFINED SPACE ENTRY

Personnel under the provisions of this HASP are not allowed, under any circumstances, to enter confined spaces. Confined spaces or Permit-Required Confined Spaces are not anticipated as part of this task order and have not been identified within the scope of work. Personnel should understand a confined space is defined as an area which has one or more of the following characteristics:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry).
- Is not designed for continuous employee occupancy.

Additionally, a Permit-Required Confined Space may also have one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential to engulf an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.
- Contains any other recognized, serious, safety or health hazard.

For further information on confined space consult the Health and Safety Guidance Manual or call the Manager, Health Sciences.

10.0 MATERIALS AND DOCUMENTS

The Halliburton NUS FOL shall ensure the following materials/documents are taken to the project site and utilized as required.

- Incident Reports
- Medical Data Sheets
- Material Safety Data Sheets for decon solutions and other substances brought to the site
- Follow-Up Reports (to be completed by the FOL)
- OSHA Job Safety and Health Poster (posted in site trailer)
- Training/Medical Surveillance Documentation Form (Blank)
- First Aid Supply Usage Form
- Emergency Reference Form (Section 2.0, extra copy for posting)
- Health and Safety Guidance Manual

11.0 GLOSSARY

ACGIH	American Conference of Governmental Industrial Hygienists
APR	Air Purifying Respirators
AS/SVE	Air Sparging Vapor Extraction
CFR	Code of Federal Regulations
CNS	Central Nervous System
CQP	Construction Quality Plan
eV	electron Volts
FID	Flame Ionization Detector
FOL	Field Operations Leader
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HSM	Health and Safety Manager
IWWTF	Industrial Waste Water Treatment Facility
N/A	Not Available
NIOSH	National Institute Occupational Safety and Health
NWIRP	Naval Weapons Industrial Reserve Plant
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PEL	Permissible Exposure Limit
PID	Photo Ionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
PVC	Poly Vinyl Chloride
SAP	Sampling and Analyses Plan
SCBA	Self Contained Breathing Apparatus
SSO	Site Safety Officer
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
UV	Ultra Violet
WP	Work Plan