

Final Work Plan for Confirmation Sampling for Site 15 Soil Remediation Oceana Naval Air Station, Virginia Beach, Virginia



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**Work Plan
for Confirmation Sampling
for Site 15 Soil Remediation**

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Work Plan for SWMU 15 Soil Remediation Confirmation Sampling

This Work Plan defines sampling tasks and field investigation procedures that will be performed during the Naval Air Station, Oceana (NAS Oceana), confirmation soil sampling for soil remediation at Solid Waste Management Unit (SWMU) 15. This Work Plan supersedes all proposed confirmatory sampling strategies documented in the design and construction specifications documents. The data collection quality assurance for the confirmation soil sampling field activities are documented in the Sampling and Analysis Plan (SAP), the Data Management Plan (DMP), the Quality Assurance Project Plan (QAPP), and the Health and Safety Plan (HSP).

Sample Collection Goals and Objectives

The principal goals of the confirmation sampling are to: (1) determine the contaminant concentrations in the remaining soil around the perimeter of the excavation area, and (2) determine the residual contaminant concentrations in the soil within the biopile area.

Specific sampling objectives developed to satisfy the goals of the confirmation soil sampling at SWMU 15 are documented below:

Confirmatory Sampling of Excavation-Perimeter Soil

The collection of ten (10) grab soil samples is proposed for confirmation sampling of the perimeter soil surrounding the excavation area at SWMU 15. The samples will be collected at equidistant intervals (approximately every 200 feet) around the perimeter of the excavation at a distance of 2 feet outward from the edge of the excavation perimeter. The soil samples will be collected from a depth interval of 1-2 feet below ground surface. The samples will be analyzed for benzene, toluene, ethylbenzene, xylenes (BTEX), and polynuclear aromatic hydrocarbons (PAHs). Approximate sampling locations are shown in Figure 1.

In a generalization for groundwater conditions at NAS Oceana, CH2M HILL has stated in previous investigation documents that the water table has fluctuated between 3 and 8 feet below ground surface. SWMU-specific groundwater data were collected during March 1994, October 1994, and March 1995 (refer to Table A-18 in the CMS for SWMU 15). Monitoring wells 15-MW5, 15-MW6, 15-MW8, and 15-MW9 are adjacent to or within the area of excavation. Water table data from these wells demonstrate a high water table of 2.56 feet below ground surface in 15-MW8 and a low water table of 7.75 feet below ground surface in 15-MW8. Monitoring well 15-MW9 is in the center of the excavation. For the same period, this well had a high water table of 2.65 feet below ground surface and a low water table of 7.5 feet below ground surface.

Soil sampling of the floor of the excavation is not proposed because contaminated groundwater entering the excavation will impact the quality of the samples. The soil was

excavated to a depth of 7 feet below ground surface. The depth of excavation is nearly equivalent to the lowest recorded water table in the excavation area. A natural attenuation remediation strategy for groundwater contamination with long term monitoring is proposed for this SWMU.

Confirmatory Sampling of Biopile Soil

The collection of confirmatory soil samples is proposed for the two biopiles at SWMU 15 to determine the residual contaminant concentrations in the soil after bioremediation. The locations of the two biopiles are illustrated in Figure 1.

The biopile soil is currently more homogeneous than when it was initially excavated. The soil has been moved several times since it was excavated. The soil was screened and pulverized with a hammer mill to generate a material with a uniform grain size. Then the soil was deposited into two biopiles in lifts using a conveyor belt. Based upon the extensive mixing and homogenization, the number of samples needed to represent the character of the pile as a whole, is substantially less than the number of samples needed to characterize an undisturbed pile of excavated soil.

Sample Numbers

Based on the homogeneous nature of the soil, the number of confirmatory soil samples proposed for collection at the biopiles is as follows:

Biopile 1	27 Sampling Locations for VOCs, PAHs, and TPH
Biopile 2	7 Sampling Locations for VOCs, PAHs, and TPH

Thirty-four soil samples are proposed for VOC, PAH, and TPH analyses; 27 from the large pile and 7 from the small pile. All soil samples shall be grab soil samples collected from discreet randomly selected locations and depths within the biopiles.

The non-hazardous soils are expected to meet the definition of clean fill and will be replaced into the excavation from which they came. If the soils do not meet the definition of clean fill, the Navy will submit a request, accompanied by a human health risk assessment, to the VDEQ, for alternative standards, in order that the Navy may replace the soil into the excavated area.

Sample Locations

The locations of confirmatory soil samples within the two biopiles are illustrated in Figure 2. The soil sample locations were derived using statistical methods published in the EPA guidance document *Statistical Methods for Evaluating the Attainment of Cleanup Goals, Volume 3: Reference-Based Standards for Soils and Solid Media*, December 1992. First, the piles were gridded such that a single grid contained between 1-2 percent of the area of the pile. The derivation of sampling locations began with the selection of a single random location within the sampling area following formulas presented in Chapter 5 of the guidance document. Formulas to determine the separation distance and row spacing were applied to each pile to form a triangular sampling network. The last step involved the determination of random offset distances from triangulated sampling points in X and Y

directions to determine the exact sampling points. A randomly selected variance of ± 3 feet was used.

Sample Depths

Sample depths for each sampling point were selected using randomly generated numbers between 0 and 9 feet. Where the randomly selected depth is greater than the depth of the pile, the sample will be collected at the lowermost sample depth obtainable in the field. The sample depths are tabulated in Table 1.

Sample Collection Methods

All grab soil samples will be collected with an auger and removed to sample containers using a stainless steel trowel. Samples will be immediately placed in sample containers with minimum headspace to minimize volatile contaminant loss.

The sample numbering scheme will be as follows: OCW15-SBxx-dd, where xx is the sample number, and dd represents the sample depth. OC is for Oceana, W15 is for SWMU 15, and SB is for soil boring. An example sample number would be, OCW15-SB03-02 (Oceana SWMU-15 soil boring with a sample collected from a depth of 2 feet).

The soil remediation pile sampling locations will be sketched and labeled on a site map showing conditions at the time of sampling.

Sample Analysis and Validation

The confirmatory soil samples will be analyzed for VOCs, including benzene, toluene, ethylbenzene, xylenes (BTEX), and chlorinated VOCs using SW-846, Method 8260, polynuclear aromatic hydrocarbons (PAHs) using SW-846, Method 8310, and TPH using SW-846, Method 8015. All analyses of soil will be conducted at a contracted laboratory that fulfills all requirements of the U.S. Navy's QA/QC Program Manual and EPA's Contract Laboratory Program. A signed certificate of analysis will be provided with each laboratory analysis, along with a certificate of compliance certifying that all work was performed in accordance with the applicable federal, state, and local regulations. All analyses will be performed following Navy guidance for Level D.

All data will be validated before the project staff performs an interpretation. The data validation will be performed by an independent subcontractor and will conform to the Navy guidance for Level D. Data that should be qualified will be flagged with the appropriate symbol. Results for QA/QC samples will be reviewed and the data will be qualified further, if necessary. Finally, the data set as a whole will be examined for consistency, anomalous results, and reasonableness.

Risk Assessment

A human health Baseline Risk Assessment (BLRA) will be performed for the SWMU 15 confirmatory excavation soil samples and the confirmatory biopile soil samples to assess the potential human health risks posed by the site and replacement of the treated soil back into the excavation. The risk assessment will evaluate the potential effects of existing site contamination on both current and potential future exposed populations. Future risks will

be based on current site conditions, assuming no additional remedial action for soil is conducted at the site. The future risk management classification of the site is expected to remain residential.

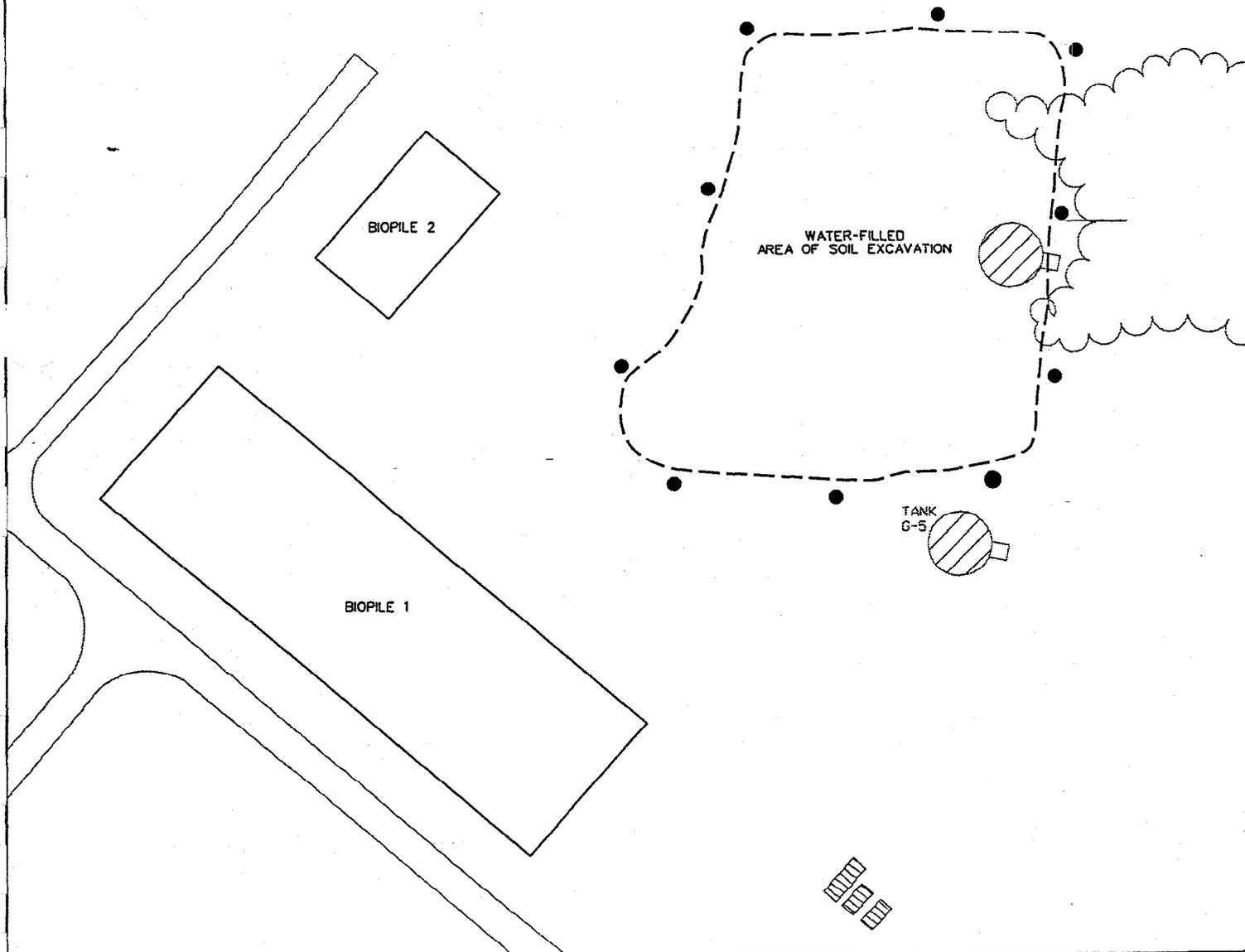
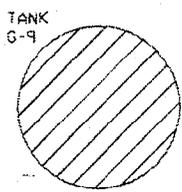
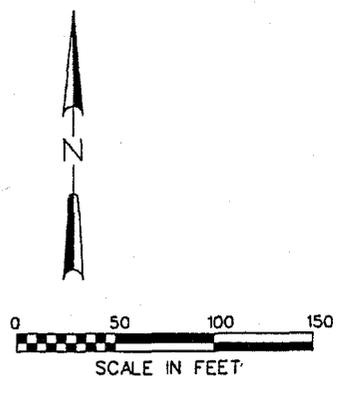
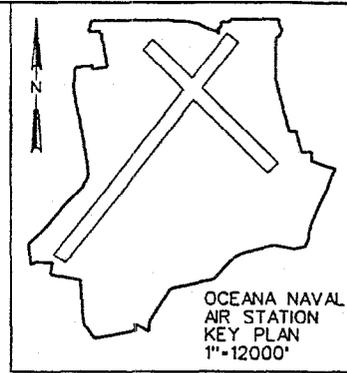
The risk assessment will be completed in accordance with EPA's *Risk Assessment Guidance for Superfund (RAGS), Volume I - Human Health Evaluation Manual (Part A)*, dated December 1989, *RAGS Parts B and C* dated December 1989, and EPA Region III guidance. The exposure factors in RAGS have been superseded by OSWER Directive 9285.6-03, *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors*, dated March 1991. Dermal permeability coefficients will be taken from EPA's *Interim Guidance for Dermal Exposure Assessment*, dated January 1992. Other required exposure factors may be taken from *Exposure Factors Handbook* (EPA, 1989) and the American Industrial Health Council's *Exposure Factors Sourcebook* (AIHC, May 1994). The risk assessment will contain the following major components:

- Data evaluation and identification of chemicals of potential concern
- Exposure assessment
- Toxicity assessment
- Risk characterization
- Uncertainty analysis

At the request of the EPA, the Army Corps of Engineers conducted a wetland survey in the vicinity of SWMU 15 in July of 1998. The results of the survey indicate that mapped wetlands in the vicinity of this SWMU are not going to be impacted by the soil sampling or soil replacement activities since they are not located adjacent to the work area. An ecological risk assessment is not proposed as part of this scope of work. However, an ecological risk assessment will be performed at this SWMU prior to close out.

Reporting

A draft report will be prepared and submitted to the Navy. A draft-final report will be prepared and submitted to the Navy, EPA, and VDEQ. This report will contain an interpretation of the results of confirmatory soil sampling and will contain the human health risk assessment results. The report will also contain recommendations regarding the extent of the soil excavation based upon results of excavation-perimeter sampling. The report will also contain recommendations regarding the disposition of soil in the biopile. This will be a function of human health risk assessment results and the TPH, PAH, and BTEX sampling results. Upon completion of Navy and regulatory review and comment, a final document will be issued.

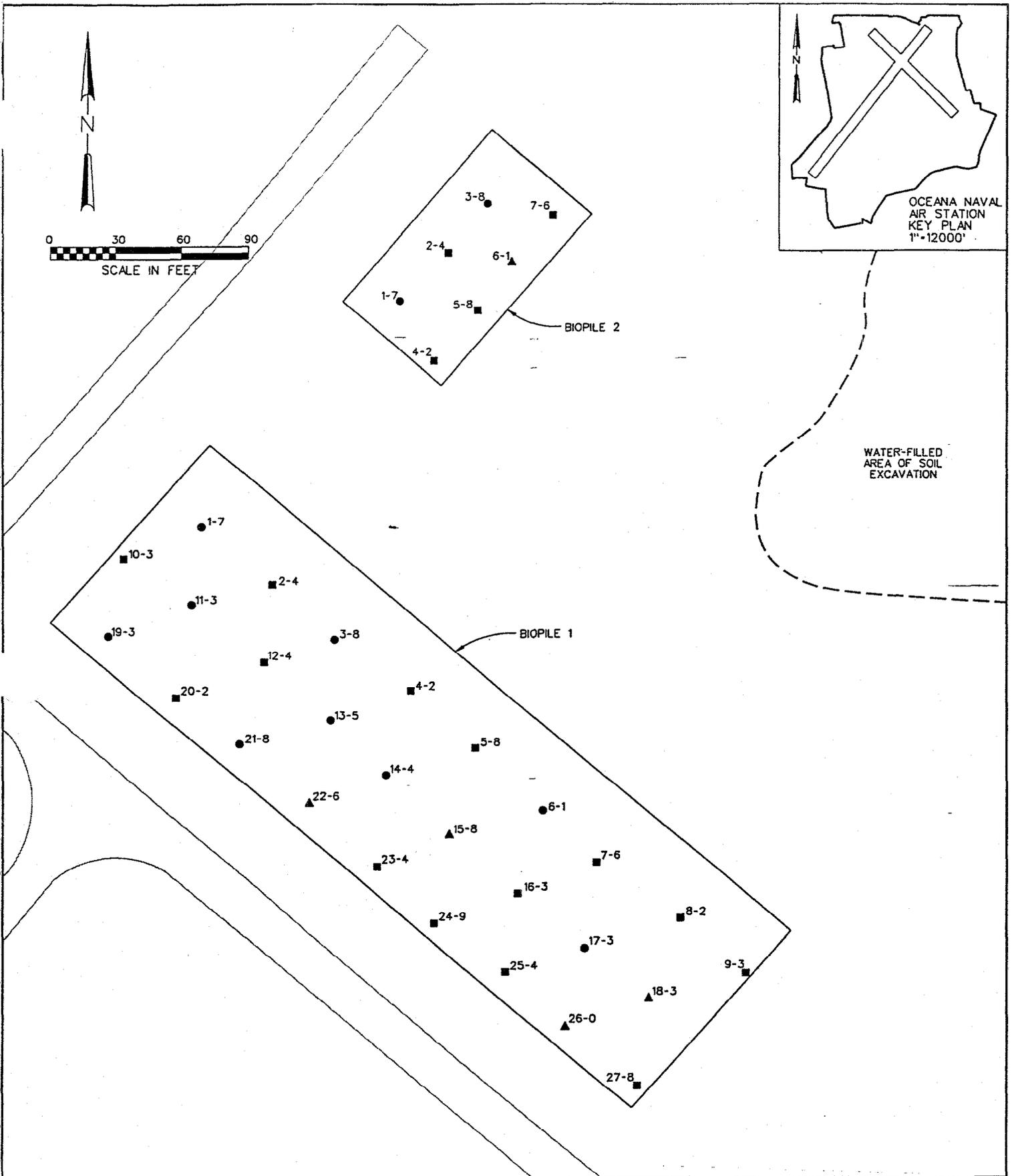


LEGEND

- PROPOSED SAMPLE LOCATION
- - - APPROXIMATE AREA OF EXCAVATION

Figure 1
PROPOSED EXCAVATION PERIMETER
SOIL SAMPLE LOCATIONS
AT SWMU 15
Naval Air Station, Oceana





LEGEND

- VOC SAMPLING LOCATIONS - SAMPLE DEPTHS
- VOC AND PAH SAMPLING LOCATIONS - SAMPLE DEPTHS
- ▲ VOC AND TCLP SAMPLING LOCATIONS - SAMPLE DEPTHS
- APPROXIMATE AREA OF EXCAVATION

Figure 2
 STATISTICALLY DETERMINED
 RANDOM SAMPLING LOCATIONS
 AT SWMU 15
 Naval Air Station, Oceana

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Random Sample Point Selections for Biopile 1

Sample Selection for VOCs and TPH

Point	X	Y	Sample Depths	Random 1-1000
1	-3	-2	7	508
2	-1	-1	4	135
3	-2	-3	8	460
4	0	3	2	365
5	0	1	8	312
6	3	-1	1	549
7	-3	-3	6	395
8	3	1	2	43
9	2	2	3	388
10	0	-1	3	34
11	-2	3	3	812
12	0	3	4	190
13	1	3	5	694
14	-3	0	4	548
15	-2	-2	8	878
16	0	-2	3	64
17	-1	-2	3	673
18	3	1	3	981
19	-1	2	3	821
20	1	-1	2	78
21	-3	2	8	586
22	-1	2	6	930
23	2	-1	4	19
24	-1	-3	9	296
25	-1	1	4	212
26	-3	-1	0	986
27	0	0	8	326

Sample Selection for PAHs

Point	X	Y	Sample Depths	PAHs Selection
23	2	-1	4	19
10	0	-1	3	34
8	3	1	2	43
16	0	-2	3	64
20	1	-1	2	78
2	-1	-1	4	135
12	0	3	4	190
25	-1	1	4	212
24	-1	-3	9	296
5	0	1	8	312
27	0	0	8	326
4	0	3	2	365
9	2	2	3	388
7	-3	-3	6	395

Table 1 cont.
Random Sample Point Selections for Biopile 2

Sample Selection for VOCs and TPH

Point	X	Y	Sample Depths	Random 1-1000
1	-3	-2	7	508
2	-1	-1	4	135
3	-2	-3	8	460
4	0	3	2	365
5	0	1	8	312
6	3	-1	1	549
7	-3	-3	6	395

Sample Selection for PAHs

Point	X	Y	Sample Depths	PAHs Selection
2	-1	-1	4	135
5	0	1	8	312
4	0	3	2	365
7	-3	-3	6	395

**Addendum to the Sampling
and Analysis Plan
for Confirmation Sampling
for Site 15 Soil Remediation**

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Addendum to the Sampling and Analysis Plan

This is an Addendum to the CH2M HILL, RCRA Facility Investigation, Sampling and Analysis Plan, dated June 1992. This Addendum to the RFI Sampling and Analysis Plan (SAP) defines the sampling procedures that will be performed during the SWMU 15 confirmatory soil sampling at NAS Oceana. Detailed descriptions of the sample locations and numbers are located in the Addendum to the work plan. Detailed descriptions of QA/QC measures and analytical methods are documented in the Addendum to the Data Collection Quality Assurance Plan (DCQAP).

Sample Collection Procedures

Soil sampling procedures that will be followed during the RFI supplemental sampling are documented in CH2M HILL standard operating procedures (SOPs). The following SOPs are included as the Addendum to this FSP:

- Water Level Measurements
- Shallow Soil Sampling
- Volatiles Monitoring by OVM
- Decontamination of Personnel and Equipment
- Field Rinse Blank Preparation
- Packaging and Shipping Procedures

Water-Level Measurements

I. Purpose and Scope

The purpose of this procedure is to provide a guideline for the measurement of the depth to groundwater in monitoring wells, where a second phase of floating liquid (e.g., gasoline) is not encountered. This SOP includes guidelines for discrete measurements of static water levels and does not cover the use of continuously recording loggers.

II. Equipment and Materials

- Electronic water level meter, Solinst or equivalent, with a minimum 100-foot tape; the tape should have graduations in increments of 0.01 feet or less

III. Procedures and Guidelines

Verify that the unit is turned on and functioning properly. Slowly lower the probe on its cable into the well until the probe just contacts the water surface; the unit will respond with a tone or light signal. Sight across the top of the locking well casing adjacent to the measuring point, recording the position of the cable when the probe is at the water surface. The measuring point will be a standardized surveyed location on the top of each well casing, adjacent to the lock hasp, indicated by a notch, paint mark, or similar method. Measure the distance from this point to the closest interval marker on the tape, and record the water level reading in the log book.

Measure and record the three following additional readings: (1) the depth of the well; (2) the depth from the top of the casing to the top of the well riser; and (3) the distance to the surface of the concrete pad or to ground. Measurements are to be taken with respect to the measuring point on the top of the well casing. The depth of the well may be measured using the water-level probe with the instrument turned off.

IV. Attachments

None.

V. Key Checks and Preventative Maintenance

Prior to each use, verify that the battery is charged by pressing the test button on the water-level meter. Verify that the unit is operating correctly by testing the probe in distilled or deionized water. Leave the unit turned off when not in use.

Soil Sampling

I. Purpose and Scope

The purpose of this procedure is to provide guidelines for obtaining samples of surface and subsurface soils using hand and drilling-rig mounted equipment.

II. Equipment and Materials

- Stainless-steel trowel, shovel, scoopula, coring device, trier, hand auger, or other appropriate hand tool
- Stainless-steel, split-spoon samplers
- Drilling rig or soil-coring rig
- Stainless-steel pan or bowl
- Sample bottles

III. Procedures and Guidelines

Before sampling begins, equipment will be decontaminated using the procedures described in SOP Deconrig (Decontamination of Drilling Rigs and Equipment). The sampling point is located and recorded in the field logbook. Debris should be cleared from the sampling location.

A. Surface and Shallow Subsurface Sampling

A shovel, post-hole digger, or other tool can be used to remove soil to a point just above the interval to be sampled. A decontaminated sampling tool will be used to collect the sample when the desired sampling depth has been reached. Soil for semivolatile organic and inorganic analyses is placed in the bowl and mixed; soil for volatile organic analysis is not mixed or composited but is placed directly into the appropriate sample bottles. A stainless-steel or dedicated wooden tongue depressor is used to transfer the sample from the bowl to the container.

The soils removed from the borehole should be visually described in the field log book, including approximated depths.

When sampling is completed, photo-ionization device (PID) readings should be taken directly above the hole, and the hole is then backfilled.

B. Split-Spoon Sampling

Using a drilling rig, a hole is advanced to the desired depth. For split-spoon sampling, the samples are then collected following the ASTM D 1586 standard (attached). The sampler is lowered into the hole and driven to a depth equal to the total length of the sampler; typically this is 24 inches. The sampler is driven in 6-inch increments using a 140-pound weight ("hammer") dropped from a height of 30 inches. The number of hammer blows for each 6-inch interval is counted and recorded. To obtain enough volume of sample for subsequent laboratory analysis, use of a 3-inch ID sampler may be required. Blow counts obtained with a 3-inch ID spoon would not conform to ASTM D 1586 and would therefore not be used for geotechnical evaluations.

Once retrieved from the hole, the sampler is carefully split open. Care should be taken not to allow material in the sampler to fall out of the open end of the sampler. To collect the sample, the surface of the sample should be removed with a clean tool and disposed of. Samples collected for volatiles analysis should be placed directly into the sample containers from the desired depth in the split spoon. Material for samples for all other parameters should be removed to a decontaminated stainless steel tray. The sample for semivolatile organic and inorganic analyses should be homogenized in the field by breaking the sample into small pieces and removing gravel. The homogenized sample should be placed in the sample containers. If sample volume requirements are not met by a single sample collection, additional sample volume may be obtained by collecting a sample from below the sample and compositing the sample for non-volatile parameters only.

Split-spoon samples also will be collected using a tripod rig. When using a tripod rig the soil samples are collected using an assembly similar to that used by the drilling rig.

IV. Attachments

ASTM D 1586.

V. Key Checks and Preventative Maintenance

Check that decontamination of equipment is thorough. Check that sample collection is swift to avoid loss of volatile organics during sampling.

MINIRAM Personal Monitor

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MINIRAM Personal Monitor

I. Purpose

The purpose of this SOP is to provide general reference information using the MINIRAM (Mini Real-time Aerosol Monitor) Model PDM-3 to monitor airborne particulates.

II. Scope

This procedure provides information regarding the field operation and general maintenance of the MINIRAM Model PDM-3. The information contained herein presents the operation procedures for this field monitoring equipment. Review of the owner's instruction manual is a necessity for more detailed descriptions pertaining to the operation and maintenance of the monitor.

III. Definitions

MINIRAM - Mini Real-time Aerosol Monitor (MINIRAM) Model PDM-3 used to monitor airborne particulates for preferential response to the particle size range of 0.1 to 10 micrometers.

Sun Shield -.An accessory to the MINIRAM that protects the sensing elements from excessive ambient light fluctuations.

Z-Bag kit - A calibration kit that consists of a one-way flow rubber bulb for manual air pumping, a filter cartridge, a zippered plastic container, and connecting hardware.

mg/m³ - milligrams per cubic meter of particulate (size range of 0.1 to 10 micrometers) in air, by volume

IV. Responsibilities

Project Manager - The Project Manager is responsible for ensuring that project-specific plans are in accordance with these procedures, where applicable, or that other approved procedures are developed. The Project Manager is responsible for selecting qualified individuals for the monitoring activities.

Health and Safety Officer - The Health and Safety Officer is responsible for developing a site-specific Health and Safety Plan (HASp) which specifies air monitoring requirements.

Field Team Leader - It is the responsibility of the Field Team Leader to implement these procedures in the field, and to ensure that the field team performing air monitoring activities, have been briefed and trained to execute these procedures before the start of site operations.

Site Safety Coordinator (SSC) - The SSC is responsible for ensuring that the specified air monitoring equipment is on site, calibrated, and used correctly by the field team. The SSC will coordinate these activities with the Field Team Leader.

Field team - It is the responsibility of the field team to follow these procedures or to follow documented project-specific procedures as directed by the Field Team Leader/SSC. The field team is responsible for documenting the air monitoring results in the field logbook during field investigation.

V. Procedures

The following sections provide information on the operating principles, calibration, operation, and maintenance of the MINIRAM.

A. Principle of Operation

The MINIRAM Model PDA13 (MINIRAM) is an airborne particulate monitor whose operating principle is based on the detection of scattered electromagnetic radiation in the near infrared. The MINIRAM uses a pulsed light emitting source which generates a narrow-band emission centered at 880 nanometers (=); it is a light scattering aerosol monitor of the nephelometric type, i.e., the instrument continuously senses the combined scattering from the population of particles present within its sensing volume (approximately 1 cm³) whose dimensions are large compared with the average separation between the individual airborne particles.

In the "Open Sensing Chamber Sampling Method", air surrounding the MINIRAM passes freely through the open aerosol sensing chamber as a result of air transport caused by convection, circulation, ventilation and personnel movement (i.e., a pump is not used). The scattering sensing parameters have been designed for preferential response to the particle size range of 0.1 to 10 micrometers, ensuring high correlation with standard gravimetric measurements of both the respirable and inhalable size fractions. The rate at which air passes through the sensor does not influence the indicated concentration because the detection is performed directly on every parcel of air traversing the fixed sensing volume. Therefore, flow velocity through a real-time sensor such as the MINIRAM influences only the response time.

The MINIRAM measures the concentration of any airborne particles, both solid and liquid, and the display indicates this level in the units of milligrams per cubic meter (mg/m³), based on its factory calibration. The MINIRAM should be operated in a vertical position and away from reflecting surfaces.

The MINIRAM comes with a sun shield accessory that protects the sensing elements from excessive ambient light fluctuations. The sun shield is used for outdoor use and under fluctuating bright light illumination. However, it is advisable to use the sun shield at all times.

B. Calibration

Calibration is achieved in the field using a Z-Bag™ Calibrator which will provide a clean-air environment inside a plastic bag into which the MINIRAM is placed for zeroing. The Z-Bag kit consists of a one-way flow rubber bulb for manual air pumping, a filter cartridge, a zippered plastic container, and connecting hardware.

Prior to calibration, ensure that the MINIRAM is clean before placing into Z-Bag. Do not expose Z-Bag to sub-zero freezing temperatures as the plastic zippered bag may crack.

The calibration procedure is as follows:

1. Place Z-Bag on flat surface with red flow fitting facing up. Flatten bag. Remove small plastic cap from flow fitting on bag.
2. Connect rubber bulb/filter assembly to red flow fitting of plastic bag, until flush with bottom of fitting.
3. MINIRAM should be in its OFF condition (check display). If display is blanked, or if MINIRAM is in another mode, press OFF.
4. Open Z-Bag and place MINIRAM inside at the center. Press ZERO* and immediately zip closed the bag and begin pumping the rubber bulb/filter assembly.
5. Inflate Z-Bag up to a height of about five inches, then maintain the bag pressure until the MINIRAM displays OFF again.
6. Record background reading displayed while zeroing, on calibration form.
7. Unzip Z-Bag and remove MINIRAM. Place rubber bulb/filter assembly inside Z-Bag, and plug small plastic cap into flow fitting to close it. Zip close while flattening Z-Bag to ensure cleanliness of the bag interior.
8. MINIRAM is ready for use.

The "zero value" is the background level and is automatically subtracted from all aerosol concentrations readings during the measurement mode. Therefore, the displayed readings depend only on the actual dust concentration present within the sensing chamber. It will increase somewhat as the chamber inner walls and windows become contaminated with dust. A zero value greater than 3 mg/m² indicates excessive chamber contamination. For cleaning instructions, refer to manufacturer's operating manual.

C. Use and Applications

To use the MINIRAM, remove it from the case and observe the display. If the display is blank the MINIRAM is in the minimum power mode. An "OFF" display means that it has been in the off mode for less than 48 hours.

Depending on the mode of interest, refer to the subsections below for a brief explanation of the use and applications.

1. Measure (MEAS) Mode

With a blank display mode press OFF and wait until the display reads "OFF" (approximately 5 seconds), before pressing MEAS to initiate measurement cycle. - If the MINIRAM shows "OFF", press MEAS directly to initiate measurement cycle.

The first readout displayed is "GO" (or "CGO" if TIME is also pressed), followed by the last concentration reading or ".00". Approximately 36 seconds after pressing MEAS the first new 10 second averaged concentration reading is displayed. All subsequent readings are concentration values in milligrams per cubic meter, updated every 10 seconds. The MINIRAM will run in this mode for 500 minutes after which it will stop and display the OFF reading (retaining in storage the concentration average and elapsed time information).

Once the measurement cycle has started, the only way it will be stopped is by pressing OFF. The MINIRAM normally operates in the .00 to 9.99 mg/m³ range but whenever a 10-second concentration exceeds 9.99 mg/m³ it will automatically switch to a .0 to 99.9 mg/m³ range and remain there until the concentration drops to the lower range.

If both MEAS and TIME are pressed at the same moment (TIME then MEAS) the MINIRAM will display "CGO" (for Continuous Go) which will cause the instrument to measure continuously in 500 minute intervals. It will run continuously until OFF is engaged or the batteries are exhausted at which time "OFF" will be displayed. Concentration averages and timing information for the last seven 500 minutes intervals will remain in storage.

2. Time-Weighted Average (TWA) Mode

During the measurement mode, if TWA is pressed the display will indicate the average concentration in mg/m³ up to that instant, from the start of the last run. The value of TWA is updated every 10 seconds. After releasing the TWA key the MINIRAM display returns to the 10-second concentration display.

3. Shift-Average (SA) Mode

During the measurement mode, if SA is pressed the display will provide the aerosol concentration up to that moment, averaged over an 8-hour shift period. This concentration corresponds to the exposure from the start of the measurement cycle and is updated every 10 seconds. After releasing the SA key the MINIRAM display returns to the 10-second concentration display.

4. Play Back (PBK) Mode

With the MINIRAM in the off mode, the stored information can be played back by pressing PBK for more than 1 second. The information will be played back in the following order:

- ID number
- Shift or run number
- Sampling time in minutes
- Off-time between the last and next run (in tens of minutes)

- Average in mg/m³

This sequence is repeated seven times; an average reading of 9.99 mg/m³ indicates that a significant overload condition occurred during that run. It will take approximately 70 seconds to run through this program.

5. ID Number Selection

In order to change the MINIRAM identification number, press the OFF key then the ID# key and the presently stored number (between 1 and 999) will be displayed. To raise the number press the up arrow key, and to lower the number press the down arrow key. Pressing the OFF key after this selection will lock-in that number.

D. Maintenance

After each use, the MINIRAM should be wiped clean with a soft cloth and connected to charger. The MINIRAM requires a minimum 8 hour charge for daily operation. When not in use it should be stored in the accompanying case to avoid particulate build up in the sensing chamber.

When the zero value exceeds 3 Mg/M3, the sensing chamber may need to be cleaned following the instructions provided in the manufacturer's operating manual.

VI. Quality Assurance Records

Quality assurance records will be maintained for each air monitoring event. The following information shall be recorded in the Field Logbook.

- Identification - Site name, date, location, CTO number, activity monitored (monitoring --well installation, etc.), serial number, time, resulting concentration, comments and identity of air monitoring personnel.
- Field observations - Appearance of sampled media (if definable).
- Additional remarks (e.g., the MINIRAM experienced a wide range of fluctuations).

VII. References

Monitoring Instruments for the Environment (MIE), INC., MINIRAM Personal Monitor

Model PDM-3 Operations Manual. March 1990.

Decontamination of Personnel and Equipment

I. Purpose

To provide general guidelines for the decontamination of personnel, sampling equipment, and monitoring equipment used in potentially contaminated environments.

II. Scope

This is a general description of decontamination procedures.

III. Equipment and Materials

- Demonstrated analyte-free, deionized ("DI") water (specifically, ASTM Type II water)
- Distilled water
- Potable water; must be from a municipal water supplier, otherwise an analysis must be run for appropriate volatile and semivolatile organic compounds and inorganic chemicals (e.g., Target Compound List and Target Analyte List chemicals)
- 2.5% (W/W) trisodium phosphate ("TSP") and water solution
- Concentrated (V/V) pesticide grade methanol (DO NOT USE ACETONE)
- 10% (V/V) nitric acid (HNO_3) and water solution (only ultrapure grade HNO_3 is to be used)
- Large plastic pails or tubs for TSP and water, scrub brushes, squirt bottles for TSP, methanol and water, plastic bags and sheets
- DOT approved 55-gallon drum for disposal of waste
- Phthalate-free gloves
- Decontamination pad and steam cleaner/high pressure cleaner for large equipment

IV. Procedures and Guidelines

A. PERSONNEL DECONTAMINATION

To be performed after completion of tasks whenever potential for contamination exists, and upon leaving the exclusion zone.

1. Wash boots in TSP solution, then rinse with water. If disposable latex booties are worn over boots in the work area, rinse with TSP solution, remove, and discard into DOT approved 55-gallon drum.
2. Wash outer gloves in TSP solution, rinse, remove, and discard into DOT approved 55-gallon drum.
3. Remove disposable coveralls ("Tyveks") and discard into approved 55-gallon drum.
4. Remove respirator (if worn).
5. Remove inner gloves and discard.
6. At the end of the work day, shower entire body, including hair, either at the work site or at home.
7. Sanitize respirator if worn.

B. SAMPLING EQUIPMENT DECONTAMINATION—GROUNDWATER SAMPLING PUMPS

Sampling pumps are decontaminated after each use as follows.

1. Don phthalate-free gloves.
2. Spread plastic on the ground to keep hoses from touching the ground
3. Turn off pump after sampling. Remove pump from well and place pump in decontamination tube, making sure that tubing does not touch the ground
4. Turn pump back on and pump 1 gallon of TSP solution through the sampling pump.
5. Rinse with 1 gallon of 10% methanol solution pumped through the pump. (DO NOT USE ACETONE).
6. Rinse with 10% HNO₃ solution pumped through the pump, when sampling for inorganics (carbon steel split spoons will be rinsed with a 1% solution).
7. Rinse with 1 gallon of tap water.
8. Rinse with 1 gallon of deionized water.
9. Keep decontaminated pump in decontamination tube or remove and wrap in aluminum foil or clean plastic sheeting.

10. Collect all rinsate and dispose of in a DOT approved 55-gallon drum.

C. SAMPLING EQUIPMENT DECONTAMINATION—OTHER EQUIPMENT

Reusable sampling equipment is decontaminated after each use as follows.

1. Don phthalate-free gloves.
2. Prior to entering the potentially contaminated zone, wrap soil contact points in aluminum foil (shiny side out).
3. Rinse and scrub with potable water.
4. Wash all equipment surfaces that contacted the potentially contaminated soil/water with TSP solution.
5. Rinse with potable water.
6. Rinse with 10% HNO₃ solution when sampling for inorganics (carbon steel split spoons will be rinsed with a 1% solution).
7. Rinse with distilled or potable water and methanol solution (DO NOT USE ACETONE).
8. Air dry.
9. Rinse with deionized water.
10. Completely air dry and wrap exposed areas with aluminum foil (shiny side out) for transport and handling if equipment will not be used immediately.
11. Collect all rinsate and dispose of in a DOT approved 55-gallon drum.

D. HEALTH AND SAFETY MONITORING EQUIPMENT DECONTAMINATION

1. Before use, wrap soil contact points in plastic to reduce need for subsequent cleaning.
2. Wipe all surfaces that had possible contact with contaminated materials with a paper towel wet with TSP solution, then a towel wet with methanol solution, and finally three times with a towel wet with distilled water. Dispose of all used paper towels in a DOT approved 55-gallon drum.

E. SAMPLE CONTAINER DECONTAMINATION

The outsides of sample bottles or containers filled in the field may need to be decontaminated before being packed for shipment or handled by personnel without hand protection. The procedure is:

1. Wipe container with a paper towel dampened with TSP solution or immerse in the solution AFTER THE CONTAINERS HAVE BEEN

SEALED. Repeat the above steps using potable water.

2. Dispose of all used paper towels in a DOT approved 55-gallon drum.

F. HEAVY EQUIPMENT AND TOOLS

Heavy equipment such as drilling rigs, drilling rods/tools, and the backhoe will be decontaminated upon arrival at the site and between locations as follows:

1. Set up a decontamination pad in area designated by the Navy
2. Steam clean heavy equipment until no visible signs of dirt are observed. This may require wire or stiff brushes to dislodge dirt from some areas.

V. Attachments

None.

VI. Key Checks and Items

- Clean with solutions of TSP, methanol, nitric acid, and distilled water.
- Do not use acetone for decontamination.
- Drum all contaminated rinsate and materials.
- Decontaminate filled sample bottles before relinquishing them to anyone.

Equipment Blank and Field Blank Preparation

I. Purpose

To prepare blanks to determine whether decontamination procedures are adequate and whether any cross-contamination is occurring during sampling due to contaminated air and dust.

II. Scope

The general protocols for preparing the blanks are outlined. The actual equipment to be rinsed will depend on the requirements of the specific sampling procedure.

III. Equipment and Materials

- Blank liquid (use ASTM Type II grade water)
- Millipore™ deionized water
- Sample bottles as appropriate
- Gloves
- Preservatives as appropriate

IV. Procedures and Guidelines

- A. Decontaminate all sampling equipment that has come in contact with sample according to SOP Decontamination of Personnel and Equipment.
- B. To collect an equipment blank for volatile analysis from the surfaces of sampling equipment other than pumps, pour blank water over one piece of equipment and into two 40-ml vials until there is a positive meniscus, then seal the vials. Note the sample number and associated piece of equipment in the field notebook as well as the type and lot number of the water used.

For non-volatiles analyses, one aliquot is to be used for equipment. For example, if a pan and trowel are used, place trowel in pan and pour blank fluid in pan such that pan and trowel surfaces which contacted the sample are contacted by the blank fluid. Pour blank fluid from pan into appropriate sample bottles.

Do not let the blank fluid come in contact with any equipment that has not been decontaminated.

- C. When collecting an equipment blank from a pump, run an extra gallon of deionized water through the pump while collecting the pump outflow into appropriate containers. Make sure the flow rate is low when sampling VOCs. If a Grundfos Redi-Flo2 pump with disposable tubing is used, remove the disposable tubing after sampling but before decon. When decon is complete, put a 3 to 5 foot segment of new tubing onto the pump to collect the equipment blank.
- D. To collect a field blank, slowly pour ASTM Type II water directly into sample containers.
- E. Document and ship samples in accordance with the procedures for other samples.
- F. Collect next field sample.

V. Attachments

None.

VI. Key Checks and Items

- Wear gloves.
- Do not use any non-decontaminated equipment to prepare blank.
- Use ASTM-Type II grade water.

Packaging and Shipping Procedures

I. Low-Concentration Samples

- A. Prepare coolers for shipment:
 - Tape drains shut.
 - Affix "This Side Up" labels on all four sides and "Fragile" labels on at least two sides of each cooler.
 - Place mailing label with laboratory address on top of coolers.
 - Fill bottom of coolers with about 3 inches of vermiculite.
- B. Arrange decontaminated sample containers in groups by sample number. Consolidate VOC samples into one cooler to minimize the need for trip blanks.
- C. Affix appropriate adhesive sample labels to each container. Protect with clear label protection tape.
- D. Seal each sample bottle within a separate ziplock plastic bag or bubble wrap, if available. Tape the bag around bottle. Sample label should be visible through the bag.
- E. Arrange sample bottles in coolers so that they do not touch.
- F. If ice is required to preserve the samples, cubes should be repackaged in zip-lock bags and placed on and around the containers.
- G. Fill remaining spaces with vermiculite.
- H. Complete and sign chain-of-custody form (or obtain signature) and indicate the time and date it was relinquished to Federal Express or the courier.
- I. Separate copies of forms. Seal proper copies (traffic reports, packing lists) along with a return address label within a large zip-lock bag and tape to inside lid of cooler.
- J. Close lid and latch.
- K. Carefully peel custody seals from backings and place intact over lid openings (right front and left back). Cover seals with clear protection tape.
- L. Tape cooler shut on both ends, making several complete revolutions with strapping tape. **Do not** cover custody seals.

- M. Relinquish to Federal Express or to a courier arranged with the laboratory. Place airbill receipt inside the mailing envelope and send to the sample documentation coordinator along with the other documentation.

II. Medium- and High-Concentration Samples:

Medium- and high-concentration samples are packaged using the same techniques used to package low-concentration samples, with several additional restrictions. First, a special airbill including a Shipper's Certification for Restricted Articles is required. Second, "Flammable Liquid N.O.S." or "Flammable Solid N.O.S." (as appropriate) labels must be placed on at least two sides of the cooler. Third, sample containers are packaged in metal cans with lids before being placed in the cooler, as indicated below:

- Place approximately ½ inch of vermiculite in the bottom of the can.
- Position the sample jar in the zip-loc bag so that the sample tags can be read through the plastic bag.
- Place the jar in the can and fill the remaining volume with vermiculite.
- Close the can and secure the lid with metal clips.
- Write the traffic report number on the lid.
- Place "This Side Up" and "Flammable Liquid N.O.S." or "Flammable Solid N.O.S." (as appropriate) labels on the can.
- Place the cans in the cooler.
- For medium concentration samples, ship samples with ice or "blue ice" inside the coolers. (Double bag ice in zip-lock plastic bags.)

III. Special Instructions for Shipping Medium and High Concentration Samples by Federal Express

- A. Label cooler as hazardous shipment:
- Write shipper's address on outside of cooler. If address is stenciled on, just write "shipper" above it.
 - Write or affix sticker saying "This Side Up" on two adjacent sides.
 - Write or affix sticker saying "ORM-E" with box around it on two adjacent sides. Below ORM-E, write NA#9188.
 - Label cooler with "Hazardous Substance, N.O.S." and "liquid" or "solid," as applicable.

- B. Complete the special shipping bill for restricted articles.
- Under Proper Shipping Name, write "Hazardous Substance, N.O.S." and "liquid" or "solid," as applicable.
 - Under Class, write "ORM-E."
 - "Under Identification No., write NA No. 9188.
- C. For high concentration samples, ship samples with "blue ice" only inside coolers.

**Addendum to the Quality
Assurance Project Plan
for Confirmation Sampling
for Site 15 Soil Remediation**

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Addendum to the Quality Assurance Project Plan

1. Introduction

This Quality Assurance Project Plan (QAPP) Addendum updates the original QAPP of June 1992. The Addendum focuses on the confirmatory soil sampling activities at SWMU 15, Naval Air Station (NAS) Oceana, Virginia Beach, Virginia. Confirmatory soil sampling activities will follow the original QAPP except where amended below.

When the June 1992 Work Plan was approved, the Naval Energy and Environmental Support Activity guidance document (NEESA 20.2-047B) was being used. A new interim guidance document by the Naval Facilities Engineering Service Center (NFESC) is now in effect. All field sampling and laboratory analyses will be conducted in accordance with the *Navy Installation Restoration Laboratory Quality Assurance Guide*, February 1996.

2. Project Description

A discussion of tasks associated with SWMU 15 confirmatory soil sampling is documented in the Work Plan.

3. Project Organization

Mr. Jack Robinson will serve as the activity manager and the primary contact at CH2M HILL. Mr. Robinson will assume primary responsibility for ensuring that the work is performed in a manner that is acceptable to LANTDIV. As project manager, Mr. Jack Robinson will also be responsible for such activities as budget and schedule review and tracking, preparation and review of invoices, personnel resources planning and allocation, and coordination with LANTDIV, the Naval Base, and subcontractors. Mr. Doug Dronfield will provide senior review.

The confirmatory soil sampling field tasks will be performed by the CH2M HILL supporting field personnel. CH2M HILL will notify LANTDIV and the NAS Oceana as to which CH2M HILL personnel will mobilize to the site prior to initiating field activities. A field task manager will be assigned to lead all field activities. This person will be responsible for assuring that the Field Sampling Plan (FSP), as amended, is being followed, maintaining the field log book, monitoring the site for all releases, and other activities. The field staff will be responsible for collecting the samples, supervising subcontractors, completing sample paperwork, shipping samples, and the like.

4. Quality Assurance Objectives

Data Quality Objectives (DQOs) will be established for each major sample collection effort as specified in the *Data Quality Objectives for Remedial Response Activities*, March 1987. DQOs are the quantitative and qualitative descriptions of the quality of data required to support an environmental decision or action.

The DQOs for Phase III activities are to confirm and support Phase I and Phase II information. So that new data collected can be compared with previously-collected data, analysis methods, detection limits, and quality control procedures will be matched to the earlier efforts.

The documents and amendments of the Work Plan (QAPP, FSP, DMP, and HSP) contain the plans and procedures for safe, competent sampling and for effective management of the data. Each laboratory providing analytical data for the additional characterization has developed its own Laboratory Quality Assurance Plan (LQAP). The LQAP must address the elements of the Navy QA Program as stated in the NFESC guidance document.

5. Sample Collection Procedures

A detailed description of sampling procedures is provided in the original FSP, the addendum of the FSP, and Attachment 1 of the FSP addendum (the SOPs).

6. Sample Custody

This information is contained in the original project plans.

7. Field Equipment Calibration

The field equipment to be used during this investigation that will require calibration includes:

- OVM

The OVM will be calibrated before and during each day's use according to procedures and schedules outlined in the Health and Safety Plan (HSP) and in the SOPs of the FSP. The standards, which will be used to calibrate these instruments, are shown in Table 7-1. Standards will be purchased as necessary from appropriate vendors.

Instrument	Calibration Standard	Span	Reading	Method
OVM	100 ppm isobutylene	RF = 0.55	100 ppm	1.5 l/m regulator T-tubing

If an individual suspects an equipment malfunction, the device shall be removed from service and tagged so that it is not inadvertently used, and the equipment manager notified so that a substitute piece of equipment can be used. Backup equipment will be available in the field for use in the event of a malfunction.

Equipment that fails calibration or becomes inoperable during use shall be removed from service and tagged so that it is not inadvertently used. Such equipment shall be repaired and satisfactorily recalibrated. Equipment that cannot be repaired will be replaced.

Results of activities performed using equipment that has failed recalibration shall be evaluated. If the results are adversely affected, the outcome of the evaluation will be documented and the task manager will be notified.

8. Analytical Procedures

All laboratory analyses will be performed by a Navy-approved laboratory. The laboratories will be procured using the Basic Ordering Agreements (BOAs). Laboratory methods to be used for the project are listed in Table 8-1. Methods will be the same as those used in the Phase II work. The highest level of documentation will be required.

Analysis	Methodology
BTEX	SW-846 Method 8021
PAHs	SW-846 Method 8310
TPH	SW-846 Method 8015

9. Data Reduction, Validation, and Record Keeping

Data reduction, validation, and record keeping are documented in the June 1992 QAPP and in the amendment to the Data Management Plan.

Data validation services will be procured using a BOA subcontractor. The highest level of data validation will be required; raw data including spectra and chromatograms will be provided by the laboratory for full validation.

**Table 8-2
Chemical Parameters and Quantitation Limits
SWMU 15, Naval Air Station, Oceana**

Chemical	Aqueous Quantitation Limit	Units	Soil Quantitation Limit	Units
Volatile Organic Compounds and BTEX (Method 8260)				
Chlorofluorobenzene	1	µg/kg	1	µg/L
Bromodichloromethane	1	µg/kg	1	µg/L
Bromobenzene	1	µg/kg	1	µg/L
Bromochloromethane	1	µg/kg	2	µg/L
Bromomethane	2	µg/kg	1	µg/L
n-Butylbenzene	1	µg/kg	1	µg/L
sec-Butylbenzene	1	µg/kg	1	µg/L
tert-Butylbenzene	1	µg/kg	1	µg/L
Benzene	1	µg/kg	1	µg/L
Toluene	1	µg/kg	1	µg/L
Chlorobenzene	1	µg/kg	1	µg/L
2-Chlorotoluene	1	µg/kg	1	µg/L
4-Chlorotoluene	1	µg/kg	1	µg/L
Chloroethane	2	µg/kg	2	µg/L
Chloromethane	2	µg/kg	1	µg/L
Carbon tetrachloride	1	µg/kg	1	µg/L
p-Isopropyltoluene	1	µg/kg	1	µg/L
Dibromochloromethane	1	µg/kg	5	µg/L
1,2-Dibromo-3-chloropropane	1	µg/kg	1	µg/L
Dibromomethane	1	µg/kg	1	µg/L
1,1-Dichloroethane	1	µg/kg	1	µg/L
1,2-Dichloroethane	1	µg/kg	1	µg/L
1,2-Dichlorobenzene	1	µg/kg	1	µg/L
1,3-Dichlorobenzene	1	µg/kg	1	µg/L

Volatile Organic Compounds and BTEX (Method 8260) cont.				
Chemical	Aqueous Quantitation Limit	Units	Soil Quantitation Limit	Units
1,4-Dichlorobenzene	1	µg/kg	1	µg/L
1,1-Dichloroethene	2	µg/kg	1	µg/L
cis-1,2-Dichloroethene	1	µg/kg	1	µg/L
trans-1,2-Dichloroethene	1	µg/kg	1	µg/L
1,1-Dichloropropene	1	µg/kg	1	µg/L
cis-1,3-Dichloropropene	1	µg/kg	1	µg/L
trans-1,3-Dichloropropene	1	µg/kg	1	µg/L
1,2-Dichloropropane	1	µg/kg	1	µg/L
1,3-Dichloropropane	1	µg/kg	1	µg/L
2,2-Dichloropropane	1	µg/kg	1	µg/L
Ethylbenzene	1	µg/kg	1	µg/L
1,2-Dibromoethane	1	µg/kg	1	µg/L
Trichlorofluoromethane	1	µg/kg	5	µg/L
Dichlorodifluoromethane	5	µg/kg	1	µg/L
Hexachlorobutadiene	1	µg/kg	1	µg/L
Isopropylbenzene	1	µg/kg	1	µg/L
Methylene chloride	1	µg/kg	1	µg/L
Naphthalene	1	µg/kg	1	µg/L
n-Propylbenzene	1	µg/kg	1	µg/L
1,1,2,2-Tetrachloroethane	1	µg/kg	1	µg/L
Tetrachloroethene	1	µg/kg	1	µg/L
Styrene	1	µg/kg	1	µg/L
Bromoform	1	µg/kg	1	µg/L
1,1,1,2-Tetrachloroethane	1	µg/kg	1	µg/L
1,1,1-Trichloroethane	1	µg/kg	1	µg/L
1,1,2-Trichloroethane	1	µg/kg	1	µg/L

Volatile Organic Compounds and BTEX (Method 8260) cont.				
Chemical	Aqueous Quantitation Limit	Units	Soil Quantitation Limit	Units
1,2,3-Trichlorobenzene	1	µg/kg	1	µg/L
1,2,4-Trichlorobenzene	1	µg/kg	1	µg/L
Trichloroethene	1	µg/kg	1	µg/L
Chloroform	1	µg/kg	1	µg/L
1,2,3-Trichloropropane	1	µg/kg	1	µg/L
1,2,4-Trimethylbenzene	1	µg/kg	1	µg/L
1,3,5-Trimethylbenzene	1	µg/kg	2	µg/L
Vinyl chloride	2	µg/kg	3	µg/L
Xylene (all isomers)	3	µg/kg	2	µg/L
m,p-Xylene	2	µg/kg	1	µg/L
o-Xylene	1	µg/kg		µg/L
Polynuclear Aromatic Hydrocarbons (PAHs) Method 8310				
Chemical	Aqueous Quantitation Limit	Units	Soil Quantitation Limit	Units
Acenaphthene	67	µg/kg	1	µg/L
Acenaphthylene	67	µg/kg	1	µg/L
Anthracene	3.3	µg/kg	1	µg/L
Benzo (a) anthracene	3.3	µg/kg	0.1	µg/L
Benzo (a) pyrene	3.3	µg/kg	0.1	µg/L
Benzo (b) fluoranthene	3.3	µg/kg	0.1	µg/L
Benzo (ghi) perylene	3.3	µg/kg	0.1	µg/L
Benzo (k) fluoranthene	3.3	µg/kg	0.05	µg/L
Chrysene	3.3	µg/kg	0.1	µg/L
Dibenzo (a,h) anthracene	6.7	µg/kg	0.1	µg/L
Fluoranthene	3.3	µg/kg	0.1	µg/L
Fluorene	3.3	µg/kg	1	µg/L
Indeno (1,2,3-cd) pyrene	6.7	µg/kg	0.1	µg/L

Polynuclear Aromatic Hydrocarbons (PAHs) Method 8310 cont.				
Chemical	Aqueous Quantitation Limit	Units	Soil Quantitation Limit	Units
Naphthalene	3.3	µg/kg	1	µg/L
Phenanthrene	6.7	µg/kg	1	µg/L
Pyrene	3.3	µg/kg	0.1	µg/L

10. Quality Control Checks

A number of QA/QC samples will be collected to check the adequacy of sample collection and analysis and to monitor laboratory performance. Duplicates, blanks, and spiked samples are used to determine if the sampling technique affects the analytical results, to measure the internal consistency of the samples, and to estimate any variance or bias in the analytical process. The field and laboratory QA/QC sampling procedures are described below.

Field Sampling Quality Control Procedures

Quality control (QC) duplicate samples and blanks are used to provide a measure of the internal consistency of the samples and an estimate of variance and bias. The QC samples will be collected at the same frequency as described in the June 1992 QAPP. A temperature blank will also be sent to the lab, one per cooler, to allow the lab to determine the temperature of the samples upon receipt without disturbing field samples. It consists of reagent water in a single VOA vial. Table 10-1 shows the samples to be collected in each media with their associated QC samples.

SWMU	Soil	Solid medium					
		VOCs	PAHs	TPH	VOCs	PAHs	TPH
15							
Field Total	132	44	44	44	0	0	0
Duplicates	18	5	5	5	1	1	1
Equip. blank	9				3	3	3
Field blank	3				1	1	1
Trip blank	3				3	0	0
MS/MSD	9	3	3	3			
Total Samples	165	49	49	49	8	5	5

Notes:
 Duplicate samples collected at one duplicate per ten samples
 Equipment blanks collected at one per day per matrix
 Field Blank collected one per event per matrix
 Trip blank shipped with volatiles
 Matrix spike/matrix spike duplicate (MS/MSD) samples collected one per 20 samples

Laboratory Analytical Quality Control Procedures

The analytical laboratory will use the quality control elements including matrix spikes, matrix spike duplicates, and laboratory blanks as specified in the *Navy Installation Restoration Laboratory Quality Assurance Guide, Interim Guidance Document*, February, 1996.

11. Performance and Systems Audits

Performance and systems audit procedures are documented in the June 1992 QAPP.

12. Preventive Maintenance

Routine maintenance procedures and schedules for sampling equipment are described in the manufacturer's instruction manuals. All records of inspection and maintenance will be dated and documented in the field notebook.

Maintenance procedures and schedules for all field and laboratory analytical instruments will follow the recommendations of the equipment manufacturers. Routine laboratory equipment maintenance will be performed by laboratory personnel as needed or as indicated in the LQAP. All records of inspection and maintenance will be dated and documented in laboratory record books.

13. Data Assessment Procedures

The precision and accuracy of data will be routinely assessed to ensure that they meet the requirements of the DQOs.

All data will be validated by a subcontractor before interpretation. The validation will be performed according to *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, February 1994, the *USEPA Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses*, January 1993, the Region III Modifications to the Functional Guidelines, and the SW-846 Methods.

Data validation will be performed by an independent contractor, as it would not be appropriate for CH2M HILL to validate data collected by CH2M HILL staff. Data that should be qualified will be flagged with the appropriate symbol. Results for field and equipment blanks will be reviewed, and the data will be qualified further, if necessary. Finally, the data set as a whole will be examined for consistency, anomalous results, and reasonableness.

14. Corrective Actions

The project manager is responsible for initiating corrective actions. Corrective action steps will include problem identification, investigation responsibility assignment, action to eliminate the problem, increased monitoring of the effectiveness of the corrective action, and verification that the problem has been eliminated.

Examples of corrective actions include, but are not limited to, correcting COC forms, analysis reruns (if holding time criteria permit), recalibration with fresh standards, replacement of sources of blank contamination, examination of calculation procedures, additional training in sample preparation and analysis, reassignment of analytical responsibilities using a different batch of containers, or recommending an audit of laboratory procedures. Additional approaches may include:

- Resampling and analyzing
- Evaluating and amending sampling and analytical procedures
- Accepting the data and acknowledging the level of uncertainty or inaccuracy by flagging the data and providing an explanation for the qualification.

15. Quality Assurance Reports

A QA report will be completed at the end of the field activity to summarize the QA/QC status of the project and any problems. The report will be an assessment of the measured QA parameters (for example, precision and accuracy), results of performance audits, any reported non-conformance, and any significant QA problems and the recommended solutions. Any change in the QAPP will be summarized in a report or letter and sent to LANTDIV and distributed to the CH2M HILL project team.

**Data Management Plan
for Confirmation Sampling
for Site 15 Soil Remediation**

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Data Management Plan

Data management practices for confirmatory soil sampling at SWMU 15, Naval Air Station Oceana, are documented below. Data management includes project documentation, data validation, field data specifications, and analytical data specifications.

Project Documentation

Data from the SWMU 15 soil remediation confirmation sampling will be compiled and summarized in tables. The following information will be included in the tables:

- Sample location number
- Date of each sample
- Parameters measured
- Results of analyses or measurements
- Reporting units

All incoming data and reports will be logged and dated. All information generated from field activities will be documented on appropriate forms, including the following:

- Chain-of-custody record
- Field books
- Location sketches
- Photograph logs
- Telephone conversation logs

Incoming documents will be filed. If distribution is required, the appropriate number of copies will be made and distributed to project personnel. In addition, all notes from project meetings and telephone conversations will be filed along with other project documents.

Laboratory Data Validation

The data validation process consists of a review of the following: laboratory holding times, instrument tuning and calibration, blanks, field duplicates, surrogate recovery, matrix spike/matrix spike duplicates, internal standards performance, system performance, and reported detection limits.

The laboratory responsible for analyzing the samples will send the analytical data to the validation contractor who will validate the analytical data using EPA protocols, (Laboratory Data Validation Functional Guidelines for Evaluating Organics and Inorganics Analyses and U.S. EPA Region III Functional Guideline Modifications), SW-846 methodologies, and data validation procedures reported in Sampling and Analysis Quality Assurance Requirements for the Navy Installation and Restoration Program.

Specifications for Field Location Data

Field station data are information assigned to a physical location in the field at which some sort of sample is collected. For example, a monitoring well that has been installed will require a name that will uniquely identify it with respect to other monitoring wells or other types of sample locations. The station name provides for a key in a database to which any samples collected from that location can be linked to form a relational database structure.

A listing of the location identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all field activities. Each station will be designated by an alphanumeric code that will identify the station's location by facility, site type, site number, station type, and sequential station number. The schema that will be used to identify field station data is documented in Table 1.

Specifications for Analytical Data

Analytical data will be generated through sampling of various media at NAS Oceana. Each analytical sample collected in the field will be assigned a unique sample identifier. The schema used as a guide for labeling analytical samples in the field is documented below. The format that will be used for electronic deliverables from the analytical laboratory and the data validator is also documented below.

Sample Identification Schema

A standardized numbering system will be used to identify all samples collected during water, soil, and sediment sampling activities. The numbering system will provide a tracking procedure to ensure accurate data retrieval of all samples taken. A listing of the sample identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all sampling activities. Sample identification for all samples collected during the investigations will use the following format.

Each sample will be designated by an alphanumeric code that will identify the facility, site, and matrix sampled and contain a sequential sample number. QA/QC samples will have a unique sample designation. The general guide for sample identification is documented in Table 2. If one qualifier is pertinent to the sample ID but another is not, only the applicable qualifiers will be used. A non-utilized character space does not have to be maintained.

Electronic Deliverable File Format

An offsite analytical laboratory will analyze the RFI samples and tabulate results in an electronic format specified by CH2M HILL. The data validator will add data validation qualifiers to the table of analytical results. In addition to hard copy data package deliverable, CH2M HILL will receive an electronic file from the data validator in a table format that will facilitate downloading into a database. The format that will be used for electronic deliverables from the analytical laboratory and the data validator is tabulated in Table 3.

Table 1 Field Station Schema		
First Segment	Second Segment	
Facility, Station Type, Site Number	Station Type	Station Number, Qualifier
AANN	AA	NNNA
Notes: "A" = alphabetic "N" = numeric		
<u>Facility:</u> O = NAS Oceana <u>Station Type:</u> W = SWMU S = Site O = Operable Unit U = UST <u>SWMU Number:</u> 15 - Abandoned Tank Farm	<u>Station Type:</u> DS = Direct Push—Soil DW = Direct Push—Water DG = Direct Push—Soil Gas GB = Geotechnical Boring GG = Geophysical Grid Node MW = Monitoring Well PW = Purge Well PZ = Piezometer RW = Residential Well SB = Soil Boring SD = Sediment Sample Location SS = Surface Soil Sample Location SW = Surface Water Sample Location TS = Tissue Sample <u>Station Number:</u> Sequential Station Number <u>Qualifier:</u> S = Shallow D = Deep K = Background	

**Table 2
Sample Designation Schema**

First Segment	Second Segment		Third Segment
Facility, Station, and Site Number	Sample Type	Sample Location + Sample Qualifier	Additional Qualifiers (sample depth, sampling round, etc.)
AANN	AA	NNNA or NNAA	ANN or NNNN

Notes: "A"= alphabetic "N"= numeric

<u>Facility:</u>	<u>Sample Type:</u>	<u>Additional Qualifiers:</u>
O = NAS Oceana	DS = Direct Push - Soil Sample	1. Monitoring Well Groundwater Sample (refers to sampling round for that well): R01 - Round 1 R02 - Round 2 R03 - Round 3 2. Direct Push Subsurface Sample (refers to depth of sample): Enter depth of top of sample interval 3. QC Samples NNNN - refers to day and year of sampling event
<u>Station Type:</u>	DW = Direct Push - Water Sample	
W = SWMU	DG = Direct Push - SoilGas Sample	
S = Site	GB = Geotechnical Boring Sample	
O = Operable Unit	MW = Monitoring Well Sample	
U = UST	PW = Purge Well	
<u>Site Number:</u>	PZ = Piezometer Sample	
15 = Abandoned Tank Farm	RW = Residential Well Sample	
	SB = Soil Boring Sample	
	SD = Sediment Sample	
	SS = Surface Soil Sample	
	SW = Surface Water Sample	
	TB = Trip Blank	
	EB = Equipment Blank	
	FB = Field Blank	
	WS = Waste Soil	
	WW = Waste Water	
	<u>Sample Location:</u>	
	1. Station Samples (NNA)	
	<u>NNA</u> - refers to sequential station number	
	<u>NNA</u> - letter qualifier for Deep, Shallow, or Composite, sample (if applicable).	
	2. QC Samples (NNN)	
	<u>NNN</u> - numbered sequentially for each type of blank (i.e., 1, 2, etc.) collected for that day's sampling	
	<u>NNN</u> - refers to month of sampling event	
	<u>Sample Qualifiers:</u>	
	F = filtered sample	
	P = duplicate sample	
	K = background sample	

Table 3
Analytical Data Electronic Deliverable

Field Name	Field Type	Description
Sample_ID	A	The CH2M HILL sample ID (taken from the Chain-of-Custody)
Sample_Analysis	A	The method code
Date_Analyzed	D	The date the sample was analyzed.
Date_Received	D	The date the sample was received in the lab.
Lab_Sample_ID	A	The lab sample ID
Dilution_Factor	N	The dilution factor used, if applicable.
SDG_Number	A	The Sample Delivery Group number
CAS_Number	A6-A2-A1	CAS Number (Note dashes)
Chem_Name	A	The compound being analyzed
Ana_Value	N	The analytical result
Std_Qual	A	The lab qualifiers, if any (e.g., U, UJ, B)
DV_Qual	A	Leave blank; used for data validation
Units	A	The unit of the result (e.g., mg/l)
Detect_Limit	N	The detection limit for the compound
Method	A	Analytical method used to analyze the sample fraction
Note: CAS = chemical abstract service SDG = sample delivery group		

**Final
Health and Safety Plan**

**SWMU 15 Confirmatory Sampling
SWMU 24 In-Well Aeration Remediation
SWMUs 1 & 15 Long-Term Monitoring**

**Oceana Naval Air Station
Virginia Beach, Virginia**

September 22, 1998

Prepared for:
**Department of the Navy
Atlantic Division
Naval Facilities Engineering Command**

Under the
**LANTDIV CLEAN II Program
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Prepared by



Herndon, Virginia

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CH2M HILL HEALTH AND SAFETY PLAN

(Reference CH2M HILL SOP 19, *Health and Safety Plans*)

This health and safety plan will be kept on the site during field activities and will be reviewed and updated as necessary. The plan adopts, by reference, the standards of practice (SOP) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, and CH2M HILL's *Site safety Notebook* as appropriate. The site safety coordinator (SSC) is to be familiar with these SOPs and the content of this plan. Site personnel must sign Attachment 1. In addition, this plan adopts procedures in the work plan for the project.

1 PROJECT INFORMATION AND DESCRIPTION

CLIENT OR OWNER: Department of the Navy
Atlantic Division

PROJECT NOS: 138763.LT.WS,
142741.FI.FI

CH2M HILL PROJECT MANAGER: Jack Robinson

OFFICE: WDC

SITE NAME: Oceana Naval Air Station

SITE ADDRESS: Oceana Boulevard
Virginia Beach, Virginia

DATE HEALTH AND SAFETY PLAN PREPARED: September 1998

DATE(S) OF INITIAL VISIT: 1986

DATE(S) OF SITE WORK: November 1998 through November 1999

SITE ACCESS: The site is accessed through a secured gate located on Oceana Boulevard.

SITE SIZE: The site is comprised of approximately 5,000 acres of land fronting on the Chesapeake Bay in Virginia Beach, Virginia.

SITE TOPOGRAPHY: The topography at the Oceana Naval Air Station is flat. The ground surface elevation ranges from a high of approximately 25 feet above mean sea level (msl) in the eastern portion of the facility to just above msl along the bulkhead adjacent to the Chesapeake Bay.

SITE DESCRIPTION AND HISTORY: Oceana Naval Air Station began as a small auxiliary air field constructed by the U.S. Government on 328 acres of remote, swampy land in November of 1940. The original air station consisted of 2,500 foot long asphalt runways and a workforce of 32 officers and 172 enlisted personnel. In 1943, at the height of the second World War, Congress approved plans to expand the station to accommodate 160 officers and 800 enlisted personnel. Oceana was designated a Naval Air Station in the late 1950's when it became too large to work as a subordinate to other stations in the area. Oceana then became an all weather station, and was eventually designated a Master Jet Base.

Over the years, Oceana has grown to more than 16 times its original size. The base presently encompasses 5,916 acres and supports a naval community of more than 10,200 Navy personnel and some 11,500 dependents. The annual payroll exceeds \$286 million.

The 12 F-14 Tomcat jet-fighter squadrons and the 7 A-6 Intruder medium-attack squadrons assigned to the Atlantic Fleet are based at Oceana. In addition, the station also supports a search and rescue unit and three squadrons for training aircrews and maintenance personnel.

2 PROJECT ORGANIZATION AND TASKS TO BE PERFORMED UNDER THIS PLAN

2.1 PROJECT ORGANIZATION

CLIENT: Mr. Tim Reisch/LANTNAVFACENGCOM Navy Technical Representative

CH2M HILL:

Project Manager: Jack Robinson/CH2M HILL WDC

Lead Hydrogeologist/Field Team Leader: Teresa White/CH2M HILL WDC

Refer to Section 4 for field staff.

CONTRACTORS and SUBCONTRACTORS: Refer to Section 4.2.

2.2 DESCRIPTION OF TASKS (Reference Section 1, "Field Activity Start-up Form," of *Site Safety Notebook*)

Refer to project documents (i.e., work plans) for detailed task information. A health and safety risk analysis has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks in addition to those listed below require an approved amendment to this plan before additional work begins. Refer to Section 10.2 for procedures related to tasks that do not involve hazardous waste operations and emergency response (Hawzoper).

The field investigation at the Oceana Naval Air Station will include monitoring well installation, Geoprobe sampling, and the collections soil, sediment, and groundwater samples at several SWMUs.

2.2.1 HAZWOPER-REGULATED TASKS

- Soil/Sediment Sampling
 - Groundwater Sampling
-
-

2.2.2 NON-HAZWOPER-REGULATED TASKS

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the HSM is required before these tasks are conducted on regulated hazardous waste sites.**

TASK	RESTRICTIVE CONDITIONS
<ul style="list-style-type: none">• Electrical installation• Iron work (installing rebar)• Masonry work• General heavy equipment work (excavation, grading, etc.)• Mechanical installations (equipment, pumps, etc.)• Engineering testing/evaluation• Building construction	Not Approved

3 HAZARD EVALUATION AND CONTROL

3.1 HEAT AND COLD STRESS (Reference CH2M HILL SOP HS-09, *Heat and Cold Stress*)

3.1.1 PREVENTING HEAT STRESS

- Drink 16 ounces of water before beginning work, such as in the morning or after lunch. Disposable (e.g., 4-ounce) cups and water maintained at 50° to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Take regular breaks in a cool, preferably air-conditioned, area. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours. Monitor for signs of heat stress.
- Acclimate to site work conditions by slowly increasing workloads; e.g., do not begin site work with extremely demanding activities.
- Use cooling devices, such as cooling vests, to aid natural body ventilation. The devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- During hot weather, conduct field activities in the early morning or evening if possible.
- Provide adequate shelter to protect personnel against radiant heat (sun, flames, hot metal), which can decrease physical efficiency and increase the probability of heat stress.
- In hot weather, rotate shifts of workers.
- Maintain good hygiene standards by frequently changing clothing and by showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should consult medical personnel.

3.1.2 SYMPTOMS AND TREATMENT OF HEAT STRESS

	Heat Syncope	Heat Rash (<i>miliaria rubra</i> , "prickly heat")	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool—but not cold—water. Call ambulance, and get medical attention immediately!

3.1.3 HEAT-STRESS MONITORING

For field activities part of ongoing site work activities in hot weather, the following procedures should be used to monitor the body's physiological response to heat and to estimate the work-cycle/rest-cycle when workers are performing moderate levels of work. These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high (>50%), or when the workers exhibit symptoms of heat stress.

The heart rate should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 110 beats/minute, or 20 beats/minute above resting pulse.

3.1.4 PREVENTING COLD STRESS

- Be aware of the symptoms of cold-related disorders, and *wear proper clothing for the anticipated fieldwork.*
- Consider monitoring the work conditions and adjusting the work schedule, using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- **Wind-Chill Index.** This measure relates the dry bulb temperature and the wind velocity. It is used only to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index sometimes is limited in its usefulness because the index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it is used only as a guideline to warn workers when they are in a situation that can cause cold-related illnesses. Used in conjunction with the NSC guidelines, the wind-chill index provides a starting point for adjusting work and warm-up schedules.
- **NSC Guidelines for Work and Warm-Up Schedules.** The cold-exposure limits recommended by the NSC can be used in conjunction with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; *workers should be monitored for symptoms of cold-related illness.* If symptoms are not observed, the work duration can be increased.
- The wind-chill index and the NSC guidelines are in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual, SOP HS-09.*

3.1.5 SYMPTOMS AND TREATMENT OF COLD STRESS

	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Rewarm area quickly in warm—but not hot—water. Have victim drink warm fluids, but not coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but not coffee or alcohol. Get medical attention.

3.2 PROCEDURES FOR LOCATING BURIED UTILITIES

Local Utility Mark-Out Service

Name: Public Works Department - Oceana Naval Air Station
Phone: (757) 433-3105

Name: Miss Utility
Phone: 1-800-257-7777

- Where available, obtain utility diagrams for the facility.
- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural-gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.
- Where necessary, clear locations with a utility-locating instrument (e.g., metal detector).
- Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually.
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon).
- When the client or other onsite party is responsible for determining the presence and locations of buried utilities, the SSC should confirm that arrangement.

3.3 GENERAL PHYSICAL (SAFETY) HAZARDS AND CONTROLS
 Engineering and administrative controls are to be implemented by the party in control of the site or the hazard (i.e., CH2M HILL, subcontractor, or contractor). CH2M HILL employees and subcontractors must, at a minimum, remain aware of hazards affecting them regardless of who is responsible for controlling the hazards. Specialty subcontractors are responsible for the safe operation of their equipment (e.g., drill rig, heavy equipment). CH2M HILL employees are not to operate, or assist in the operation of, any subcontractor or contractor equipment.

Hazard (Refer to SOP, or HSP Section)	Engineering Controls, Administrative Controls, and Work Practices	Groundwater Sampling	Sediment Sampling	Soil Sampling	Monitoring Well Installation	Surveying
Flying debris/objects (HS-07)	Provide shielding and PPE; maintain distance.		X	X	X	
Noise > 85 dBA	Noise protection and monitoring required.				X	
Gas cylinders (HS-21)	Instruct employees in the safe use of compressed gases. Make certain gas cylinders are properly anchored and chained. Keep cylinders away from ignition sources. Cap cylinders when not in use.	X	X	X	X	
Electrical	<ul style="list-style-type: none"> • Make certain third wire is properly grounded. Do not tamper with electrical wiring unless qualified to do so. Ground as appropriate. • Project field sites should have ground fault circuit interrupters (GFCIs) installed for all wiring, including extension cords. • Heavy equipment (e.g., drill rig) should remain at least 15 feet from overhead power line for power lines of 50 kV or less. For each 10 kV > 50, increase distance by ½ foot. • Operate and maintain equipment according to manufacturer's instructions. • Use only extension cords that are three-wire grounded. Cords passing through work areas must be covered or elevated to protect from damage. • Use only electrical tools and equipment that are either effectively grounded or double-insulated UL approved. • Properly label switches, fuses, and circuit breakers. • Remove cord from an outlet by grasping the plug, not pulling the cord. • Protect all electrical equipment, tools, switches, etc., from elements. • Avoid physical contact with power circuit. • Only qualified electricians are to install and work on electrical circuits and equipment. 	X				
Buried utilities, drums, tanks, etc. (Section 3.3)	Locate buried utilities, drums, tanks, etc., before digging or drilling and mark location.			X	X	
Slip, trip, fall hazards (e.g., wet/muddy surface, inadequate railing, unstable surface)	Provide slip-resistant surfaces, ropes, and/or other devices to be used. Brace and shore equipment	X	X	X	X	X
Back injury (HS-29)	Use proper lifting techniques, or provide mechanical lifting aids.	X	X	X	X	
Visible lightning	Stop work.	X	X	X	X	X
Fire prevention and control (HS-22)	<ul style="list-style-type: none"> • No spark sources are allowed within exclusion or decontamination zones. • Appropriate firefighting equipment must be available on the site. • Extinguishers are to be inspected visually every month and undergo an annual maintenance check. • Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations. Keep areas near exits and extinguishers clear. Open flames are prohibited in the vicinity of flammable materials. • Combustible materials stored outside should be at least 10 feet from the building. • Unnecessary combustible materials and flammable or combustible liquids must not be allowed to accumulate. • Flammable or combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet. 	X		X	X	
Inadequate illumination	Site work will be performed during daylight hours whenever possible. Work conducted during hours of darkness will require enough illumination intensity "to read a newspaper without difficulty."	X	X	X	X	X
Entanglement in rotating equipment	<ul style="list-style-type: none"> • Prohibit loose clothing and hair • Prohibit wearing jewelry 				X	

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3.4 BIOLOGICAL HAZARDS AND CONTROLS

Hazard and Location	Control Measures
<p>Snakes typically are found in underbrush and tall grassy areas.</p>	<p>If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. DO NOT apply ice, cut the wound, or apply a tourniquet. Carry the victim or have him/her walk slowly if the victim must be moved. Try to identify the type of snake: note color, size, patterns, and markings.</p>
<p>Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas.</p>	<p>Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.</p>
<p>Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with medical or other potentially infectious material, or when coming into contact with landfill waste or waste streams containing such infectious material.</p>	<p>Training is required before a task involving potential exposure is performed. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, <i>Bloodborne Pathogens</i>. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.</p>
<p>Bees and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic.</p>	<p>Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SSC and/or the buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.</p>
<p>Other Potential Biological Hazards: None anticipated</p>	<p>None required</p>

3.5 TICK BITES (Reference CH2M HILL HS-03, *Tick Bites*)

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size.

Prevention against tick bites includes avoiding tick areas; wearing tightly woven light-colored clothing with long sleeves and wearing pant legs tucked into boots or socks; spraying **only outside** of clothing with insect repellent containing permethrin or permethrin, and spraying skin with DEET; and checking yourself frequently for ticks and showering as soon as possible. To prevent chemical repellents from interfering with sample analyses, exercise care while using repellents during the collection and handling of environmental samples.

If bitten by a tick, carefully remove the tick with tweezers, grasping the tick as close as possible to the point of attachment while being careful not to crush the tick. After removing the tick, wash your hands and disinfect and press the bite area. The removed tick should be saved. Report the bite to human resources personnel.

Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, bone pain may develop. If symptoms appear, seek medical attention.

3.6 RADIOLOGICAL HAZARDS AND CONTROLS

Refer to CH2M HILL's *Corporate Health and Safety Program, Program and Training Manual*, and *Corporate Health and Safety Program, Radiation Protection Program Manual*, for standards of practice for operating in contaminated areas.

Hazards	Controls
None	None

3.7 HAZARDS POSED BY CHEMICALS BROUGHT ON THE SITE

3.7.1 HAZARD COMMUNICATION

(Reference CH2M HILL *Hazard Communication Manual* and Section 5 of the *Site Safety Notebook*)

CH2M HILL's *Hazard Communication Program Manual*, which is available from area or regional offices and from the Corporate Human Resources Department in Denver. The project manager is to request Material Safety Data Sheets (MSDSs) from the client or from the contractors and the subcontractors for chemicals to which CH2M HILL employees potentially are exposed. The SSC is to do the following:

- Give employees required site-specific HAZCOM training.
- Confirm that the inventory of chemicals brought on the site by subcontractors is available.
- Before or as the chemicals arrive on the site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, if any.

The chemical products listed below will be used on the site. Refer to Attachment 2 for MSDSs.

Chemical	Quantity	Location
Isobutylene (calibration gas)	1 liter, compressed gas	Support Zone
Hydrochloric Acid (sample preservative)	< 500 ml	Support/Exclusion Zone
Nitric Acid (sample preservative)	< 500 ml	Support/Exclusion Zone
Sulfuric Acid (sample preservative)	< 500 ml	Support/Exclusion Zone
Sodium Hydroxide (sample preservative)	< 500 ml	Support/Exclusion Zone
Methanol (decontamination solvent)	< 1 gallon	Support/Decontamination Zone
pH Buffers (calibration standard)	< 500 ml	Support Zone
Alconox/Liquinox (detergent)	< 1 liter, powder/liquid	Support/Decontamination Zone

3.7.2 SHIPPING AND TRANSPORTATION OF CHEMICAL PRODUCTS

(Reference CH2M HILL's *Procedures for Shipping and Transporting Dangerous Goods*)

Nearly all chemicals brought to the site are considered hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive the CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

3.8 CONTAMINANTS OF CONCERN (REFER TO PROJECT FILES FOR MORE-DETAILED CONTAMINANT INFORMATION)

Contaminant	Location and Highest ^a Concentration (ppm)	Exposure Limit ^b	IDLH ^c	Symptoms and Effects of Exposure	PIP ^d (eV)
Vinyl chloride	GW: 2 ppm	1 ppm	NL Ca	Weakness, abdominal pain, GI bleeding, ; pallor or cyanosis of extremities;	9.99
1,2-Dichloroethane	GW: 0.047 ppm	1 ppm	50 ppm Ca	CNS depression; nausea, vomiting; dermatitis; irritant eyes, corneal opacity;	11.05
Benzene	GW: 0.005 ppm	1 ppm	500 ppm [Ca]	Irritant eyes, nose, respiratory system; giddiness; headache nausea, staggered gait, fatigue, anorexia, lassitude; dermatitis; bone marrow depression;	9.24
Toluene	GW: 0.003 ppm	50 ppm	500 ppm	Fatigue, weakness; confusion euphoria, dizziness, headache; dilated pupils, tearing of eyes; muscle fatigue, insomnia; paresis; dermatitis	8.82
Ethyl benzene	GW: 0.008 ppm	100 ppm	800 ppm	Irritant eyes, mucous membranes; headache; dermatitis; narcotic, coma	8.76
Pentachlorophenol	GW: 0.010 ppm	0.5 mg/m ³ [skin]	2.5 mg/m ³	Irritant eyes, nose, throat; sneezing, cough; weakness, low-weight, sweating; headache, dizziness; nausea, vomiting; difficulty breathing, chest pain; high fever; dermatitis	UK
Napthalene	GW: 0.003 ppm	10 ppm	250 ppm	Eye irritant; headache; confusion, excitement,; nausea, vomit, abdominal pain; irritant bladder, profuse sweat; jaundice; renal shutdown; dermatitis	8.12
m-Xylene	GW: 0.084 ppm	100 ppm	900 ppm	Dizziness, excitement, incoherent, staggering gait; irritant eyes, nose, throat; anorexia, nausea, vomiting, abdominal pain; dermatitis	8.56
(o-,p-)Xylenes	GW: 0.084 ppm	100 ppm	900 ppm	Dizziness, excitement, incoherent, staggering gait; irritant eyes, nose, throat; , anorexia, nausea, vomiting, abdominal pain; dermatitis	8.56
Acetone	GW: 0.027 ppm	1,000 ppm	2500 ppm	Irritant eyes, nose, throat; headache, dizziness; dermatitis	9.69
4-Methyl-2-pentanone (Hexanone)	SB: 71 ppm	100 ppm	500 ppm	Narcotic, irritant eyes, skin, respiratory system.	9.30
1,1,2,2-Tetrachloroethane	SB: 100 ppm	1 ppm [skin]	100 ppm	Nausea, vomiting, abdominal pain; tremor fingers, jaundice, enlarged tend liver; dermatitis;; kidney damage	11.10
bis(2-Ethylhexyl) phthalate	GW: 0.24 ppm	NL	NL	NL	NL
Chlorobenzene	GW: 0.007 ug/l	10 ppm	1,000 ppm	Irritant skin, eye, nose; drowsiness, incoherent, in animal; liver, lung, kidney damage	9.07
Chloroform	GW: 0.004 ppm	2 ppm	500 ppm Ca	Dizziness, mental dullness, nausea, disorientation; headache, fatigue; anesthesia; hepatomegaly; irritant eyes, skin;	11.42

3.8 CONTAMINANTS OF CONCERN (REFER TO PROJECT FILES FOR MORE-DETAILED CONTAMINANT INFORMATION)

Contaminant	Location and Highest ^a Concentration (ppm)	Exposure Limit ^b	IDLH ^c	Symptoms and Effects of Exposure	PIP ^d (eV)
1,2-Dichloropropane	GW: 0.047 ppm	75 ppm	400 ppm Ca	Eye and skin irritant; drowsiness, light-headed; ; in animals: liver, kidney disease	10.87
1,2,3-Trichloropropane	GW: 0.024 ppm	50 ppm	100 ppm Ca	Irritant eyes, nose, skin, throat; CNS depression, liver injury	UK
2-Methylnaphthalene	GW: 0.007 ppm	NL	NL	NL	NL
Lindane (BHC)	GW: 0.028 ppm	0.5 mg/m ³ [skin]	1,000 mg/m ³	Irritant eyes, skin, nose, throat; head; nausea; respiratory difficulty; cyan, aplastic anemia; muscle spasm; in animals; liver, kidney damage	UK
2-Chloroaniline	GW: 0.099 ppm	NL	NL	NL	NL
2,4,6-Trichlorophenol	GW: 1.9ppm	NL	NL	NL	NL
Dinitrotoluene	GW: 0.70 ppm	1.5 mg/m ³ [skin]	50mg/m ³ Ca	Anoxia; cyanosis; anemia; jaundice; reproductive effects	UK
2,4-Dinitrophenol	GW: 0.071 ppm	NL	NL	NL	NL
Lead	SB: 1,000 mg/kg	0.05 mg/m ³	100 mg/m ³	Weak, lassitude, insomnia; facial pallor, pale eye, anorexia, low-weight, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; para wrist, ankles; encephalopathy, nephropathy; irritant eyes; hypotension	NA
4,4-DDT	SB: 24 mg/kg	1 mg/m ³	500 mg/m ³ Ca	Pares tongue, lips, face; tremor; dizziness, confusion, malaise, headache, fatigue; convulsion; paresis hands; vomit; irritant eyes, skin	UK
4,4-DDD	SB: 4.0 mg/kg	NL	NL	NL	NL
4,4-DDE	SB: 3.8 mg/kg	NL	NL	NL	NL
Chlordane	SB: 4.9 mg/kg	0.5 mg/m ³	100 mg/m ³ Ca	Blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomit, diarrhea; irritability, tremor, convulsion; anuria; in animals: lung, liver, kidney damage	UK
Heptachlor	SB: 0.8 mg/kg	0.5 mg/m ³ [skin]	35 mg/m ³ Ca	In animals: tremors, convulsions, liver damage	UK
Dieldrin	SB: 3.6 mg/kg	0.25 mg/m ³ [skin]	50 mg/m ³ Ca	Headache, dizziness; nausea, vomit, malaise, sweating; myoclonic limb jerks; clonic, tonic convulsion; coma; in animals: liver, kidney damage	UK

3.8 CONTAMINANTS OF CONCERN (REFER TO PROJECT FILES FOR MORE-DETAILED CONTAMINANT INFORMATION)

Contaminant	Location and Highest Concentration (ppm)	Exposure Limit ^b	IDLH ^c	Symptoms and Effects of Exposure	PIP ^d (eV)
Lindane (BHC)	SB: 1.0 mg/kg	0.5 mg/m ³ [skin]	50 mg/m ³	Irritant eyes, skin, nose, throat; head; nausea; respiratory difficulty; cyan; aplastic anemia; muscle spasm; in animals: liver, kidney damage	UK
Toxaphene	SB: 120 mg/kg	0.5 mg/m ³ [skin]	200 mg/m ³ Ca	Nausea, confusion, agitation, tremors, convulsion, unconscious; dry, red skin;	UK
Arsenic	SB: 2,000 mg/kg	0.01 mg/m ³	5 mg/m ³ Ca	Ulceration of nasal septum, dermatitis, GI disturbances, peri neur, respiratory irritant, hyper pigment of skin	NA

Footnotes:

- a: Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), SS (Surface Soil), SL (Sludge), SW (Surface Water),
 b: Appropriate value of PEL, REL, or TLV listed
 c: IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen
 d: PIP = photoionization potential; NA = Not applicable; UK = Unknown

3.9 POTENTIAL ROUTES OF EXPOSURE

DERMAL: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 5.

INHALATION: Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in sections 5 and 6, respectively.

OTHER: Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before eating, drinking, or smoking).

4 PERSONNEL

4.1 CH2M HILL EMPLOYEE MEDICAL SURVEILLANCE AND TRAINING

(Reference CH2M HILL SOP HS-01, *Medical Surveillance*, and HS-02, *Health and Safety Training*)

The employees listed below are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SSC" have received 8 hours of supervisor and instrument training and can serve as site safety coordinator (SSC) for the level of protection indicated. An SSC with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones that involve the potential for exposure to health and safety hazards. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones that involve the potential for exposure to health and safety hazards. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL's SOP HS-04, *Reproduction Protection*, including obtaining a physician's statement of the employee's ability to perform hazardous activities, before being assigned fieldwork.

Employee Name	Office	Responsibility	SSC/FA-CPR
Theresa White	WDC	Field Team Leader	Level D SSC; FA-CPR
Don Martinson	WDC	Field Team Member	Level B SSC; FA-CPR

4.2 FIELD TEAM CHAIN OF COMMAND AND COMMUNICATION PROCEDURES

4.2.1 CLIENT

Contact Name: Mr. Tim Reisch/Navy Technical Representative - LANTNAVFACENCOM
Phone: (757) 322-4758

Facility Contact Name: Mr. Will Bullard
Phone: (757) 433-3431

4.2.2 CH2M HILL

Project Manager:
Health and Safety Manager:
Field Team Leader:
Site Safety Coordinator:

The SSC is responsible for contacting the field team leader and the project manager. In general, the project manager either will contact or will identify the client contact. The Health and Safety Manager (HSM) should be contacted as appropriate. The SSC or the project manager must notify the client and the HSM when a serious injury or a death occurs or when health and safety inspections by OSHA or other agencies are conducted. Refer to sections 10 through 12 for emergency procedures and phone numbers.

4.2.3 SUBCONTRACTORS

(Reference Section 3, *Corporate Health and Safety Program Manual*)

When specified in the project documents (e.g., contract), this plan may cover CH2M HILL subcontractors. However, this plan does not address hazards associated with tasks and equipment that the subcontractor has expertise in (e.g., operation of drill rig). Specialty subcontractors are responsible for health and safety procedures and plans specific to their work. Specialty subcontractors are to submit plans to CH2M HILL for review and approval before the start of fieldwork. Subcontractors must comply with the established health and safety plan(s). CH2M HILL must monitor and enforce compliance with the established plan(s).

Drilling Subcontractor: Not yet under subcontract
Subcontractor Contact:
Telephone:

Geoprobe Subcontractor: Not yet under subcontract
Contact Name:
Telephone:

Surveying Subcontractor: Not yet under subcontract
Contact Name:
Telephone:

General health and safety communication with subcontractors contracted with CH2M HILL and covered by this plan is to be conducted as follows:

- Request that the subcontractor, if a specialty subcontractor, submit a safety or health plan applicable to their expertise (e.g., drill-rig safety plan or nuclear density gauge [NDG] health plan); attach the reviewed plan.
- Supply subcontractors with a copy of this plan, and brief them on its provisions.
- Direct health and safety communication to the subcontractor-designated safety representative.
- Notify the subcontractor-designated representative if a violation of the plan(s) is observed. Specialty subcontractors are responsible for mitigating hazards in which they have expertise.
- If a hazard condition persists, inform the subcontractor. If the hazard is not mitigated, stop affected work as a last resort and notify the project manager.
- When an apparent imminent danger exists, promptly remove all affected personnel. Notify the project manager.
- Make clear that consistent violations of the health and safety plan by a subcontractor may result in termination of the subcontract.

4.2.4 CONTRACTORS

(Reference Section 3, *Corporate Health and Safety Program Manual*)

This plan does not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for directing contractor personnel and is not to assume responsibility through their actions. When the contractor is in control of the site, ask the contractor to conduct a briefing of their health and safety practices and to describe how they apply to CH2M HILL's activities. Request a copy of the contractor's health and safety plan.

Contractor: Not yet subcontracted

Contact Name:

Telephone:

General health and safety communication with contractors *not* contracted with CH2M HILL is listed below. These procedures can also be applied to other third party communications (e.g., client personnel).

- Ask the contractor to brief CH2M HILL on the contractor's health and safety plan for how the plan affects CH2M HILL employees on the site.
- If acceptable to the client, communicate about health and safety directly with the contractor PM or other onsite contractor-designated representative. CH2M HILL employees are not to direct the details of the contractor's work or to advise on health and safety (e.g., how the contractor corrects unsafe conditions).
- If an observed hazard poses a risk to CH2M HILL personnel, notify the party controlling the work activity as soon as possible. Notify the project manager; the project manager will notify the client. Document oral notification in project records (i.e., the field logbook).
- If a hazardous condition endangering a CH2M HILL employee persists, inform the contractor and the project manager (the project manager will contact the client) that CH2M HILL cannot execute the assigned work until the hazard is mitigated.
- When an apparent imminent danger exists, orally warn the person(s) in danger and orally notify the contractor promptly. When an imminent danger involves a CH2M HILL employee, remove the employee and suspend CH2M HILL work immediately until the hazard has been mitigated. Inform the project manager and the contractor promptly.
- The SSC or the project manager must notify the client and CH2M HILL health and safety staff when (1) the contractor fails to remedy an unsafe condition affecting CH2M HILL personnel, (2) the contractor does not remedy the hazardous condition within a reasonable period of time, or (3) the contractor repeatedly creates the hazardous condition.

5 PERSONAL PROTECTIVE EQUIPMENT (PPE) (Reference CH2M HILL SOP HS-07, *Personal Protective Equipment*, HS-08, *Respiratory Protection*, Section 2 of the *Site Safety Notebook*)

5.1 PPE SPECIFICATIONS^a

Task	Level	Body	Head	Respirator ^b
Surveying	D	Work clothes; steel-toe, steel-shank leather work boots; work gloves	Hardhat ^c Safety glasses Ear protection ^d	None required
Sediment, Soil and Groundwater Sampling, Monitoring Well Installation	Modified D	COVERALLS: Uncoated Tyvek® BOOTS: Steel-toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers GLOVES: Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat ^c Splash shield ^e Safety glasses Ear protection ^d	None required
Tasks requiring upgrade per sections 5.2 or 6.	C	COVERALLS: Polycoated Tyvek® BOOTS: Steel-toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers GLOVES: Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat ^c Splash shield ^e Ear protection ^d Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H ^f cartridges or equivalent
None Authorized	B	COVERALLS: Polycoated Tyvek® BOOTS: Steel toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers GLOVES: Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat ^c Splash shield ^e Ear protection ^d Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA): MSA Ultralite, or equivalent

^a Modifications are as indicated. CH2M HILL will provide PPE to only CH2M HILL employees.

^b No facial hair that would interfere with respirator fit is permitted.

^c Hardhat and splash-shield areas are to be determined by the SSC.

^d Ear protection should be worn while working around drill rigs or other noise-producing equipment or when conversations cannot be held at distances of 3 feet or less without shouting. Refer to Section 6 for other requirements.

^f The GME-H cartridge is the new standard-issue cartridge. Available stock of the previously standard GMC-H cartridges may be used for tasks covered by this plan.

5.2 REASONS FOR UPGRADING OR DOWNGRADING LEVEL OF PROTECTION

Upgrade*	Downgrade
<ul style="list-style-type: none"> Request from individual performing task. Change in work task that will increase contact or potential contact with hazardous materials. Occurrence or likely occurrence of gas or vapor emission. Known or suspected presence of dermal hazards. Instrument action levels (Section 6) exceeded. 	<ul style="list-style-type: none"> New information indicating that situation is less hazardous than originally thought. Change in site conditions that decreases the hazard. Change in work task that will reduce contact with hazardous materials.

*Performing a task that requires an upgrade to a higher level of protection (e.g., level D to level C) is permitted only when the PPE requirements have been specified in Section 5 and an SSC who meets the requirements specified in subsection 4.1 is present.

6 AIR MONITORING SPECIFICATIONS (Reference CH2M HILL SOP HS-06, *Air Monitoring*, and Section 2 of the *Site Safety Notebook*)

Instrument	Tasks	Action Levels ^a		Frequency ^b	Calibration
PID: OVM with 11.8 eV lamp or equivalent	Sediment, Soil and	<1 ppm	Level D	Initially and periodically during task	Daily
	Groundwater	1-5 ppm	Level C		
	Sampling, Monitoring	>5 ppm	Stop work. Notify		
	Well Installation	HSM for guidance			

Note a: Action levels apply to sustained breathing-zone measurements above background.

Note b: The exact frequency of monitoring depends on field conditions and is to be determined by the SSC; generally, every 5 to 15 minutes is acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time and measurement result, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3," "at surface/SB-2," etc.).

6.1 CALIBRATION SPECIFICATIONS

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
PID: OVM, 11.8 eV bulb	100 ppm isobutylene	RF = 0.68	68 ppm	1.5 lpm reg T-tubing

6.2 AIR SAMPLING

Sampling may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

Method Description: None anticipated

Personnel and Areas

Results must be sent immediately to the HSM. Regulations may require reporting to monitored personnel. Results reported to:

HSM:

Other:

7 DECONTAMINATION (REFERENCE CH2M HILL SOP HS-13, DECONTAMINATION)

The SSC must monitor the effectiveness of the decontamination procedures. Decontamination procedures found to be ineffective will be modified by the SSC.

7.1 DECONTAMINATION SPECIFICATIONS

Personnel	Sample Equipment	Heavy Equipment
<ul style="list-style-type: none">• Boot wash/rinse• Glove wash/rinse• Outer-glove removal• Body-suit removal• Inner-glove removal• Respirator removal• Hand wash/rinse• Face wash/rinse• Shower ASAP• PPE-disposal method: PPE will be placed in plastic garbage bags and drummed.• Water-disposal method: Decon water will be drummed.	<ul style="list-style-type: none">• Wash/rinse equipment• Solvent-rinse equipment• Solvent-disposal method: Solvents generated during equipment decontamination will be drummed.	<ul style="list-style-type: none">• Power wash• Steam clean• Water-disposal method: Water generated during the decontamination of heavy equipment will be drummed.

7.2 DIAGRAM OF PERSONNEL-DECONTAMINATION LINE

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SSC should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 7-1 illustrates a typical establishment of work zones, including the decontamination line. Work zones are to be modified by the SSC to accommodate task-specific requirements.

8 SPILL-CONTAINMENT PROCEDURES

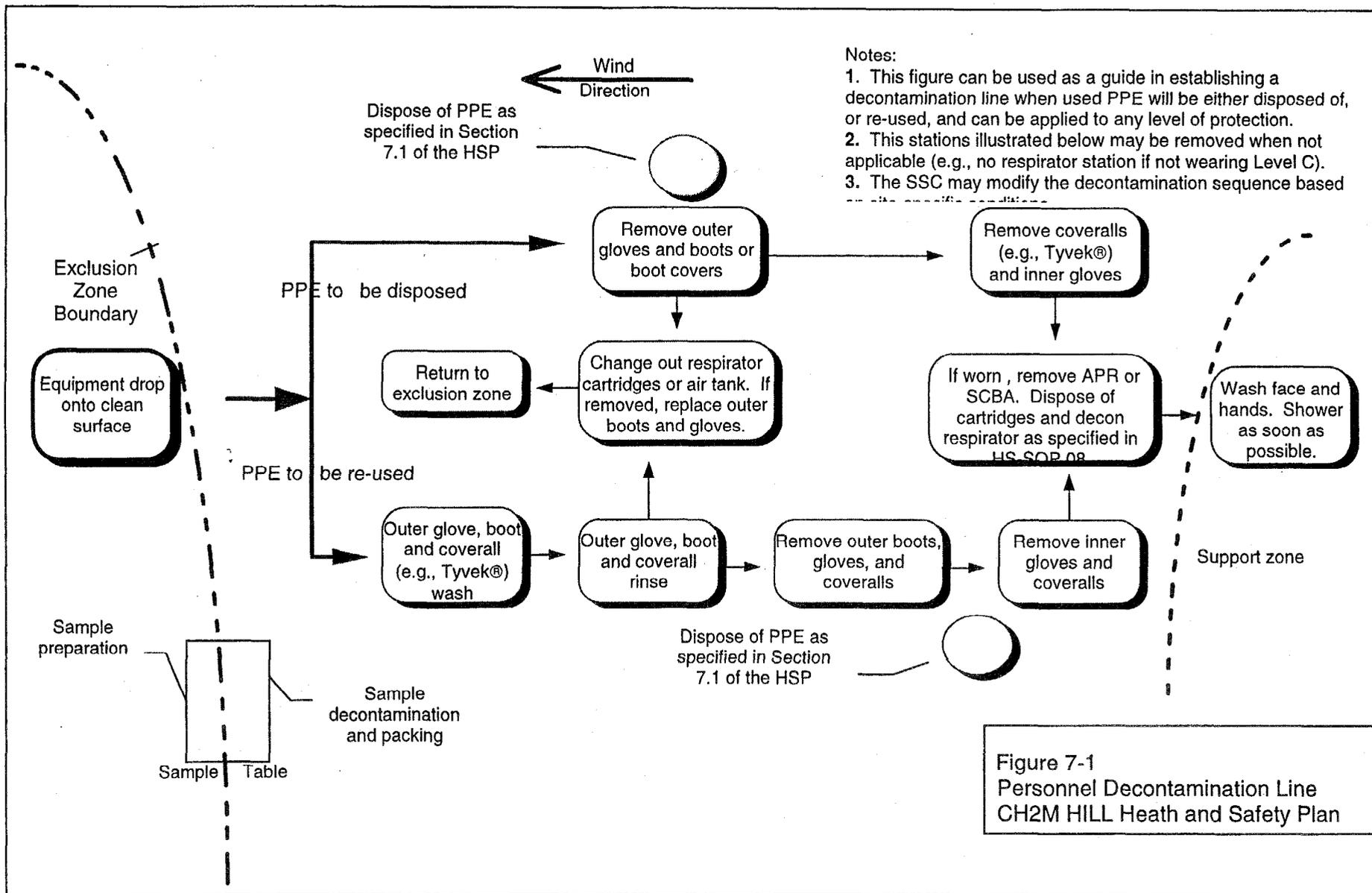
Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and will be disposed of properly.

9 CONFINED-SPACE ENTRY

(Reference CH2M HILL SOP HS-17, *Confined Space Entry*)

No confined-space entry will be permitted. Confined-space entry requires additional health and safety procedures, training, and a permit. If conditions change such that confined-space entry is necessary, contact the HSM to develop the required entry permit.

When planned activities will not include confined-space entry, permit-required confined spaces accessible to CH2M HILL personnel are to be identified before the task begins. The SSC is to confirm that permit spaces are properly posted or that employees are informed of their locations and informed of their hazards.



- Notes:
1. This figure can be used as a guide in establishing a decontamination line when used PPE will be either disposed of, or re-used, and can be applied to any level of protection.
 2. This stations illustrated below may be removed when not applicable (e.g., no respirator station if not wearing Level C).
 3. The SSC may modify the decontamination sequence based on site specific conditions.

Figure 7-1
Personnel Decontamination Line
CH2M HILL Health and Safety Plan

10 SITE-CONTROL PLAN

10.1 SITE-CONTROL PROCEDURES

- The site safety coordinator (SSC) will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of health and safety plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies. Refer to Section 8 of *Site Safety Notebook*.
- The SSC records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location at sites where project field offices, trailers, or equipment storage boxes are established. Posters can be obtained by calling either 800/548-4776 or 800/999-9111.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Determine wind direction.
- Establish work zones: support, decontamination, and exclusion zones. Delineate work zones with flags or cones as appropriate. Support zone should be upwind of the site.
- Establish decontamination procedures, including respirator-decontamination procedures, and test the procedures.
- Use access control at the entry and exit from each work zone.
- Store chemicals in appropriate containers.
- Make MSDSs available for onsite chemicals to which employees are exposed.
- Establish onsite communication consisting of the following:
 - Line-of-sight and hand signals
 - Air horn
 - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Establish procedures for disposing of material generated on the site.
- Initial air monitoring is conducted by the SSC in appropriate level of protection.
- The SSC is to conduct periodic inspections of work practices to determine the effectiveness of this plan -- refer to CH2M HILL SOP 18, *Health and Safety Checklist*, or Section 4 of *Site Safety Notebook*. Deficiencies are to be noted, reported to the HSM, and corrected.

10.2 HAZWOPER COMPLIANCE PLAN (Reference CH2M HILL SOP HS-17, Health and Safety Plans)

This section outlines procedures to be followed when certain activities do not require 24- or 40-hour training. *Note, prior approval from the HSM is required before these tasks are conducted on regulated hazardous waste sites.*

- Certain parts of the site work may be covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated tasks must be included in subsection 2.2.1.
- Air sampling must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to subsections 3.8 and 6.2 for contaminant data and air sampling requirements, respectively.
- Non-Hazwoper-trained personnel must be informed of the nature of the existing contamination and its locations, the limits of their access, and the emergency action plan for the site. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements, including 29 CFR 1910.1200 (HAZCOM). Refer to subsection 3.7.1 for hazard communication requirements.
- Air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to volatile contaminants. Non-Hazwoper-trained personnel should be monitored whenever the belief is that there may be a possibility of exposure (e.g., change in site conditions), or at some reasonable frequency to confirm that there is no exposure. Refer to Section 6.1 for air monitoring requirements.
- Treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hours of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must leave the site.

If Hazwoper-regulated tasks are conducted concurrently with nonregulated tasks, non-Hazwoper-trained subcontractors must be removed from areas of exposure. If non-Hazwoper-trained personnel remain on the site while a Hazwoper-regulated task is conducted, the contaminant/exposure area (exclusion zone) must be posted, non-Hazwoper-trained personnel must be reminded of the locations of restricted areas and the limits of their access, and real-time monitoring must be conducted. Non-Hazwoper-trained personnel at risk of exposure must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.

11 EMERGENCY RESPONSE PLAN (REFERENCE CH2M HILL SOP HS-12, EMERGENCY RESPONSE)

11.1 PRE-EMERGENCY PLANNING

The SSC performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with the facility and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Locate the nearest telephone; determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Identify and communicate chemical, safety, radiological, and biological hazards.
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Post site map marked with locations of emergency equipment and supplies, and post OSHA job-site poster. The OSHA job-site poster is required at sites where project field offices, trailers, or equipment-storage boxes are established. Posters can be obtained by calling either 800/548-4776 or 800/999-9111.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Evaluate capabilities of local response teams where applicable.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, chemical and vapor releases.
- Review notification procedures for contacting CH2M HILL's medical consultant and team member's occupational physician.
- Rehearse the emergency response plan once before site activities begin, including driving the route to the hospital.
- Brief new workers on the emergency response plan.
- The SSC will evaluate emergency response actions and initiate appropriate follow-up actions.

11.2 EMERGENCY EQUIPMENT AND SUPPLIES

The SSC should mark the locations of emergency equipment on the site map and should post the map.

Emergency Equipment and Supplies	Location
First aid kit	Field vehicle
Eye wash	Field vehicle
Potable water	Field vehicle
Bloodborne-pathogen kit	Field vehicle
Additional equipment (specify)	None

11.3 EMERGENCY MEDICAL TREATMENT

- Notify appropriate emergency response authorities listed in sections 12 and 13 (e.g., 911).
 - During a time of no emergency, contact CH2M HILL's medical consultant for advice and guidance on medical treatment.
 - The SSC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
 - Prevent further injury.
 - Initiate first aid and CPR where feasible.
 - Get medical attention immediately.
 - Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
 - Notify the field team leader and the project manager of the injury.
 - Make certain that the injured person is accompanied to the emergency room.
 - Notify the health and safety manager.
 - Notify the injured person's human resources department within 24 hours.
 - Prepare an incident report -- refer to CH2M HILL SOP 12, *Emergency Response and First Aid*, and Section 6 of *Site Safety Notebook*. Submit the report to the corporate director of health and safety and the corporate human resources department (COR) within 48 hours.
 - When contacting the medical consultant, state that you are calling about a CH2M HILL matter, and give your name, your telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
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11.4 NONEMERGENCY PROCEDURES

The procedures listed above may be applied to nonemergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant.

- When contacting the medical consultant, state that the situation is a CH2M HILL matter, and give your name, your telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Follow these procedures as appropriate.

11.5 INCIDENT RESPONSE

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CH2M HILL operations and evacuate the immediate work area.
- Account for personnel at the designated assembly area(s).
- Notify appropriate response personnel.
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

11.6 EVACUATION

- Evacuation routes will be designated by the SSC before work begins.
- Onsite and offsite assembly points will be designated before work begins.
- Personnel will leave the exclusion zone and assemble at the onsite assembly point upon hearing the emergency signal for evacuation.
- Personnel will assemble at the offsite point upon hearing the emergency signal for a site evacuation.
- The SSC and a "buddy" will remain on the site after the site has been evacuated (if possible) to assist local responders and advise them of the nature and location of the incident.
- The SSC accounts for all personnel in the onsite assembly zone.
- A person designated by the SSC before work begins will account for personnel at the offsite assembly area.
- The SSC will write up the incident as soon as possible after it occurs and will submit a report to the corporate director of health and safety.

11.7 EVACUATION ROUTES AND ASSEMBLY POINTS

Refer to the site map in Section 1. Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.

11.8 EVACUATION SIGNALS

Signal	Meaning
Grasping throat with hand	Emergency—help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

Client/Facility:

12 EMERGENCY RESPONSE

12.1 EMERGENCY RESPONSE TELEPHONE NUMBERS

SITE ADDRESS: Oceana Naval Air Station
Oceana Boulevard
Virginia Beach, Virginia

Phone: (757)
Cellular Phone: None

Police: Oceana Naval Air Station Police **Phone:** (757) 433-9111

Fire: Oceana Naval Air Station Fire Department **Phone:** (757) 433-9111

Ambulance: Oceana Naval Air Station Rescue Squad **Phone:** (757) 433-9111

Water: Oceana Naval Air Station Utilities **Phone:** (757) 433-3105

Gas: Oceana Naval Air Station Utilities **Phone:** (757) 433-3105

Electric: Oceana Naval Air Station Utilities **Phone:** (757) 433-3105

*When using a cellular phone outside the telephone's normal calling area, exercise caution in relying on the cellular phone to activate 911. When the caller is outside the normal calling area, the cellular service carrier should connect the caller with emergency services in the area where the call originated, but this may not occur. Telephone numbers of backup emergency services should be provided if a cellular phone is relied on to activate 911.

Hospital: Virginia Beach General Hospital **Phone:** (757) 481-8262

Route to Hospital: (Refer to Figure 12-1) From Site - Leave base from main entrance and turn left on Oceana Boulevard. Travel about 3 miles, turn left on Virginia Beach Boulevard, then right on First Colonial Road. Travel about 1.5 miles, Virginia Beach Hospital is on the right.

12.2 GOVERNMENT AGENCIES INVOLVED IN PROJECT

Federal Agency and Contact Name: United States Environmental Protection Agency – Rob Thomson
Phone: (215) 566-3425

State Agency and Contact Name: VDEQ – Steve Mihalko
Phone: (804) 698-4202

Local Agency and contact Name: None

Phone:

Contact the project manager. Generally, the project manager will contact relevant government agencies.

13 EMERGENCY CONTACTS

If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured person. Notification **MUST** be made within 24 hours of the injury.

CH2M HILL Medical Consultant

Dr. Elayne F. Theriault
Environmental Medical Resources, Inc.
Atlanta, Georgia
800/229-3674 OR 770/455-0818
(After-hours calls will be returned within 20 minutes.)

Occupational Physician (Regional or Local)

Dr. Laura Staton
46440 Benedict Drive, Suite 108
Sterling, Virginia 22170
703/444-5656

Corporate Director Health and Safety

Name: Mollie Netherland/SEA
Phone: 206/453-5005

Site Safety Coordinator (SSC)

Name: To Be Determined/WDC
Phone: 703/471-1441

Medical and Training Administrator

Name: Cyndi Carel./SEA
Phone: 206/453-5005

Regional Manager

Name: Steve Guttenplan/WDC
Phone: 703/471-1441

Health and Safety Manager (HSM)

Name: Rich Rathnow/MKE
Phone: 414/272-1052

Project Manager

Name: Jack Robinson
Phone: 703/471-1441

Radiation Health Manager (RHM)

Name: David McCormack/SEA
Phone: 206/453-5005

Regional Human Resources Department

Name: Norman Fisher
Phone: 703/471-1441

Client

Name: Mr. Tim Reisch
Phone: 757/322-4758

Corporate Human Resources Department

Name: Julie Zimmerman/COR
Phone: 303/771-0900

Federal Express Dangerous Goods Shipping

Phone: 800/238-5355

Worker's Compensation and Auto Claims

GAB Business Services, Inc.
Phone: 800/747-7222 After hours 800/621-5410

CH2M HILL Emergency Number for Shipping Dangerous Goods

Phone: 800/255-3924

Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

14 APPROVAL

This site-specific health and safety plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

14.1 ORIGINAL PLAN

WRITTEN BY: Don Martinson/WDC

DATE: 6/12/97

APPROVED BY: Laura Johnson/NJO

DATE: 6/24/97

14.2 REVISIONS

REVISIONS MADE BY:

DATE:

REVISIONS TO PLAN:

REVISIONS APPROVED BY:

DATE:

15 DISTRIBUTION

Name	Office	Responsibility	Number of Copies
Jerri McCauslin	COR	Senior Program Assistant	1
John Longo/Laura Johnson	NJO	Health and Safety Manager/Approver	1
Jack Robinson	WDC	Project Manager	1
Teresa White	WDC	Site Safety Coordinator	1
Client	NA	Client Project manager	

16 ATTACHMENTS

Attachment 1: Employee Signoff

Attachment 2: Applicable Material Safety Data Sheets

Attachment 1
Employee Signoff

Attachment 2
Material Safety Data Sheets

MSDS for HYDROCHLORIC ACIDPage 1

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: HYDROCHLORIC ACID
FORMULA: HCL
FORMULA WT: 36.46
CAS NO.: 7647-01-0
NIOSH/RTECS NO.: MW4025000
COMMON SYNONYMS: MURIATIC ACID; CHLOROHYDRIC ACID; HYDROCHLORIDE
PRODUCT CODES: 9543,9539,9535,5367,9534,9544,9529,9542,4800,9549,9530,9548
9540,9547,9546,9537
EFFECTIVE: 08/07/86
REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 3 SEVERE (POISON)
FLAMMABILITY - 0 NONE
REACTIVITY - 2 MODERATE
CONTACT - 3 SEVERE (CORROSIVE)

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER

CAUSES SEVERE BURNS

MAY BE FATAL IF SWALLOWED OR INHALED

DO NOT GET IN EYES, ON SKIN, ON CLOTHING.

DO NOT BREATHE VAPOR. CAUSES DAMAGE TO RESPIRATORY SYSTEM (LUNGS),
EYES AND SKIN. KEEP IN TIGHTLY CLOSED CONTAINER. LOOSEN CLOSURE CAUTIOUSLY.
USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE
OF SPILL NEUTRALIZE WITH SODA ASH OR LIME AND PLACE IN DRY CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE (CORROSIVE).

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
HYDROCHLORIC ACID (23 BAUME)	35-40	7647-01-0

3 - PHYSICAL DATA

BOILING POINT: 110 C (230 F) VAPOR PRESSURE(MM HG): N/A

MSDS for HYDROCHLORIC ACID

Page 2

MELTING POINT: -25 C (-13 F) VAPOR DENSITY(AIR=1): 1.3

SPECIFIC GRAVITY: 1.19 EVAPORATION RATE: N/A
(H2O=1) (BUTYL ACETATE=1)

SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: CLEAR, COLORLESS OR SLIGHTLY YELLOW, PUNGENT,
FUMING LIQUID.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP) N/A NFPA 704M RATING: 3-0-0

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL. DO NOT GET WATER INSIDE CONTAINERS.

UNUSUAL FIRE & EXPLOSION HAZARDS

MAY EMIT HYDROGEN GAS UPON CONTACT WITH METAL.

TOXIC GASES PRODUCED

HYDROGEN CHLORIDE, HYDROGEN GAS

5 - HEALTH HAZARD DATA

PEL AND TLV LISTED DENOTE CEILING LIMIT.

THRESHOLD LIMIT VALUE (TLV/TWA): 7 MG/M3 (5 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 7 MG/M3 (5 PPM)

TOXICITY: LD50 (ORAL-RABBIT) (MG/KG) - 900
LD50 (IPR-MOUSE) (MG/KG) - 40
LC50 (INHL-RAT-1H) (PPM) - 3124

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION OF VAPORS MAY CAUSE PULMONARY EDEMA, CIRCULATORY SYSTEM COLLAPSE, DAMAGE TO UPPER RESPIRATORY SYSTEM, COLLAPSE.
INHALATION OF VAPORS MAY CAUSE COUGHING AND DIFFICULT BREATHING.
LIQUID MAY CAUSE SEVERE BURNS TO SKIN AND EYES.
INGESTION IS HARMFUL AND MAY BE FATAL.

MSDS for HYDROCHLORIC ACID

Page 3

INGESTION MAY CAUSE SEVERE BURNING OF MOUTH AND STOMACH.
INGESTION MAY CAUSE NAUSEA AND VOMITING.

TARGET ORGANS

RESPIRATORY SYSTEM, EYES, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

ROUTES OF ENTRY

INGESTION, INHALATION, SKIN CONTACT, EYE CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.

IF SWALLOWED, DO NOT INDUCE VOMITING; IF CONSCIOUS, GIVE WATER, MILK, OR MILK OF MAGNESIA.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.

WASH CLOTHING BEFORE RE-USE.

6 - REACTIVITY DATA

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, MOISTURE

INCOMPATIBLES:

MOST COMMON METALS, WATER, AMINES, METAL OXIDES, ACETIC ANHYDRIDE, PROPIOLACTONE, VINYL ACETATE, MERCURIC SULFATE, CALCIUM PHOSPHIDE, FORMALDEHYDE, ALKALIES, CARBONATES, STRONG BASES, SULFURIC ACID, CHLOROSULFONIC ACID

DECOMPOSITION PRODUCTS: HYDROGEN CHLORIDE, HYDROGEN, CHLORINE

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. VENTILATE AREA. NEUTRALIZE SPILL WITH SODA ASH OR LIME. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

J. T. BAKER NEUTRASORB(R) OR NEUTRASOL(R) "LOW NA+" ACID NEUTRALIZERS ARE RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER:

D002 (CORROSIVE WASTE)

8 - PROTECTIVE EQUIPMENT

MSDS for HYDROCHLORIC ACID

Page 4

VENTILATION:

USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 100 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ACID CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, ACID-RESISTANT GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE (CORROSIVE)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN CORROSION-PROOF AREA.
ISOLATE FROM INCOMPATIBLE MATERIALS.
DO NOT STORE NEAR OXIDIZING MATERIALS.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME HYDROCHLORIC ACID
HAZARD CLASS CORROSIVE MATERIAL (LIQUID)
UN/NA UN1789
LABELS CORROSIVE
REPORTABLE QUANTITY 5000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME HYDROCHLORIC ACID, SOLUTION
HAZARD CLASS 8
UN/NA UN1789
LABELS CORROSIVE

MSDS for NITRIC ACIDPage 1

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: NITRIC ACID
 FORMULA: HNO3
 FORMULA WT: 63.01
 CAS NO.: 7697-37-2
 NIOSH/RTECS NO.: QU5775000
 COMMON SYNONYMS: HYDROGEN NITRATE; AZOTIC ACID
 PRODUCT CODES: 4801,9605,9602,9598,9606,9601,5371,9597,9600,5113,9616
 EFFECTIVE: 09/10/86
 REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	3	SEVERE (POISON)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	3	SEVERE (OXIDIZER)
CONTACT	-	4	EXTREME (CORROSIVE)

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER

STRONG OXIDIZER - CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE
 LIQUID AND VAPOR CAUSE SEVERE BURNS - MAY BE FATAL IF SWALLOWED

HARMFUL IF INHALED AND MAY CAUSE DELAYED LUNG INJURY

SPILLAGE MAY CAUSE FIRE OR LIBERATE DANGEROUS GAS

KEEP FROM CONTACT WITH CLOTHING AND OTHER COMBUSTIBLE MATERIALS. DO NOT
 STORE NEAR COMBUSTIBLE MATERIALS. DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
 DO NOT BREATHE VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE
 VENTILATION. IN CASE OF FIRE, USE WATER SPRAY, ALCOHOL FOAM, DRY CHEMICAL,
 OR CARBON DIOXIDE. FLUSH SPILL AREA WITH WATERSPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: YELLOW (REACTIVE)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
NITRIC ACID	65-75	7697-37-2

3 - PHYSICAL DATA

BOILING POINT: 121 C (250 F) VAPOR PRESSURE(MM HG):

MSDS for NITRIC ACID

Page 2

MELTING POINT: -42 C (-44 F) VAPOR DENSITY(AIR=1):
SPECIFIC GRAVITY: 1.41 EVAPORATION RATE: N/A
(H2O=1) (BUTYL ACETATE=1)
SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 100
APPEARANCE & ODOR: COLORLESS LIQUID, WITH CHOKING ODOR.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A NFPA 704M RATING: 3-0-0 OXY
FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %
FIRE EXTINGUISHING MEDIA
USE WATER SPRAY.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE EXPOSED CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL; DO NOT GET WATER INSIDE CONTAINERS.

UNUSUAL FIRE & EXPLOSION HAZARDS

STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE.

TOXIC GASES PRODUCED

NITROGEN OXIDES, HYDROGEN GAS

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 5 MG/M3 (2 PPM)
SHORT-TERM EXPOSURE LIMIT (STEL): 10 MG/M3 (4 PPM)
PERMISSIBLE EXPOSURE LIMIT (PEL): 5 MG/M3 (2 PPM)
CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION OF VAPORS MAY CAUSE NAUSEA, VOMITING, LIGHTHEADEDNESS OR HEADACHE.
INHALATION OF VAPORS MAY CAUSE SEVERE IRRITATION OF THE RESPIRATORY SYSTEM. INHALATION OF VAPORS MAY CAUSE COUGHING, CHEST PAINS, DIFFICULTY BREATHING, OR UNCONSCIOUSNESS.
CONTACT WITH LIQUID OR VAPOR MAY CAUSE SEVERE IRRITATION OR BURNS OF THE SKIN, EYES, AND MUCOUS MEMBRANES.
INGESTION MAY CAUSE SEVERE BURNS TO MOUTH, THROAT, AND STOMACH. MAY HAVE ADVERSE EFFECT ON KIDNEY FUNCTION AND MAY BE FATAL.

MSDS for NITRIC ACID

Page 3

INGESTION IS HARMFUL AND MAY BE FATAL.

TARGET ORGANS

EYES, SKIN, RESPIRATORY SYSTEM, TEETH

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

ROUTES OF ENTRY

INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.

IF SWALLOWED, DO NOT INDUCE VOMITING; IF CONSCIOUS, GIVE WATER, MILK, OR MILK OF MAGNESIA.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.

WASH CLOTHING BEFORE RE-USE.

6 - REACTIVITY DATA

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, LIGHT, MOISTURE

INCOMPATIBLES:

STRONG BASES, COMBUSTIBLE MATERIALS,
STRONG REDUCING AGENTS, ALKALIES, MOST COMMON METALS,
ORGANIC MATERIALS, ALCOHOLS, CARBIDES

DECOMPOSITION PRODUCTS: OXIDES OF NITROGEN, HYDROGEN

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. VENTILATE AREA. NEUTRALIZE SPILL WITH SODA ASH OR LIME. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER. KEEP COMBUSTIBLES (WOOD, PAPER, OIL, ETC.) AWAY FROM SPILLED MATERIAL.

J. T. BAKER NEUTRASORB(R) OR NEUTRASOL(R) "LOW NA+" ACID NEUTRALIZERS ARE RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER:

D002 (CORROSIVE WASTE)

8 - PROTECTIVE EQUIPMENT

MSDS for NITRIC ACID

Page 4

VENTILATION:

USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 100 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ACID CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, ACID-RESISTANT GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: YELLOW (REACTIVE)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. STORE SEPARATELY AND AWAY FROM FLAMMABLE AND COMBUSTIBLE MATERIALS.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	NITRIC ACID (OVER 40%)	POISON - INHALATION HAZARD
HAZARD CLASS	OXIDIZER	
UN/NA	UN2031	
LABELS	OXIDIZER, CORROSIVE, POISON	
REPORTABLE QUANTITY	1000 LBS.	

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	NITRIC ACID
HAZARD CLASS	8
UN/NA	UN2031
LABELS	CORROSIVE

MSDS for SODIUM HYDROXIDE

Page 1

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: SODIUM HYDROXIDE
 FORMULA: NAOH
 FORMULA WT: 40.00
 CAS NO.: 01310-73-2
 NIOSH/RTECS NO.: WB4900000
 COMMON SYNONYMS: CAUSTIC SODA; SODIUM HYDRATE; LYE
 PRODUCT CODES: 3730,3722,5312,5104,3729,3734,3726,5045,3728,3723,5022,3736
 EFFECTIVE: 08/28/86
 REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 3 SEVERE (POISON)
 FLAMMABILITY - 0 NONE
 REACTIVITY - 2 MODERATE
 CONTACT - 4 EXTREME (CORROSIVE)

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER
 CAUSES SEVERE BURNS
 MAY BE FATAL IF SWALLOWED

DO NOT GET IN EYES, ON SKIN, ON CLOTHING. AVOID SPATTERING BY SLOWLY ADDING TO SOLUTION.

AVOID BREATHING DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
SODIUM HYDROXIDE	90-100	1310-73-2

3 - PHYSICAL DATA

BOILING POINT: 1390 C (2534 F) VAPOR PRESSURE(MM HG): 0
 MELTING POINT: 318 C (604 F) VAPOR DENSITY(AIR=1): N/A

MSDS for SODIUM HYDROXIDE

Page 2

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN CORROSION-PROOF AREA.
STORE IN A DRY AREA.
ISOLATE FROM INCOMPATIBLE MATERIALS.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	SODIUM HYDROXIDE, DRY SOLID
HAZARD CLASS	CORROSIVE MATERIAL (SOLID)
UN/NA	UN1823
LABELS	CORROSIVE
REPORTABLE QUANTITY	1000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	SODIUM HYDROXIDE, SOLID
HAZARD CLASS	8
UN/NA	UN1823
LABELS	CORROSIVE

MSDS for METHANOL

Page 1

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: METHANOL
 FORMULA: CH₃OH
 FORMULA WT: 32.04
 CAS NO.: 67-56-1
 NIOSH/RTECS NO.: PC1400000
 COMMON SYNONYMS: METHYL ALCOHOL; WOOD ALCOHOL; CARBINOL; METHYLOL; WOOD SPIRIT
 PRODUCT CODES: 9049,9072,9075,9076,9071,5217,5370,9074,P704,9093,5536,9068
 9073,9091,9263,9069,9070
 EFFECTIVE: 09/26/86
 REVISION #04

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 3 SEVERE (POISON)
 FLAMMABILITY - 3 SEVERE (FLAMMABLE)
 REACTIVITY - 1 SLIGHT
 CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER
 FLAMMABLE
 HARMFUL IF INHALED

CANNOT BE MADE NON-POISONOUS
 MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED

KEEP AWAY FROM HEAT, SPARKS, FLAME. DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
 AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH
 ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE,
 USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIVE.
 FLUSH SPILL AREA WITH WATER SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
METHANOL	90-100	67-56-1

MSDS for METHANOL

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 3 - PHYSICAL DATA

BOILING POINT: 65 C (149 F) VAPOR PRESSURE(MM HG): 96
 MELTING POINT: -98 C (-144 F) VAPOR DENSITY(AIR=1): 1.11
 SPECIFIC GRAVITY: 0.79 EVAPORATION RATE: 4.6
 (H2O=1) (BUTYL ACETATE=1)
 SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 100
 APPEARANCE & ODOR: CLEAR, COLORLESS LIQUID WITH CHARACTERISTIC PUNGENT ODOR.

 4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP 12 C (54 F) NFPA 704M RATING: 1-3-0
 FLAMMABLE LIMITS: UPPER - 36.0 % LOWER - 6.0 %
 FIRE EXTINGUISHING MEDIA
 USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
 (WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK. CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE.
 BURNS WITH A CLEAR, ALMOST INVISIBLE FLAME.

TOXIC GASES PRODUCED

CARBON MONOXIDE, CARBON DIOXIDE, FORMALDEHYDE

 5 - HEALTH HAZARD DATA

TLV LISTED DENOTES (TLV-SKIN).

THRESHOLD LIMIT VALUE (TLV/TWA): 260 MG/M3 (200 PPM)
 SHORT-TERM EXPOSURE LIMIT (STEL): 310 MG/M3 (250 PPM)
 PERMISSIBLE EXPOSURE LIMIT (PEL): 260 MG/M3 (200 PPM)
 TOXICITY: LD50 (ORAL-RAT) (MG/KG) - 5628
 LD50 (IPR-RAT) (MG/KG) - 9540

 MSDS for METHANOL

Page 3

LD50 (SCU-MOUSE) (MG/KG) - 9800
 LD50 (SKN-RABBIT) (G/KG) - 20

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION AND INGESTION ARE HARMFUL AND MAY BE FATAL.
INHALATION MAY CAUSE HEADACHE, NAUSEA, VOMITING, DIZZINESS, NARCOSIS,
SUFFOCATION, LOWER BLOOD PRESSURE, CENTRAL NERVOUS SYSTEM DEPRESSION.
LIQUID MAY BE IRRITATING TO SKIN AND EYES. PROLONGED SKIN CONTACT MAY
RESULT IN DERMATITIS. EYE CONTACT MAY RESULT IN TEMPORARY CORNEAL DAMAGE.
INGESTION MAY CAUSE BLINDNESS.
INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS,
GASTROINTESTINAL IRRITATION.
CHRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.

TARGET ORGANS

EYES, SKIN, CENTRAL NERVOUS SYSTEM

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

ROUTES OF ENTRY

INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL
RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR
AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
WASH CLOTHING BEFORE RE-USE.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS, STRONG ACIDS, ALUMINUM

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE, FORMALDEHYDE

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OR FLAMES IN AREA. STOP LEAK
IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP
WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO
CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

MSDS for METHANOL

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J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED
FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL

ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: U154 (TOXIC WASTE)

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS ABOVE 200 PPM, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, RUBBER GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS

BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	METHANOL
HAZARD CLASS	FLAMMABLE LIQUID
UN/NA	UN1230
LABELS	FLAMMABLE LIQUID
REPORTABLE QUANTITY	5000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	METHANOL
HAZARD CLASS	3.2, 6.1
UN/NA	UN1230
LABELS	FLAMMABLE LIQUID, POISON

MSDS for METHANOL

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MSDS for HEXANEPage 1

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: HEXANE
 FORMULA: C6H14
 FORMULA WT: 86.18
 CAS NO.: 110-54-3
 NIOSH/RTECS NO.: MN9275000
 COMMON SYNONYMS: NORMAL HEXANE; HEXYL HYDRIDE
 PRODUCT CODES: 9310,9304,N168,9303
 EFFECTIVE: 09/26/86
 REVISION #01

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	2	MODERATE
FLAMMABILITY	-	3	SEVERE (FLAMMABLE)
REACTIVITY	-	0	NONE
CONTACT	-	2	MODERATE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

DANGER
 CAUSES IRRITATION
 EXTREMELY FLAMMABLE

HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN

KEEP AWAY FROM HEAT, SPARKS, FLAME.

DO NOT BREATHE VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH
 ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE,
 USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIVE.
 FLUSH SPILL AREA WITH WATER SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
N - HEXANE	>98	110-54-3
METHYLCYCLOPENTANE	<2	96-37-7

3 - PHYSICAL DATA

BOILING POINT: 69 C (156 F) VAPOR PRESSURE(MM HG): 130

MSDS for HEXANE

Page 2

MELTING POINT: -95 C (-139 F) VAPOR DENSITY(AIR=1): 3.0
SPECIFIC GRAVITY: 0.66 EVAPORATION RATE: 9
(H2O=1) (BUTYL ACETATE=1)
SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 100
APPEARANCE & ODOR: COLORLESS LIQUID WITH MILD ODOR.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP -23 C (-10 F) NFPA 704M RATING: 1-3-0
FLAMMABLE LIMITS: UPPER - 7.7 % LOWER - 1.2 %
FIRE EXTINGUISHING MEDIA
USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
(POSITIVE PRESSURE IF AVAILABLE) BREATHING APPARATUS WITH FULL FACEPIECE.
MOVE EXPOSED CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK.
USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK.
CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG
OXIDIZERS MAY CAUSE FIRE.

TOXIC GASES PRODUCED

CARBON MONOXIDE, CARBON DIOXIDE

5 - HEALTH HAZARD DATA

BLOOD CHANGES HAVE BEEN REPORTED IN LABORATORY ANIMALS. FETAL DEATH
HAS BEEN REPORTED IN LABORATORY ANIMALS BUT NOT FOUND IN TWO ADDITIONAL
STUDIES.

THRESHOLD LIMIT VALUE (TLV/TWA): 180 MG/M3 (50 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 1800 MG/M3 (500 PPM)

TOXICITY: LD50 (ORAL-RAT) (G/KG) - 28.7

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION OF VAPORS MAY CAUSE HEADACHE, NAUSEA, VOMITING, DIZZINESS,
DROWSINESS, IRRITATION OF RESPIRATORY TRACT, AND LOSS OF CONSCIOUSNESS.
INHALATION OF VAPORS MAY CAUSE NARCOSIS.
CONTACT WITH SKIN OR EYES MAY CAUSE IRRITATION.

MSDS for HEXANE

Page 3

CONTACT WITH SKIN HAS A DEFATTING EFFECT, CAUSING DRYING AND IRRITATION.
INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS,

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1000 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, NEOPRENE GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS

BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	HEXANE
HAZARD CLASS	FLAMMABLE LIQUID
UN/NA	UN1208
LABELS	FLAMMABLE LIQUID

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	HEXANES
HAZARD CLASS	3.1
UN/NA	UN1208
LABELS	FLAMMABLE LIQUID

MSDS for ISOPROPYL ALCOHOLPage 1

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: ISOPROPYL ALCOHOL
 FORMULA: CH₃CHOHCH₃
 FORMULA WT: 60.10
 CAS NO.: 67-63-0
 NIOSH/RTECS NO.: NT805000
 COMMON SYNONYMS: 2-PROPANOL; ISOPROPANOL; SEC-PROPYL ALCOHOL; IPA;
 DIMETHYLCARBINOL
 PRODUCT CODES: U298,5082,9080
 EFFECTIVE: 09/03/86
 REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 1 SLIGHT
 FLAMMABILITY - 3 SEVERE (FLAMMABLE)
 REACTIVITY - 1 SLIGHT
 CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

WARNING

FLAMMABLE

CAUSES IRRITATION

HARMFUL IF SWALLOWED OR INHALED

KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING.
 AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH
 ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE,
 USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIVE.
 FLUSH SPILL AREA WITH WATER SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
ISOPROPYL ALCOHOL	90-100	67-63-0

3 - PHYSICAL DATA

BOILING POINT: 82 C (180 F) VAPOR PRESSURE(MM HG) : 33

MSDS for ISOPROPYL ALCOHOL

Page 2

MELTING POINT: -89 C (-128 F) VAPOR DENSITY(AIR=1): 2.1
SPECIFIC GRAVITY: 0.79 EVAPORATION RATE: 2.83
(H2O=1) (BUTYL ACETATE=1)
SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 100
APPEARANCE & ODOR: COLORLESS LIQUID WITH SLIGHT ODOR OF RUBBING ALCOHOL.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP 12 C (53 F) NFPA 704M RATING: 1-3-0
FLAMMABLE LIMITS: UPPER - 12.0 % LOWER - 2.0 %
FIRE EXTINGUISHING MEDIA
USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK. CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE.

TOXIC GASES PRODUCED

CARBON MONOXIDE, CARBON DIOXIDE

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 980 MG/M3 (400 PPM)
SHORT-TERM EXPOSURE LIMIT (STEL): 1225 MG/M3 (500 PPM)
PERMISSIBLE EXPOSURE LIMIT (PEL): 980 MG/M3 (400 PPM)

TOXICITY: LD50 (ORAL-RAT) (MG/KG) - 5045
LD50 (IPR-MOUSE) (MG/KG) - 933
LD50 (SKN-RABBIT) (G/KG) - 13
LD50 (IV-MOUSE) (MG/KG) - 1863

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION OF VAPORS MAY CAUSE HEADACHE, NAUSEA, VOMITING, DIZZINESS,

MSDS for ISOPROPYL ALCOHOL

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DROWSINESS, IRRITATION OF RESPIRATORY TRACT, AND LOSS OF CONSCIOUSNESS.
INHALATION OF VAPORS MAY CAUSE PULMONARY EDEMA.

LIQUID MAY BE IRRITATING TO SKIN AND EYES. PROLONGED SKIN CONTACT MAY RESULT IN DERMATITIS. EYE CONTACT MAY RESULT IN TEMPORARY CORNEAL DAMAGE. INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS, GASTROINTESTINAL IRRITATION. INGESTION MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION.

TARGET ORGANS

EYES, SKIN, RESPIRATORY SYSTEM

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

ROUTES OF ENTRY

INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.

IF SWALLOWED, DO NOT INDUCE VOMITING.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. FLUSH SKIN WITH WATER.

6 - REACTIVITY DATA

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS, ALUMINUM, NITRIC ACID, SULFURIC ACID, AMINES AND AMMONIA, HALOGEN ACIDS AND HALOGEN COMPOUNDS

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING, OR FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D001 (IGNITABLE WASTE)

MSDS for ISOPROPYL ALCOHOL

Page 4

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1000 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, NEOPRENE GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS

BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	ISOPROPANOL
HAZARD CLASS	FLAMMABLE LIQUID
UN/NA	UN1219
LABELS	FLAMMABLE LIQUID

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	ISOPROPANOL
HAZARD CLASS	3.2
UN/NA	UN1219
LABELS	FLAMMABLE LIQUID

 MSDS for BUFFER CONCENTRATE (BIPHTHALATE), PH 4, DIL,JT-B5625.ms Page 1

 1 - PRODUCT IDENTIFICATION

PRODUCT NAME: BUFFER CONCENTRATE (BIPHTHALATE), PH 4, DILUT-IT
 FORMULA:
 FORMULA WT: .00
 CAS NO.: - -
 COMMON SYNONYMS: (AMPOULE FOR DILUTION)
 PRODUCT CODES: 4795
 EFFECTIVE: 05/05/86
 REVISION #01

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	- 0	NONE
FLAMMABILITY	- 0	NONE
REACTIVITY	- 0	NONE
CONTACT	- 1	SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

CAUTION

MAY CAUSE IRRITATION

MAY BE HARMFUL IF SWALLOWED

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

 2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
NOT APPLICABLE		

 3 - PHYSICAL DATA

BOILING POINT: N/A	VAPOR PRESSURE(MM HG): N/A
MELTING POINT: N/A	VAPOR DENSITY(AIR=1): N/A
SPECIFIC GRAVITY: N/A (H2O=1)	EVAPORATION RATE: N/A (BUTYL ACETATE=1)

 MSDS for BUFFER CONCENTRATE (BIPHTHALATE), PH 4, DIL,JT-B5625.ms Page 2

SOLUBILITY (H₂O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 99

APPEARANCE & ODOR: CLEAR, COLORLESS ODORLESS LIQUID.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

5 - HEALTH HAZARD DATA

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

VAPORS MAY BE IRRITATING TO SKIN, EYES, AND MUCOUS MEMBRANES.

LIQUID MAY BE IRRITATING TO SKIN AND EYES.

INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS,
GASTROINTESTINAL IRRITATION.

TARGET ORGANS

NONE IDENTIFIED

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

ROUTES OF ENTRY

INHALATION, INGESTION, ABSORPTION, SKIN CONTACT, EYE CONTACT

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.

IF SWALLOWED, DO NOT INDUCE VOMITING; IF CONSCIOUS, GIVE LARGE AMOUNTS OF WATER.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.

WASH CLOTHING BEFORE RE-USE.

6 - REACTIVITY DATA

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS.
TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE
INTO CONTAINER FOR LATER DISPOSAL. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION
TO KEEP VAPOR AND MIST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: A RESPIRATOR WITH DUST/MIST FILTER IS RECOMMENDED.
IF AIRBORNE CONCENTRATION EXCEEDS CAPACITY OF
RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS
IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM,
PROTECTIVE SUIT, PROPER GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: BLUE (HEALTH)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. STORE IN SECURE POISON AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

 MSDS for BUFFER CONCENTRATE (PHOSPHATE), PH 7, DILUT, JT-B5629.ms Page 1

 1 - PRODUCT IDENTIFICATION

PRODUCT NAME: BUFFER CONCENTRATE (PHOSPHATE), PH 7, DILUT-IT
 FORMULA:
 FORMULA WT: .00
 CAS NO.: - -
 COMMON SYNONYMS: (AMPOULE FOR DILUTION)
 PRODUCT CODES: 4796
 EFFECTIVE: 03/20/86
 REVISION #01

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 0 NONE
 FLAMMABILITY - 0 NONE
 REACTIVITY - 0 NONE
 CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

CAUTION

MAY CAUSE IRRITATION

MAY BE HARMFUL IF SWALLOWED

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

 2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
NOT APPLICABLE		

 3 - PHYSICAL DATA

BOILING POINT: N/A	VAPOR PRESSURE(MM HG): N/A
MELTING POINT: N/A	VAPOR DENSITY(AIR=1): N/A
SPECIFIC GRAVITY: N/A (H2O=1)	EVAPORATION RATE: N/A (BUTYL ACETATE=1)

 MSDS for BUFFER CONCENTRATE (PHOSPHATE), PH 7, DILUT, JT-B5629.ms Page 2

SOLUBILITY (H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: ~95

APPEARANCE & ODOR: CLEAR, COLORLESS SOLUTION WITHOUT AN ODOR.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

5 - HEALTH HAZARD DATA

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

LIQUID MAY BE IRRITATING TO SKIN AND EYES.
INGESTION MAY BE HARMFUL.

TARGET ORGANS

NONE IDENTIFIED

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

ROUTES OF ENTRY

NONE INDICATED

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS, IMMEDIATELY GIVE
LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.

INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE EXPOSED
PERSON TO FRESH AIR. GET MEDICAL ATTENTION.

EYE CONTACT: IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15
MINUTES. GET MEDICAL ATTENTION.

SKIN CONTACT: IMMEDIATELY WASH WITH PLENTY OF SOAP AND WATER FOR AT LEAST
15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

7 - SPILL AND DISPOSAL PROCEDURES

 STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
 WEAR SUITABLE PROTECTIVE CLOTHING. TAKE UP WITH SAND OR OTHER NONCOM-
 BUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL.
 FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

 8 - PROTECTIVE EQUIPMENT

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION TO KEEP VAPOR AND MIST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS HIGH, USE AN APPROPRIATE RESPIRATOR OR DUST MASK.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, PROPER GLOVES ARE RECOMMENDED.

 9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

 10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

 MSDS for BUFFER SOLUTION (BORATE), PH 10

Page 1

 1 - PRODUCT IDENTIFICATION

PRODUCT NAME: BUFFER SOLUTION (BORATE), PH 10
 FORMULA:
 FORMULA WT: .00
 CAS NO.: - -
 PRODUCT CODES: 5655,5609
 EFFECTIVE: 11/24/86
 REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 2 MODERATE
 FLAMMABILITY - 0 NONE
 REACTIVITY - 0 NONE
 CONTACT - 3 SEVERE (LIFE)

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

DANGER

HARMFUL IF SWALLOWED

EXCEPTIONAL CONTACT HAZARD - READ MATERIAL SAFETY DATA SHEET

DO NOT GET IN EYES, ON SKIN, ON CLOTHING.

AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

SAF-T-DATA(TM) STORAGE COLOR CODE: BLUE (HEALTH)

 2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
BUFFER SOLUTION (BORATE), PH 10	90-100	

 3 - PHYSICAL DATA

BOILING POINT: 100 C (212 F)	VAPOR PRESSURE(MM HG): N/A
MELTING POINT: N/A	VAPOR DENSITY(AIR=1): N/A
SPECIFIC GRAVITY: 1.00 (H2O=1)	EVAPORATION RATE: N/A (BUTYL ACETATE=1)

 MSDS for BUFFER SOLUTION (BORATE), PH 10

Page 2

SOLUBILITY (H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: ~90

APPEARANCE & ODOR: CLEAR, COLORLESS SOLUTION WITHOUT AN ODOR.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

TOXIC GASES PRODUCED

CARBON MONOXIDE, CARBON DIOXIDE

5 - HEALTH HAZARD DATA

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

LIQUID MAY BE IRRITATING TO SKIN AND EYES.

INGESTION MAY BE HARMFUL.

TARGET ORGANS

NONE IDENTIFIED

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

ROUTES OF ENTRY

NONE INDICATED

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS, IMMEDIATELY GIVE LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.

INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE EXPOSED PERSON TO FRESH AIR. GET MEDICAL ATTENTION.

EYE CONTACT: IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. GET MEDICAL ATTENTION.

SKIN CONTACT: IMMEDIATELY WASH WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

MSDS for BUFFER CONCENTRATE (BIPHTHALATE), PH 4, DIL, JT-B5625.ms Page 3

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. TAKE UP WITH SAND OR OTHER NONCOM-
BUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL.
FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION
TO KEEP VAPOR AND MIST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION
CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS
HIGH, USE AN APPROPRIATE RESPIRATOR OR DUST MASK.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, PROPER GLOVES ARE
RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE
AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

 MSDS for ALCONOX(R) Page 1

 1 - PRODUCT IDENTIFICATION

PRODUCT NAME: ALCONOX(R)
 FORMULA:
 FORMULA WT: .00
 CAS NO.: - -
 COMMON SYNONYMS: ALKYL ARYL SULFONATES
 PRODUCT CODES: A461
 EFFECTIVE: 11/22/85
 REVISION #01

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 1 SLIGHT
 FLAMMABILITY - 0 NONE
 REACTIVITY - 1 SLIGHT
 CONTACT - 2 MODERATE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

WARNING

CAUSES IRRITATION

KEEP IN TIGHTLY CLOSED CONTAINER. WASH THOROUGHLY AFTER HANDLING.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

 2 - HAZARDOUS COMPONENTS

	COMPONENT	%	CAS NO.
ALCONOX(R)		90-100	

 3 - PHYSICAL DATA

BOILING POINT: N/A VAPOR PRESSURE(MM HG): N/A
 MELTING POINT: N/A VAPOR DENSITY(AIR=1): N/A
 SPECIFIC GRAVITY: 0.00 EVAPORATION RATE: N/A
 (H2O=1) (BUTYL ACETATE=1)
 SOLUBILITY(H2O): APPRECIABLE (MORE THAN 10 %) % VOLATILES BY VOLUME: N/A

 MSDS for ALCONOX(R) Page 2

APPEARANCE & ODOR: WHITE OPAQUE POWDER.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

5 - HEALTH HAZARD DATA

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

CONTACT WITH SKIN OR EYES MAY CAUSE IRRITATION.
INGESTION MAY BE HARMFUL.

TARGET ORGANS

NONE IDENTIFIED

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

ROUTES OF ENTRY

NONE INDICATED

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN.

IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR
AT LEAST 15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.

WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND
COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

MSDS for ALCONOX(R)

Page 3

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL

ENVIRONMENTAL REGULATIONS.

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION TO KEEP FUME OR DUST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS HIGH, USE AN APPROPRIATE RESPIRATOR OR DUST MASK.

EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, PROPER GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)