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Final

Site Specific Work Plans for SWMUs 303/318 and 336

RCRA Program
Marine Corps Base
Camp Lejeune, North Carolina

Prepared For

NAVFAC
Naval Facilities Engineering Command
MID-ATLANTIC

Norfolk, Virginia

Contract No. N62470-02-D-3052
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Prepared by

CH2M HILL

Baker
Environmental, Inc.

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RCRA Program

SWMUs 303/318 and 336

MCB Camp Lejeune

Jacksonville, North Carolina

Contract Task Order Number – 091
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SITE SPECIFIC WORK PLAN

FINAL

SITE SPECIFIC WORK PLANS FOR SWMUS 303/318 AND 336

RCRA PROGRAM
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0091

FEBRUARY 2005

Prepared for:

DEPARTMENT OF THE NAVY
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NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

Under the:

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LIST OF ACRONYMS AND ABBREVIATIONS

ASTs	Aboveground Storage Tanks
ASTM	American Society for Testing and Materials
Baker	Baker Environmental, Inc.
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action Navy
CLP	Contract Laboratory Program
COPCs	Constituents of Potential Concern
CSIs	Confirmatory Sampling Investigations
CTO	Contract Task Order
cDCE	cis-1,2-Dichloroethene
DoN	Department of Navy
DOT	Department of Transportation
DQOs	Data Quality Objectives
ERA	Ecological Risk Assessment
GC/MS	Gas Chromatograph/Mass Spectroscopy
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
ID	Inside Diameter
IDW	Investigation Derived Waste
ILM	Inorganic Low Medium
IR	Installation Restoration
MCB	Marine Corps Base
MSL	Mean Sea Level
MCAS	Marine Corps Air Station
MS/MSDs	Matrix Spike/Matrix Spike Duplicates
NAVFAC	Naval Facilities Engineering Command
NC DENR	North Carolina Department of Environmental and Natural Resources
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFESC	Naval Facilities Engineering Service Center
NTUs	Nephelometric Turbidity Units
OLM	Organic Low Medium
PCE	Tetrachloroethene
PID	Photo-ionization Detector
PRGs	Preliminary Remediation Goals
PVC	Polyvinyl Chloride

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAGs	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
Redox	Oxidation/Reduction
RFIs	RCRA Facility Investigations
SEA	Safety and Environmental Affairs
Shaw	Shaw Environmental, Inc.
SOP	Standard Operating Procedure
SOW	Statement of Work
SVOCs	Semi-volatile Organic Compounds
SW	Solid Waste
SWMUs	Solid Waste Management Units
TCE	Tetrachloroethene
TCL	Target Compound List
the Base	MCB Camp Lejeune, North Carolina
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
VC	Vinyl Chloride
WQPs	Water Quality Parameters

1.0 INTRODUCTION

This Site-Specific Work Plan presents the strategy and technical approach for conducting Resource, Conservation, and Recovery Act (RCRA) Facility Investigations (RFIs) at the following Solid Waste Management Units (SWMUs):

- SWMU 303 – Aboveground Storage Tanks (ASTs)
- SWMU 318 – AS515 Oil/Water Separator
- SWMU 336 – AS4104 Paint Stripper

SWMU 303 and SWMU 318, as well as an associated helicopter wash pad, were combined into one RFI because of their close proximity and relationship to each other. The three aforementioned SWMUs are located within the Marine Corps Base (MCB) Camp Lejeune, North Carolina complex (the Base) but specifically at Marine Corps Air Station (MCAS) New River. A general location/index map of the Base is provided as Figure 1-1. Figure 1-2 depicts the locations of the three SWMUs within MCAS New River.

This Work Plan was prepared by Baker Environmental, Inc. (Baker) under Contract Task Order (CTO) 0091 of the Department of the Navy's (DoN's) Comprehensive Long-Term Environmental Action Navy (CLEAN) Program (contract number N62470-02-D-3052). Baker is subcontracted to CH2M Hill for implementation of this project. It should be noted that this Work Plan is to be used in conjunction with the Master Project Plans (Baker, 2003), which include the Master Work Plan, Master Quality Assurance Project Plan (QAPP), and Master Health and Safety Plan (HASP). The Master Project Plans will be referenced herein to the greatest extent possible.

2.0 BACKGROUND INFORMATION

Background information for the Base, including location, topography, geology, and RCRA-related history, is presented in the Master Project Plans and is not repeated herein. Pertinent background information for SWMUs 303/318 and 336 is presented below.

2.1 SWMU 303/318 - Aboveground Storage Tanks/AS515 Oil/Water Separator

SWMU 303/318 is located in the MCAS New River area east of Bancroft Street and adjacent to a helicopter wash pad and upgradient of Installation Restoration (IR) Site 86 (see Figure 1-2). SWMU 303 consists of two steel ASTs that are contained within a concrete bermed structure. The tanks were installed in 1983 and are labeled as "Hydraulic Fluid, Engine and Transmission Oils Only, No Solvents or Other Chemicals". SWMU 318 is a concrete, multi-chambered oil/water separator and grit chamber associated with the helicopter wash pad. The primary function of SWMU 318 is to collect water, soap, oil, grease, and dirt from the wash pad; separate the solids from the liquids; and then segregate the oil and grease from the remaining liquids. The helicopter wash pad is a concrete structure with raised edges. Each half of the wash pad slopes to a drain that is connected to the oil/water separator via underground piping. The area surrounding SWMU 303/318 is covered with grass, however, to the south of the SWMU is an area covered with concrete and used for aircraft parking and traffic. A drainage ditch that collects stormwater run-off is located adjacent to the oil/water separator (SWMU 318). The site features are shown on Figure 2-1.

Several environmental investigations have been conducted at SWMU 303/318 since 1997, including a Phase I Confirmatory Sampling Investigation (CSI), Phase II CSI, and RFI. The following paragraphs present a brief summary of these investigations. Detailed descriptions of the investigations are presented in the reports referenced herein. The distributions of constituents exceeding the regulatory-driven screening values as well as the background/secondary screening values (for metals) in soil and groundwater are shown on Figures 2-1 through 2-6.

The CSI was completed in two phases. Phase I (Baker, 2001a) was conducted in September 1997 and included a soil investigation in the vicinity of the SWMUs. Phase II (Baker, 2002a) was conducted in March/April 2002 and included additional soil sampling and a groundwater investigation. The purpose of the CSI was to evaluate potential impacts to soil and groundwater in the vicinity of the SWMUs. The field investigations included the following:

- Soil sampling at six soil borings and three temporary well borings advanced around the perimeter of SWMU 303
- Soil sampling at three soil borings and three temporary well borings advanced around the perimeter of SWMU 318
- Surface soil sampling at three locations within the drainage ditch adjacent to SWMU 318
- Groundwater sampling at the temporary wells

All samples were submitted to the laboratory and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and/or RCRA metals. Based on evaluation of the results from SWMU 303, one VOC (acetone), a few SVOCs, and one metal (arsenic) were detected in soil at concentrations exceeding the screening values. In addition, SVOCs (4-methylphenol and naphthalene) and metals (arsenic, chromium, and lead) were detected in groundwater at concentrations exceeding the screening values.

Based on evaluation of the results from SWMU 318, a number of VOCs, SVOCs, and metals were detected in soil at concentrations exceeding the screening values. In addition, VOCs (benzene, trichloroethene [TCE], and vinyl chloride [VC]), SVOCs (4-methylphenol and naphthalene) and metals (arsenic) were detected in groundwater at concentrations exceeding the screening values.

In 2003, the helicopter wash pad associated with SWMU 318 was scheduled to be demolished/replaced by the Base. However, during demolition activities, evidence of black petroleum-stained/saturated soils was identified beneath the concrete in the northeast portion of the pad. As a result, the demolition activities were terminated and Shaw Environmental, Inc. (Shaw) patched the disturbed portions of the wash pad with new concrete to cap the suspect contamination until a more comprehensive investigation could be conducted.

Based on the results of the Phase I and Phase II CSIs and observations made during demolition of a portion of the helicopter wash pad, it was evident that soil and groundwater have been impacted as a result of a release(s) from SWMU 303/318. A RFI was warranted to adequately characterize the SWMUs and determine the potential for future corrective action (if any) based on risks to human health and the environment. As previously discussed, these two SWMUs, as well as the helicopter wash pad, were combined into one RFI because of their close proximity and relationship to each other.

The field investigation for the initial RFI was conducted from February through April 2004. A supplemental field investigation was conducted in June 2004 under CTO-0191. The investigations included the following:

- Soil sampling at 13 borings
- Groundwater grab sampling at 30 borings
- Installation of three groundwater monitoring wells
- Groundwater sampling at the three new wells and three existing wells at Site 86

Based on evaluation of the results, soil contamination appears to be primarily related to petroleum constituents and generally has been delineated around the wash pad, both horizontally and vertically. The exception is naphthalene, which has not been delineated in soil immediately above the water table south of boring 318-SB03. Chlorinated solvent contamination in soil was limited.

There appears to be little correlation between petroleum constituents and chlorinated solvents in soil and groundwater at this point in the investigation. Groundwater contamination related to petroleum constituents is present in the upper portion (10 to 19 feet below ground surface [bgs]) of the shallow aquifer mainly in the vicinity of the northeast and northwest corners of the wash pad. While these locations appear reasonable given SWMU-related activities, they are not directly below observed soil contamination. Groundwater contamination related to chlorinated solvents is likely attributable to SWMU-related activities, but there is no clear source evident in soil at this point in the investigation.

Contaminant concentrations in groundwater appear to be highest and more widely distributed in the deeper portion of the shallow aquifer immediately above the Belgrade formation (24 to 30 feet bgs). Benzene, naphthalene, and cis-1,2-dichloroethene (cDCE) exhibit an east-west distribution pattern despite a northeast groundwater flow direction. TCE also exhibits an east-west distribution, but trends to the northeast based on the presence of elevated levels of TCE at IR Site 86. The pattern of TCE suggests that it has migrated to Site 86 since 1995.

Groundwater contamination generally decreases significantly below the Belgrade formation in the deepest interval sampled (40 to 44 feet below ground surface), but still exhibits concentrations of

benzene, TCE, and VC above the regulatory-driven screening values. This suggests that the Belgrade formation may be slowing vertical constituent migration.

cDCE has been sufficiently delineated both horizontally and vertically at this point. Naphthalene has been delineated vertically, but has not been delineated horizontally in the shallow or intermediate zones. Benzene, TCE and VC have not been delineated vertically or horizontally.

2.2 SWMU 336 - AS4106 Paint Stripper

SWMU 336 consists of a pair of paint stripping vats located in a separate room within Building AS-4106 at MCAS New River. The floor beneath the vats is concrete. Two floor drains are located on either side of the vats. These drains exit the building and are assumed to connect to the sanitary sewer. A spill kit is located near the exit doors. Spills that occur are properly contained and cleaned up according to Base personnel. The site features are shown on Figure 2-7.

Sediment samples were proposed to be collected from the floor drains as part of the Phase I CSIs that were conducted in September 1997. The purpose of the sediment sampling was to determine if a release(s) occurred at the SWMU because the contaminated material would most likely exit the SWMU via the floor drains. However, the floor drains contained no sediment that could be sampled.

The Phase II CSI (Baker, 2002a) was conducted in March/April 2002. Additional samples were collected during a supplemental Phase II investigation conducted in June/July 2003. The purpose of the CSI was to evaluate potential impacts to soil and groundwater in the vicinity of the SWMU. The field investigations included the following:

- Soil sampling at six temporary well borings advanced within the vicinity of the drain lines exiting the room with the paint stripping vats
- Groundwater sampling at six temporary wells

The soil and groundwater samples were submitted to the laboratory and analyzed for VOCs, SVOCs, and RCRA metals. The distributions of constituents exceeding the regulatory-driven screening values as well as the background/secondary screening values (for metals) in soil and groundwater are shown on Figures 2-7 and 2-8. Based on evaluation of the results, one VOC (methylene chloride) and one metal (cadmium) were detected in soil at concentrations exceeding

the screening values. The isolated and limited extent of methylene chloride and cadmium suggest that neither constituent represents a confirmed release from the SWMU, nor do they represent a significant impact to soil. Tetrachloroethene (PCE) was detected in groundwater at concentrations exceeding the screening value.

Based on the results of the Phase II CSI, it was evident that groundwater has been impacted as a result of a release(s) from the SWMU. An RFI was required to adequately characterize the SWMU and determine the potential for future corrective action (if any) based on risks to human health and the environment. These activities would primarily include addressing the extent of PCE in groundwater and identifying a potential source in soil.

3.0 DATA QUALITY AND SAMPLING OBJECTIVES

The SWMU-specific objectives presented in this section have been developed using the United States Environmental Protection Agency (USEPA) seven-step data quality objectives (DQOs) process as presented in the Guidance for the Data Quality Objectives Process (USEPA, 2000a) and Data Quality Objectives Process for Hazardous Waste Site Investigations (USEPA, 2000b).

3.1 Data Quality Objectives Process

DQOs are qualitative and quantitative statements, developed using the USEPA DQO process, that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as a basis for establishing the quality and quantity of data needed to support decisions. The seven-step DQO process is as follows:

- Step 1 - State the Problem
- Step 2 - Identify the Decision
- Step 3 - Identify the Inputs to the Decision
- Step 4 - Define the Boundaries of the Study
- Step 5 - Develop a Decision Rule
- Step 6 - Specify Tolerable Limits on Decision Errors
- Step 7 - Optimize the Design for Obtaining Data

The following sections present the seven-step DQO process developed for the subject RFIs.

3.1.1 Step 1 - State the Problem

The first activity associated with this step is to establish the planning team. The planning team will include the North Carolina Department of Environmental and Natural Resources (NC DENR), Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic Division, the Base, CH2M Hill, and Baker. These team members are decision-makers for the DQO Process.

The planning team's primary goal is to determine the potential for future corrective action (if any) at the SWMUs based on risks to human health and the environment. Previous investigations have been conducted at each of the SWMUs to evaluate potential impacts to soil and groundwater. Based on the results of these investigations, it was evident that soil and groundwater have been

impacted as a result of a release(s) from the SWMUs. The problem is that the SWMUs have not been adequately characterized and the nature and extent of contamination have not been determined (i.e., a sufficient quantity of data does not exist to support a corrective action decision). Specifically, the field information generated during the RFIs will be used to meet the following objectives:

- Collect information to supplement and/or verify the environmental setting at the SWMUs
- Characterize surface/subsurface soils and groundwater in the vicinity of the SWMUs
- Collect information to sufficiently characterize the contamination and areas where the contaminants have been released
- Determine the nature, extent, direction, and rate of movement of contamination in the vicinity of the SWMUs
- Estimate certain engineering properties of soils (e.g., permeability, dry bulk density, grain size)
- Further evaluate hydrogeologic conditions
- Evaluate potential risks to human health and ecological receptors

The final activity associated with this step is to identify available resources, constraints, and deadlines. The project team organization and project schedule are presented in Sections 5.0 and 6.0 of this Work Plan, respectively. The schedule presents the anticipated completion and/or submittal dates for specific tasks and documents.

3.1.2 Step 2 - Identify the Decision

The principal study question identified is:

- What is the nature and extent of contamination in the vicinity of the SWMUs?

Before a decision statement can be formulated, a definition of "contaminated" must be clarified. For the RCRA program, soil and groundwater will be considered "contaminated" if concentrations of constituents of potential concern (COPCs) exceed the applicable North Carolina 2L Standards, NC DENR soil to groundwater screening values and/or USEPA Region IX Preliminary Remediation Goals (PRGs) as well as the background/secondary screening values (for metals) (Baker 2001b, 2001b, 2002b).

Considering the principal study question and definition of "contaminated," the decision statement is as follows:

- Delineate the nature and extent of contamination in the vicinity of the SWMUs by determining whether or not the concentration of a given COPC at any given sampling point exceeds the regulatory-driven screening values as well as the background/secondary screening values (for metals).

3.1.3 Step 3 - Identify the Inputs to the Decision

Existing information regarding the nature and extent of contamination in the vicinity of the SWMUs varies. For example, at SWMU 336, very little is known regarding the nature and extent of contamination. In contrast, much information has been collected regarding the nature and extent of contamination at SWMU 303/318. Additional sampling is needed to fill data gaps and delineate the extent of contamination. Regardless, it is evident that additional data is required to adequately characterize the SWMUs and determine the potential for future corrective action (if any) based on risks to human health and the environment. The type of data and sources used to resolve the decision statements include the following:

Types of Information	Sources of Information
Nature and extent of contaminated soil	Existing analytical data and new field/analytical data from soil samples
Nature and extent of contaminated groundwater	Existing analytical data from temporary wells and new field/analytical data groundwater from groundwater grab samples/new monitoring wells
Groundwater flow/hydrogeologic characteristics	Groundwater elevation data and slug test data from new monitoring wells
Engineering properties of soil (e.g., permeability, dry bulk density, grain size)	Geotechnical data from soil samples (e.g., Shelby tubes)

Sufficient samples will be collected to attempt to fill data gaps and ensure adequate coverage of the SWMUs. The samples will be analyzed for VOCs, SVOCs, and/or metals using a combination of mobile laboratory and fixed-based laboratory programs as described in Section 4.3. The method detection limits will be below the screening values. The criterion for determining the presence of contamination will be based on analytical results and applicable

regulatory-driven screening values and background/secondary screening values (for metals). Existing and new analytical data will be used to update/conduct human health and ecological risk assessments to determine if contaminants at the SWMUs pose unacceptable risks.

3.1.4 Step 4 - Define the Boundaries of the Study

The SWMU 303/318 study area is approximately 4 to 5 acres in size. Significant physical constraints exist in the study area. Building AS513 and an associated storage area are located adjacent to and north of the SWMU. Building AS515 is located adjacent to and west of the SWMU. This building is an active facility and it will be necessary to coordinate with Base personnel for work being conducted inside the building. The airfield, which is frequently used for helicopter parking, is located adjacent to and south of the SWMU and is overlain by thick concrete. Access to this area is restricted. Close planning and coordination with MCAS Safety and Environmental Affairs (SEA), air operations, and the control tower will be necessary for work being conducted on the airfield. IR Site 86 is located east and northeast of the SWMU. Because the chlorinated solvent plume at the SWMU has been shown to extend within the boundaries of Site 86, the study area will not expand beyond the southwest boundary of Site 86.

The SWMU 336 study area is approximately 2 acres in size. Significant physical constraints also exist in this study area. Building AS4106 is located adjacent to and south of the SWMU. This building is an active facility and it will be necessary to coordinate with Base personnel for work being conducted inside the building. The airfield, which is frequently used for helicopter parking, is located south of Building AS4106 and is overlain by thick concrete. Access to this area is restricted. Close planning and coordination with MCAS SEA, air operations, and the control tower will be necessary for work being conducted on the airfield.

Weather conditions (such as heavy rain) can delay the field activities, but is not a serious constraint. Temporal changes in the extent of contamination at the SWMUs are expected to be limited. Plume expansion or contaminant mass loss may occur; however, the rate of expansion/attenuation compared with the project duration is expected to be negligible. As a result, data collection is not time dependent and the decision regarding the nature and extent of contamination will be based on existing conditions at the time of the investigations.

3.1.5 Step 5 - Develop a Decision Rule

The multiple decision statements for the SWMUs can be categorized in three groups, as follows:

1. A determination of the nature of contamination
2. A determination of the extent of contamination
3. A determination of the representativeness of previous analytical data

To determine the nature of contamination at a SWMU, the decision rule is as follows:

- If a given concentration for a given constituent at a given sampling point exceeds the method detection limit, that constituent will be considered part of the nature of that sample.

To determine the extent of contamination at a SWMU, the decision rule is as follows:

- If a given concentration at a given sampling point exceeds the regulatory-driven screening values as well as the background/secondary screening values (for metals) for that contaminant, then that sampling point will be considered to be within the contaminant plume.

To determine the representativeness of previous analytical data at a SWMU, the decision rule is as follows:

- If a given concentration at a given sampling point is similar to the previous data in that it exceeds the regulatory-driven screening values as well as the background/secondary screening values (for metals) for that contaminant, then the sampling point will be considered to be representative of conditions at that location.

3.1.6 Step 6 - Specify Tolerable Limits on Decision Errors

A decision error occurs when the data misleads the planning team into choosing the wrong response action, in the sense that a different response action would have been chosen if the planning team had been able to access "perfect data" or absolute truth. The possibility of a decision error may occur as sampling design error and/or measurement error. Although the

possibility of decision error can never be totally eliminated, it can be minimized and controlled. For this field investigation, sampling and measurement decision errors will be controlled by:

- Developing a sampling plan based on existing historical data that includes points inside and outside of the suspected contaminant source area/plume. This sampling approach will help ensure that the extent of contamination is sufficiently defined and that worse site conditions (i.e., areas posing the greatest risk to human health and the environment) will be captured.

- Using analytical methods that achieve reporting limits less than the screening values. This controls measurement error by ensuring that the analytical techniques provide results that will allow for the determination of the absence of a constituent below the screening values. Also, the proposed analytical methods are USEPA approved methods with stringent quality assurance/quality control (QA/QC) protocol. This minimizes the error in the precision and accuracy of the analytical program.

Although numerous efforts will be taken to control and minimize errors, there is always some uncertainty associated with sampling and analytical programs. Possible decision errors are as follows:

- Decision error based on a false positive (i.e., Type 1: Concluding there is risk present to human health or the environment, when, in fact, there is no risk. Concluding that the extent of contamination is not defined, when, in fact, it is.)

- Decision error based on a false negative (i.e., Type II: Concluding there is no risk present to human health or the environment, when, in fact, there is risk. Concluding that the extent of contamination is defined, when, in fact, it is not.)

Typically, human health and ecological risk assessments consider a Type 1 error rate, or significance level of 5 percent (or $\alpha = 0.05$) as acceptable. Risk management decisions will determine where the consequences of a false acceptance decision error are considered tolerable (gray region).

3.1.7 Step 7 - Optimize the Design for Obtaining Data

There are two fundamental goals for Step 7, and both rely on review of existing data and information:

- To evaluate the decision rule
- To design and optimize the sampling and analysis program

The decision rules developed in Step 5 have been shown to be valid following review of existing data. In this case, a simple statistical hypothesis test, broadly classified as a one-sample test was used. The test involved comparison of individual analytical data to a known value (regulatory-driven screening values and background/secondary screening values).

Existing information/data has been reviewed to evaluate and develop the data collection strategy for the field program. These documents included the Phase I SWMU Confirmatory Sampling Report (Baker, 2001a), the Phase II SWMU Confirmatory Sampling Report (Baker, 2002a), and preliminary RFI data from SWMU 303/318. Throughout the field investigation, sampling, analysis, and evaluation of data will be continually monitored to ensure that the proposed program is providing the input required making the decisions noted above. The sample locations are flexible and mobile laboratory analytical methods will be used to support a results-driven investigation to establish the nature and extent in as few mobilizations as possible. The proposed sample depth intervals are identified in Section 4.3. Actual sample depths may vary based on site conditions observed during the investigations.

4.0 RCRA FACILITY INVESTIGATION TASKS AND RESPONSIBILITIES

To accomplish the objectives of this project, and to facilitate project planning and management, this CTO will be performed as a series of eight tasks, as follows:

- Project Management
- Subcontractor Procurement
- Field Investigation
- Data Management and Validation
- Data Evaluation
- Risk Assessment
- Report Preparation
- Meetings

Each of these tasks is discussed in more detail in the following sections.

4.1 Project Management

Project management will include such activities as daily technical support and guidance; budget and schedule review and tracking; preparation and review of invoices; personnel resource planning and allocation; and coordination with NAVFAC, the Base, CH2M Hill, NC DENR, and subcontractors.

4.2 Subcontractor Procurement

This task includes procurement, scheduling, and coordination of subcontractors. The primary subcontractors required for this project include a drilling subcontractor, fixed-base analytical laboratory, mobile analytical laboratory, independent data validator, utility locator, and surveyor. Miscellaneous subcontractors may also be procured for various support services.

4.3 Field Investigation

The proposed field investigations vary from SWMU to SWMU and may include some or all of the following subtasks:

- Mobilization/Demobilization
- Soil Sampling
- Groundwater Grab Sampling
- Monitoring Well Installation and Development
- Monitoring Well Sampling
- Aquifer Properties testing
- Laboratory Analytical Program
- Field QA/QC
- Sample Preservation and Handling
- Investigation Derived Waste (IDW) Management
- Survey

The sections that follow present a discussion of the proposed field investigations.

4.3.1 Mobilization/Demobilization

Mobilization/demobilization consists of securing equipment and supplies necessary for the field activities and shipping or transporting those items both to and from the field. Travel time to and from the Base, construction of decontamination areas, location of IDW storage containers, field establishment of sampling locations, and underground utility clearance are also included under this task. Base personnel will be consulted during mobilization efforts.

4.3.2 SWMU 303/318 - Aboveground Storage Tanks/AS515 Oil/Water Separator

The proposed field investigation at SWMU 303/318 includes the following components:

- Soil Sampling
- Groundwater Grab Sampling
- Monitoring Well Installation and Development
- Monitoring Well Sampling

A summary of the sampling and analytical program is presented on Table 4-1. The proposed sample locations are shown on Figures 4-1 through 4-3. Prior to any drilling or sampling, the presence of underground utilities will be determined and located by an independent utility

locators service. The following subsections describe the methods that will be used to collect and analyze the samples.

4.3.2.1 Soil Sampling

Surface and subsurface soil samples will be collected from approximately 15 borings. The borings will be strategically located in and around potential source areas identified during the initial RFI (i.e., in areas of shallow groundwater contamination) (see Figure 4-1). Data from the borings will be used to identify/confirm source areas in soil and provide a correlation between soil and shallow groundwater contamination.

Each boring will be advanced to the water table (approximately 8 feet) using a truck-mounted rig and direct push methods. Soil samples will be collected continuously in 4-foot increments using a Geoprobe® MacroCore sampler and field screened for total volatile organic vapors using a photoionization detector (PID).

Soils will be classified in the field as they are encountered. Soil descriptions, including estimates of grain size, relative density, moisture content, discoloration, odor, and other observations will be recorded in the field logbook and on Test Boring Records. Specific sampling and field screening procedures are presented in the Master Project Plans.

Up to three soil samples will be collected from each boring for chemical analyses. In general, one sample will be collected from the 0 to 1 foot depth interval (or just below the concrete/asphalt/subbase) and one sample will be collected at the soil/groundwater interface. A third sample will be collected based on field observations (e.g., elevated PID readings, discoloration, etc.). If no evidence of contamination is observed, then the default sample depth will be half way between the surface and soil/groundwater interface. Upon completion of the borehole, the borings will be backfilled with bentonite.

The soil samples will be analyzed for Target Compound List (TCL) VOCs using an on-site mobile laboratory and gas chromatograph/mass spectroscopy (GC/MS) methods. Approximately ten percent of the samples will be submitted to a fixed-base laboratory and analyzed for TCL VOCs to provide comparative data. These samples will be selected in the field and will be representative of both "clean" and "contaminated" samples based on field observations and mobile laboratory results.

Two of the samples from each boring will also be submitted to the fixed-base laboratory and analyzed for TCL SVOCs and RCRA metals. These samples will be selected based on field observations. If no evidence of contamination is observed, then the default samples will be from the 0 to 1 foot depth interval (or just below the concrete/asphalt/subbase) and the soil/groundwater interface. In addition, a total of three samples will be selected and analyzed for Total Organic Carbon (TOC) and Total Oxidant Demand (TOD). These samples will be selected from borings located inside and outside of the source area/plume. The data will be used to support development and evaluation of corrective measures.

4.3.2.2 Groundwater Grab Sampling

Groundwater grab samples will be collected from approximately 15 borings. The borings will be strategically located to provide additional information as to the plume location, orientation, concentration, and source area. The data will be used to further determine the nature and extent of groundwater contamination and to optimize well screen placement during installation of the monitoring wells (i.e., to select screen intervals where the highest concentrations of contaminants were identified).

Soil samples will be collected from five of the borings using soil classification methodologies described in Section 4.3.2.1 of this Work Plan to supplement existing geologic information. Unlike the previous soil borings, no chemical testing of these samples will be conducted. Soil samples will not be collected from the remaining ten borings because sufficient geologic information has been collected to date. These ten borings will be used solely for groundwater grab sample collection.

Three groundwater grab samples will be collected from each boring within a specified depth range, as follows:

- Near the upper portion of the surficial aquifer 10 to 14 feet bgs
- Within the deeper portion of the surficial aquifer above the Belgrade semi-confining unit 25 to 29 feet bgs
- Near the upper portion of the Castle Hayne aquifer 40 to 44 feet bgs

Actual depth intervals may vary and will be based on observed site conditions at the time of sampling.

The groundwater grab samples will be collected using a 4-foot long, stainless steel, discrete sampler that is hydraulically pushed to the desired depth. The cover of the sampler will then be retracted, thus allowing groundwater to flow into the device for sampling. The samples will be retrieved using a peristaltic pump and new tubing for each sample. Prior to sample collection, groundwater will be purged from the borehole for several minutes to reduce the turbidity to the extent practical. Specific groundwater grab sampling procedures are presented in the Master Project Plans.

The groundwater grab samples will be analyzed for TCL VOCs using an on-site mobile laboratory and GC/MS methods. Approximately ten percent of the samples will be submitted to a fixed-base laboratory and analyzed for TCL VOCs to provide comparative data. These samples will be selected in the field and will be representative of both "clean" and "contaminated" samples based on field observations and mobile laboratory results. In addition, eight of the samples will be submitted to the fixed-base laboratory and analyzed for TCL SVOCs. These samples will be selected from borings advanced near the western portion of the study area in and around the petroleum hydrocarbon plume (see Figure 4-2).

4.3.2.3 Monitoring Well Installation and Development

Three intermediate monitoring wells (approximately 30 feet deep) and three deeper monitoring wells (approximately 60 feet deep) will be installed to supplement the existing well network. The deeper wells will be nested with the intermediate wells and will be strategically located to provide additional information as to the plume location, orientation, concentration, and source area. Specific well locations and screen placements will be based on the results of the groundwater grab samples. As a result, the locations are not depicted on any figure, however the existing wells, which will be used as part of this investigation, are depicted on Figure 4-3.

It is anticipated that the monitoring wells will be installed adjacent to Geoprobe® borings used for soil and groundwater grab sampling. In the event that a well is not located adjacent to a boring with sufficient geologic information, soil samples will be collected for lithologic identification as described in Section 4.3.2.1 of this Work Plan.

The intermediate well borings will be drilled using 6-1/4-inch inside diameter (ID), hollow-stem augers and the deeper well borings will be drilled using 6-inch nominal diameter mud rotary methods. It should be noted that during drilling of the deeper wells, the surficial aquifer will not be cased off because the Belgrade formation is semi-permeable and it has been shown that contaminated groundwater can migrate vertically through the formation in the vicinity of this SWMU. The monitoring wells will be constructed, as directed by the on-site geologist, using 2-inch ID, Schedule 40, polyvinyl chloride (PVC) well casing and screen materials. Well screens used for the construction of the intermediate wells will be 10-foot long whereas well screens for the deeper wells will be 5-feet in length. The annular space around the well screen will be backfilled with well-graded, fine sand. The sand will be extended to approximately 2 feet above the top of the screened interval. An approximate 2-foot thick bentonite seal will be placed above the sand pack and hydrated with potable water, as necessary. The annular space above the bentonite seal will be backfilled with cement/bentonite grout to prevent surface and near subsurface water from traveling down the borehole and infiltrating into the screened groundwater-monitoring zone. The wells will be completed with a flush-mounted, protective cover and locking, water-tight cap. The well construction details will be recorded in the field log book and on the Test Boring and Well Construction Records.

Each new well, as well as five of the existing wells at Site 86 (86-GW02IW, 86-GW17IW, 86-GW20IW, 86-GW21IW, and 86-GW22IW), will be developed using a surge block and Waterra pump (inertial lift pump) in conjunction with new flexible polyethylene pipe and a check valve. Although existing well 86-GW27IW is proposed to be sampled, this well will not be developed since it was developed in 2004 prior to the initial groundwater sampling event conducted as part of the RFI. The well development effort will be guided by visual observations of water clarity and volume of groundwater removed during development. Specific well installation and development procedures are presented in the Master Project Plans.

4.3.2.4 Monitoring Well Sampling

Groundwater samples will be collected from the following 15 monitoring wells using a peristaltic pump and low-flow purging/sampling procedures:

- Three existing intermediate wells installed at the SWMU (SWMU318-MW01, SWMU318-MW02, and SWMU318-MW03)

- Three new intermediate wells installed at the SWMU (SWMU318-MW04, SWMU318-MW05, and SWMU318-MW06)

- Two existing intermediate wells installed at Site 86 (86-GW02IW and 86-GW27IW)

- Three new deeper wells installed at the SWMU (SWMU318-MW04DW, SWMU318-MW05DW, and SWMU318-MW06DW)

- Four existing deeper wells installed at Site 86 (86-GW17IW, 86-GW20IW, 86-GW21IW, and 86-GW22IW)

Data from three other existing intermediate wells (86-GW08IW, 86-GW10IW, and 86-GW25IW) and six deeper wells (86-GW15IW, 86-GW16IW, 86-GW23IW, 86-GW24IW, 86-GW29IW, and 86-GW30IW) installed at Site 86 will also be used, as appropriate, to supplement the RFI data set. However, these wells will not be sampled as part of the field investigation because they are sampled as part of the Site 86 Long-Term Monitoring Program. The most recent data will be used as part of the evaluation of site conditions.

Specific sampling procedures are presented in the Master Project Plans and summarized below.

- Before purging/sampling, static water levels will be measured in the wells.

- The sampling device intake will be slowly lowered until the bottom end is 2 to 3 feet below the top of the well screen or the top of the water level, whichever is greater.

- Purging will begin. The pumping rate will be set to create a sustainable low flow (i.e. a rate of flow at which no significant loss in water level is observed).

- Water quality parameters (WQPs) including pH, specific conductance, dissolved oxygen, temperature, oxidation/reduction (redox) potential, and turbidity will be measured frequently during purging and recorded in the field log book. The field testing will be conducted within an in-line analyzer that limits exposure of the groundwater to the atmosphere while the field measurements are recorded.

- Purging will be considered complete when three successive readings of specific conductance, dissolved oxygen, temperature, and redox potential have stabilized within 10 percent, pH is within 0.1 Standard Units, and turbidity is less than 10 nephelometric turbidity units (NTUs), or there is no further discernable upward or downward trend.

- Upon WQP stabilization, the in-line analyzer will be disengaged and the groundwater samples will be collected from the end of the tubing.

The groundwater samples will be submitted to a fixed-base laboratory and analyzed for TCL VOCs and SVOCs and RCRA metals. In addition, the samples will be analyzed for dissolved gasses (methane, ethane, and ethene). This data will be used to support development and evaluation of corrective measures.

4.3.2.5 Laboratory Analytical Program

A summary of the sampling and analytical program is presented on Table 4-1. Soil and groundwater grab samples will be analyzed in the field for TCL VOCs using a mobile laboratory and GC/MS methods (Solid Waste [SW] 846 Method 8260B).

Samples collected for chemical analyses at a fixed-base laboratory will be stored on ice in coolers at approximately 4 degrees Celsius (or less) and delivered to the laboratory by Federal Express or a courier. Chain-of-Custody Forms will be completed and enclosed in the shipping packages. These samples will be analyzed for one or more of the following analytical suites in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) or SW846 Methods:

- TCL VOCs using Organic Low Medium (OLM) 04.2/04.3
- TCL SVOCs using OLM 04.2/04.3
- RCRA Metals using Inorganic Low Medium (ILM) 04.1/6010B/7470A
- TOC using SW846 Method 9060
- TOD (specialized analysis; no specific method)
- Dissolved Gasses (methane, ethane, and ethene) using SW846 Method 3810

These parameters were selected based on COPCs identified during previous investigations at the SWMU and certain engineering properties to support development and evaluation of corrective measures.

Groundwater samples collected from the monitoring wells will also be analyzed in the field for the following WQPs: pH, specific conductance, dissolved oxygen, temperature, redox potential, and turbidity.

4.3.3 SWMU 336 - AS4106 Paint Stripper

The proposed field investigation at SWMU 336 includes the following components:

- Soil sampling
- Groundwater Grab Sampling
- Monitoring Well Installation and Development
- Monitoring Well Sampling and Aquifer Properties Testing
- Laboratory Analytical Program

A summary of the sampling and analytical program is presented on Table 4-2. The proposed sample locations are shown on Figure 4-4. Prior to any drilling or sampling, the presence of underground utilities will be determined and located by an independent utility locators service. The following subsections describe the methods that will be used to collect and analyze the samples.

4.3.3.1 Soil Sampling

The proposed field investigation will be conducted using a grid-based sampling scheme. An approximate 100-foot by 100-foot sampling grid will be established across the site as shown on Figure 4-4. Sampling will begin at grid nodes closest to the source area identified during the Phase II CSI. Additional borings will be drilled at locations progressively farther away from the reported source area (accessibility permitting) until the extent of contamination in soil and groundwater is sufficiently determined. It should be noted that the investigation will be conducted such that only the borings that are necessary to determine the distribution of contamination shall be advanced. Therefore, a boring may not be advanced at every location. Decisions regarding which borings to advance will be made in the field by the on-site geologist

based on the results from previous borings. It is anticipated that a maximum of 15 borings will be advanced as part of this investigation.

Each boring will be advanced to the water table (approximately 12 feet bgs) using a truck-mounted rig and direct push methods. Surface and subsurface soil samples will be collected and field screened in accordance with methods presented in the Master Project Plans and Section 4.3.2.1 of this Work Plan.

Up to three soil samples will be collected from each boring for chemical analyses. In general, one sample will be collected from the 0 to 1 foot depth interval (or just below the concrete/asphalt/subbase) and one sample will be collected at the soil/groundwater interface. A third sample will be collected based on field observations (e.g., elevated PID readings, discoloration, etc.). If no evidence of contamination is observed, then the default sample depth will be half-way between the surface and soil/groundwater interface.

The soil samples will be analyzed for TCL VOCs using an on-site mobile laboratory and gas GC/MS methods. Approximately ten percent of the samples will be submitted to a fixed-base laboratory and analyzed for TCL VOCs to provide comparative data. These samples will be selected in the field and will be representative of both "clean" and "contaminated" samples based on field observations and mobile laboratory results.

One of the samples (0 to 1 foot depth interval or just below the concrete/asphalt/subbase) from each boring will also be submitted to the fixed-base laboratory and analyzed for RCRA metals since metals were detected in surface soil during the Phase II CSI. In addition, a total of three samples will be selected and analyzed for TOC and TOD. These samples will be selected from borings located inside and outside of the source area/plume. The data will be used to support development and evaluation of corrective measures.

4.3.3.2 Groundwater Grab Sampling

Groundwater grab samples will be collected from the borings used for soil sampling. Two groundwater grab samples will be collected from each boring within a specified depth range, as follows:

- Near the upper portion of the surficial aquifer 12 to 16 feet bgs

- Within the deeper portion of the surficial aquifer above the Belgrade semi-confining unit 25 to 29 feet bgs

Actual depth intervals may vary and will be based on observed site conditions at the time of sampling. It should be noted that the groundwater grab sampling will be limited to the surficial aquifer above the Belgrade formation. No samples will be collected below the Belgrade formation during this investigation. Deeper samples may be collected during future investigations, as necessary, based on review of the results from this investigation.

The groundwater grab samples will be collected in accordance with methods presented in the Master Project Plans and Section 4.3.2.2 of this Work Plan. Subsequent to sampling, the borings will be backfilled with bentonite.

The samples will be analyzed for TCL VOCs using an on-site mobile laboratory and GC/MS methods. Approximately ten percent of the samples will be submitted to a fixed-base laboratory and analyzed for TCL VOCs to provide comparative data. These samples will be selected in the field and will be representative of both "clean" and "contaminated" samples based on field observations and mobile laboratory results.

4.3.3.3 Monitoring Well Installation and Development

Up to five monitoring wells will be installed at the SWMU, as follows:

- One well will be positioned upgradient of the SWMU to evaluate upgradient groundwater quality and determine whether contaminants not attributable to the SWMU are present.

- One well will be positioned along the approximate center axis of the plume to evaluate/characterize groundwater contamination within the plume.

- Three wells will be positioned downgradient/sidegradient of the plume to determine the horizontal extent of groundwater contamination.

Specific well locations and screen placements will be based on the results of the groundwater grab samples. As a result, the locations are not depicted on a figure.

It is anticipated that the wells will be a maximum of 30 feet deep and will be installed adjacent to Geoprobe® borings used for soil and groundwater grab sampling. Therefore, soils will not be sampled for lithologic identification or chemical analyses.

The well borings will be drilled using 6 ¼-inch ID, hollow-stem augers. During drilling, approximately three Shelby tube samples will be collected from the borings to estimate certain engineering properties of site soils (e.g., permeability, dry bulk density, grain size). Actual locations and depths of these samples will be determined in the field by the on-site geologist and will be representative of the different stratigraphic layers in the investigation area. The data will be used to indicate the ability of COPCs to percolate through the vadose zone and to support development and evaluation of corrective measures.

The monitoring wells will be constructed, as directed by the on-site geologist, using 2-inch ID, Schedule 40, PVC well casing and screen materials. Well screens will be 10-foot long. Each well will be developed using a surge block and Waterra pump. Specific well installation and development procedures are presented in the Master Project Plans and Section 4.3.2.3 of this Work Plan.

4.3.3.4 Monitoring Well Sampling and Aquifer Properties Testing

Groundwater samples will be collected from the five new monitoring wells using a peristaltic pump and low-flow purging/sampling procedures. Specific sampling procedures are presented in the Master Project Plans and Section 4.3.2.4 of this Work Plan. The groundwater samples will be submitted to a fixed-base laboratory and analyzed for TCL VOCs and RCRA metals. In addition, the samples will be analyzed for dissolved gasses (methane, ethane, and ethene). This data will be used to support development and evaluation of corrective measures.

Slug tests will also be conducted in each monitoring well to estimate the hydraulic conductivity of the aquifer in the vicinity of the well. Rising head and/or falling head tests will be conducted depending on well construction/screen placement. A solid cylinder (slug) will be introduced into each well. The aquifer's response to change in static conditions will be measured using a

computerized data logger and pressure transducer. Multiple slug tests will be conducted at each well using different sized slugs to provide comparative data. The use of multiple tests with varying displacements will aid in identifying the presence of a well skin, which can cause an underestimation of hydraulic conductivity. A well skin is the presence of a relatively thin layer of clay that was smeared on the borehole wall during drilling that was not completely removed during development. Specific aquifer testing procedures are presented in the Master Project Plans.

4.3.3.5 Laboratory Analytical Program

A summary of the sampling and analytical program is presented on Table 4-2. Soil and groundwater grab samples will be analyzed in the field for TCL VOCs using a mobile laboratory and GC/MS methods (SW846 Method 8260B).

Samples collected for chemical analyses at a fixed-base laboratory will be stored on ice in coolers at approximately 4 degrees Celsius (or less) and delivered to the laboratory by Federal Express or a courier. Chain-of-Custody Forms will be completed and enclosed in the shipping packages. These samples will be analyzed for one or more of the following analytical suites in accordance with USEPA CLP SOW or SW846 Methods:

- TCL VOCs via OLM 04.2/04.3
- RCRA Metals via ILM 04.1
- TOC via SW846 Method 9060
- TOD (specialized analysis; no specific method)
- Dissolved Gasses (methane, ethane, and ethene) via SW846 Method 3810

These parameters were selected based on COPCs identified during previous investigations at the SWMU and certain engineering properties to support development and evaluation of corrective measures.

The Shelby tube samples will be analyzed for the following parameters:

- Grain Size – Sieve and Hydrometer using American Society for Testing and Material (ASTM) Method D422 and D1140
- Atterberg Limits using ASTM Method 4318

- Flex-Wall Permeability using ASTM Method D5084
- Moisture Content using ASTM Method D2216
- Specific Gravity using ASTM Method D854
- Dry Bulk Density using Standard Operating Procedure (SOP) S37

Groundwater samples collected from the monitoring wells will also be analyzed in the field for the following WQPs: pH, specific conductance, dissolved oxygen, temperature, redox potential, and turbidity.

4.3.4 Field Quality Assurance/Quality Control

Specific QA/QC requirements are presented in the Master QAPP, which is contained in the Master Project Plans. The Master QAPP describes the different levels of sample analyses and the associated QC procedures required with each. Adherence to established USEPA Chain-of-Custody procedures during the collection, transport, and analyses of the samples will be maintained throughout the project. Laboratory analyses of the samples will conform to accepted QA requirements.

The following QA/QC samples will be collected/prepared during the field investigation to ensure precision, accuracy, representativeness, completeness, and comparability:

- Equipment rinsate blanks
- Field blanks
- Trip blanks
- Field duplicate samples
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples

Equipment rinsate blanks will be collected by running laboratory-supplied deionized water over/through the sampling equipment and placing it into the appropriate sample containers for laboratory analyses. One equipment rinsate blank will be collected from each lot of disposable sampling equipment (i.e., each roll of tubing, each box of Geoprobe® liners); one equipment rinsate blank will be collected every other day for reusable sampling equipment. The results will be used by the data validator to verify that the sampling equipment has not contributed to contamination of the samples.

One field blank will be collected from each source of water used in decontamination. The field blanks will be collected by pouring the water from the original container or spigot directly into the sample bottle set. Field blanks will not be collected in dusty environments. The results will be used by the data validator to verify that the water used in decontamination has not contributed to contamination of the samples. In addition, the results will be used to identify other potential sources of field or laboratory contamination.

Trip blanks are samples of analyte-free water prepared at the laboratory before commencement of the sampling event and shipped to the sampling team along with the unopened sample containers. The trip blanks are then randomly selected and included in each cooler containing samples for volatile organics analysis. The data will be used to verify that the sample containers and method of sample container handling used throughout the sampling program have not contributed to contamination of the samples. In addition, the data will be used to identify other potential sources of field or laboratory contamination.

Field duplicate samples will consist of one unique sample, split into two aliquots, and analyzed independently. Duplicate soil samples analyzed for parameters other than VOCs will be homogenized and split. Samples for VOC analyses will not be mixed, but select segments of the soil will be collected. Duplicate water samples will be collected simultaneously. The duplicate samples will be analyzed to verify the reproducibility of the laboratory results and degree of variability of reported concentrations. Duplicate samples will be collected at a frequency of 10 percent for each group of samples of a similar matrix.

MS/MSD samples will be prepared in the field using the same procedures as duplicate samples and analyzed for the same parameters as the corresponding original samples. The data will be used to address aliquoting reproducibility and to provide information on matrix reproducibility otherwise unobtainable from samples reported below analytically reproducible and statistically valid levels. MS/MSD samples will be prepared at a frequency of 5 percent for each group of samples of a similar matrix.

In order to use the mobile laboratory data for more than plume delineation (e.g., risk assessment) additional QA/QC measures and reporting requirements will be implemented. Details of these measures and requirements are found in Appendix 1 of "Guidelines for Establishing Remediation

Goals at RCRA Hazardous Waste Sites" (NC DENR 2002). In summary these measures and requirements include:

- General information, including laboratory contact information and name of Facility and USEPA ID Number.

- Case narrative, including sample condition QC issues, analytical deviations and justification, and observations effecting sample or data integrity.

- Chain-of-Custody Forms or sample control forms.

- Summary of analytical results, including analytical method, sample matrix, dates and times of analysis and any preparation, instrument type, sample weights, dilutions, percent moisture, method detection limits, data qualifiers and definitions, and analytical results.

- QA/QC should include instrument calibration, method blanks, surrogate standards recoveries, matrix spikes and matrix spike duplicates, matrix duplicates, and control samples.

- Additional information may be required, including laboratory QAPP, precision and accuracy study results, detection limit studies, and annual performance study.

4.3.5 Sample Preservation and Handling

Sample preservation details are presented in the Master Project Plans. The type of container used for each sampling effort, as well as a summary of preservation requirements is described in the Master QAPP. Samples for chemical analyses will be placed into laboratory-prepared sample containers with the appropriate preservatives and stored on ice in a cooler at approximately 4 degrees Celsius (°C) or less, until shipped to the laboratory. Samples will either be hand delivered to the laboratory via courier or shipped via overnight courier.

Proper Chain-of-Custody documentation will be maintained for all samples from the time of collection until they are shipped to the analytical laboratory. The Chain-of-Custody forms will contain the following information: project number (CTO), sampler names, sample numbers, number of containers, methods of preservation, date and time of sample collection, analysis

requested, date and time of transportation to the laboratory, method of transportation, and any other information pertinent to the samples. Specific Chain-of-Custody procedures are presented in the Master Project Plans.

4.3.6 Investigation Derived Waste Management

IDW will be managed in accordance with the Master Project Plans. IDW will consist of health and safety disposables, potentially contaminated soil, decontamination fluids, and groundwater. Health and safety disposables, such as sampling gloves, will be placed in plastic bags and disposed in the dumpster located by the Baker field trailer at Lot 201. Soil IDW will be containerized in Department of Transportation (DOT) approved 55-gallon drums. Water IDW will be containerized in poly-tanks. The drums and poly-tanks will be staged in a designated area at each SWMU pending final disposition. In accordance with standard operating procedures developed by the Base, Baker will be responsible for storage of IDW, as well as labeling and staging of IDW storage containers. Baker is also responsible for communicating with the Base and Shaw (the Remedial Action Contractor). These communications will include pre-investigation quantity estimates, the form of IDW actually generated, the quantity of IDW, the type and number of containers, and the staging area location. Appendix A contains forms that will be used for IDW management.

4.3.7 Survey

The sample locations and monitoring wells will be surveyed by a subcontractor licensed in the State of North Carolina for topographic elevation relative to mean sea level (MSL) and horizontal position within the North Carolina State Plane Coordinate System. The vertical accuracy of the survey will be within 0.01 feet and the horizontal accuracy will be within 0.1 feet. Specific survey procedures are presented in the Master Project Plans.

4.4 Data Management and Validation

It is anticipated that data management activities will consist primarily of entering field and laboratory data onto computerized spreadsheets using database software and tabulating field and analytical results for preparation of the report. The analytical data will be validated by an independent data validator in accordance with the most recent USEPA National Functional Guidelines and Naval Facilities Engineering Service Center (NFESC) Guidelines. Level M-3

(organics) and IM-2 (metals) technical reviews will be performed, which include a review/evaluation of the laboratory reporting forms, raw data, instrument printouts, run logs, and supporting data provided by the laboratory.

4.5 Data Evaluation

This task involves efforts related to the data once it is received from the laboratory and is validated. In addition, this task involves evaluation of field-generated data including mobile laboratory analytical data, water level measurements, Test Boring and Well Construction Records, water quality measurements, and other field notes. Efforts under this task will include the tabulation of validated analytical data and field data, generation of Test Boring and Well Construction Records, and generation of groundwater contour maps and other diagrams/figures/tables associated with field notes or data received from the laboratory (e.g., sampling location maps).

The laboratory analytical results will be compared to the North Carolina 2L standards, NC DENR soil to groundwater screening values, and/or USEPA Region IX PRGs and the background/secondary screening values (for metals).

4.6 Human Health and Ecological Risk Assessment

A Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) will be conducted at each SWMU. The risk assessments will identify existing or potential risks that may be posed to human health and/or the environment and will serve to support the evaluation of the threats posed by a SWMU with respect to current and future potential exposure scenarios. In addition, the risk assessments will be used to support development and evaluation of corrective measures. The general approach for conducting the risk assessments is presented in the Master Project Plans and summarized in the following subsections.

4.6.1 Human Health Risk Assessment

The HHRAs will be conducted in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA, 1990). The primary guidance document will be the Risk Assessment Guidance for Superfund (RAGs), Volume I, Human Health Evaluation Manual

(Part A) Interim Final (USEPA, 1989). USEPA Region IV will be consulted for Federal guidance and the NC DENR will be consulted for guidance in the State of North Carolina.

The technical components of the HHRAs will include contaminant identification, exposure assessment, toxicity assessment, and risk characterization. The objectives of the risk assessment process are as follows:

- Characterize the toxicity and levels of COPCs in relevant media (e.g., soil, groundwater, surface water, sediment, air, and biota)
- Characterize the environmental fate and transport mechanisms within specific environmental media
- Identify potential current and future human receptors
- Identify potential exposure routes and the extent of the actual or expected exposure
- Define the extent of the expected impact or threat
- Identify the levels of uncertainty associated with the above items

4.6.2 Ecological Risk Assessment

The ERAs will be conducted to evaluate the likelihood that adverse ecological effects would occur or are occurring as a result of exposure to one or more physical or chemical stressors. The assessments will evaluate the potential effects of chemicals on terrestrial and aquatic receptors (e.g., flora and fauna) and their habitats, including the consideration of protected species and sensitive or critical habitats, and will identify particular chemical stressors that may cause adverse effects.

The ERAs will be conducted according to guidance provided by the USEPA, USEPA Region IV, and NC DENR. It should be noted that guidance designed for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites will be followed since no guidance has been developed specifically for the RCRA program.

4.7 Report Preparation

Draft reports will be prepared in accordance with the Base's RCRA Part B permit and revised Hazardous Waste Management Permit issued in 1997 and will include, but not be limited to, the following:

- Information to supplement and/or verify the environmental setting of the SWMUs, including geology and hydrogeology
- A summary of the investigation/sampling activities
- Characterization of the source(s)
- Evaluation of the nature and extent of contamination
- Human health and ecological risk assessment
- Conclusions and recommendations

The draft reports will be submitted to the NC DENR for comments and approval. Response to comments and necessary revisions will be made to the draft reports before issuing final reports.

4.8 Meetings

This task includes participation in two project meetings to be held at the Base. It is anticipated that one meeting will be held during the field investigation and one meeting will be held after submission of the draft reports. The purpose of the meetings will be to discuss the field activities and sampling results/findings.

5.0 PROJECT MANAGEMENT AND STAFFING

The proposed management and staffing is shown on Figure 5-1. The primary participants for this project (CTO-0091) are as follows:

- Mr. Matt Louth - Activity Manager (CH2M Hill)
- Ms. Louise Palmer - Project Manager (CH2M Hill)
- Mr. Rich Bonelli - Activity Coordinator (Baker)
- Mr. Jim Culp - Project Manager (Baker)
- Mr. Scott Moffett - Project Geologist (Baker)
- Mr. Rob Sok - Site Manager (Baker)

Mr. Culp and Mr. Moffett will have the overall responsibility for conducting the field activities and completing the reports associated with this CTO. They will be supported by geologists, engineers, scientists, biologists, and clerical personnel, as needed.

6.0 PROJECT SCHEDULE

The proposed project schedule is presented as Figure 6-1. The schedule presents the anticipated completion and/or submittal dates for specific tasks or documents.

7.0 REFERENCES

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SITE SPECIFIC WORK PLAN TABLES

TABLE 4-1

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM - SWMU 303/318
ADDITIONAL RCRA FACILITY INVESTIGATION ACTIVITIES (CTO-0091)
MCB CAMP LEJEUNE, NORTH CAROLINA

Soil Boring/ Monitoring Well Designation	Mobile Laboratory		Fixed-Base Laboratory								
	Soil	Groundwater	Soil					Groundwater			
	TCL VOCs	TCL VOCs	TCL VOCs	TCL SVOCs	RCRA Metals	Total Organic Carbon	Total Oxidant Demand	TCL VOCs	TCL SVOCs	RCRA Metals	Dissolved Gasses [1]
GEOPROBE SOIL BORINGS											
SWMU318-SB14	3		1	2	2						
SWMU318-SB15	3			2	2	1	1				
SWMU318-SB16	3			2	2						
SWMU318-SB17	3		1	2	2						
SWMU318-SB18	3			2	2						
SWMU318-SB19	3			2	2						
SWMU318-SB20	3		1	2	2	1	1				
SWMU318-SB21	3			2	2						
SWMU318-SB22	3			2	2						
SWMU318-SB23	3		1	2	2						
SWMU318-SB24	3			2	2						
SWMU318-SB25	3			2	2						
SWMU318-SB26	3		1	2	2	1	1				
SWMU318-SB27	3			2	2						
SWMU318-SB28	3			2	2						
GROUNDWATER GRAB GEOPROBE BORINGS											
SWMU318-GW31		3						1	1		
SWMU318-GW32		3							1		
SWMU318-GW33		3							1		
SWMU318-GW34		3							1		
SWMU318-GW35		3						1	1		
SWMU318-GW36		3							1		
SWMU318-GW37		3						1	1		
SWMU318-GW38		3							1		
SWMU318-GW39		3						1			
SWMU318-GW40		3									
SWMU318-GW41		3									
SWMU318-GW42		3									
SWMU318-GW43		3						1			
SWMU318-GW44		3									
SWMU318-GW45		3									

TABLE 4-1

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM - SWMU 303/318
ADDITIONAL RCRA FACILITY INVESTIGATION ACTIVITIES (CTO-0091)
MCB CAMP LEJEUNE, NORTH CAROLINA

Soil Boring/ Monitoring Well Designation	Mobile Laboratory		Fixed-Base Laboratory								
	Soil	Groundwater	Soil					Groundwater			
	TCL VOCs	TCL VOCs	TCL VOCs	TCL SVOCs	RCRA Metals	Total Organic Carbon	Total Oxidant Demand	TCL VOCs	TCL SVOCs	RCRA Metals	Dissolved Gasses (1)
INTERMEDIATE MONITORING WELLS											
SWMU318-MW01								1	1	1	1
SWMU318-MW02								1	1	1	1
SWMU318-MW03								1	1	1	1
SWMU318-MW04								1	1	1	1
SWMU318-MW05								1	1	1	1
SWMU318-MW06								1	1	1	1
86-GW02IW								1	1	1	1
86-GW27IW								1	1	1	1
DEEPER MONITORING WELLS											
SWMU318-MW04DW								1	1	1	1
SWMU318-MW05DW								1	1	1	1
SWMU318-MW06DW								1	1	1	1
86-GW17IW								1	1	1	1
86-GW20IW								1	1	1	1
86-GW21IW								1	1	1	1
86-GW22IW								1	1	1	1
Total Environmental Samples	45	45	5	30	30	3	3	20	23	15	15
Field Duplicate Samples	5	5	1	3	3			2	3	2	
MS/MSD Samples	3	3	1	2	2			1	2	1	
Equipment Rinsate Blanks	3	3		2	2			1	2	1	
Field Blanks								2	2	2	
Trip Blanks								5			
Total Samples	56	56	7	37	37	3	3	31	32	21	15

(1) Dissolved gasses include methane, ethane, and ethene.

TABLE 4-2

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM - SWMU 336
RCRA FACILITY INVESTIGATION (CTO-0091)
MCB CAMP LEJEUNE, NORTH CAROLINA

Soil Boring/ Monitoring Well Designation	Mobile Laboratory		Fixed-Base Laboratory						
	Soil	Groundwater	Soil				Groundwater		
	TCL VOCs	TCL VOCs	TCL VOCs	RCRA Metals	Total Organic Carbon	Total Oxidant Demand	TCL VOCs	RCRA Metals	Dissolved Gasses (1)
GEOPROBE SOIL BORINGS									
SWMU336-GW01	3	2	1	1	1	1	1		
SWMU336-GW02	3	2		1					
SWMU336-GW03	3	2		1					
SWMU336-GW04	3	2	1	1			1		
SWMU336-GW05	3	2		1					
SWMU336-GW06	3	2		1	1	1			
SWMU336-GW07	3	2	1	1					
SWMU336-GW08	3	2		1					
SWMU336-GW09	3	2		1					
SWMU336-GW10	3	2	1	1					
SWMU336-GW11	3	2		1					
SWMU336-GW12	3	2		1					
SWMU336-GW13	3	2	1	1			1		
SWMU336-GW14	3	2		1	1	1			
SWMU336-GW15	3	2		1					
MONITORING WELLS									
SWMU336-MW01							1	1	1
SWMU336-MW02							1	1	1
SWMU336-MW03							1	1	1
SWMU336-MW04							1	1	1
SWMU336-MW05							1	1	1
Total Environmental Samples	45	30	5	15	3	3	8	5	5
Field Duplicate Samples	5	5	1	2			1	1	
MS/MSD Samples	3	3	1	1			1	1	
Equipment Rinsate Blanks	3	3		1			1	1	
Field Blanks							2	2	
Trip Blanks							5		
Total Samples	56	41	7	19	3	3	18	10	5

(1) Dissolved gasses include methane, ethane, and ethene.

SITE SPECIFIC WORK PLAN FIGURES

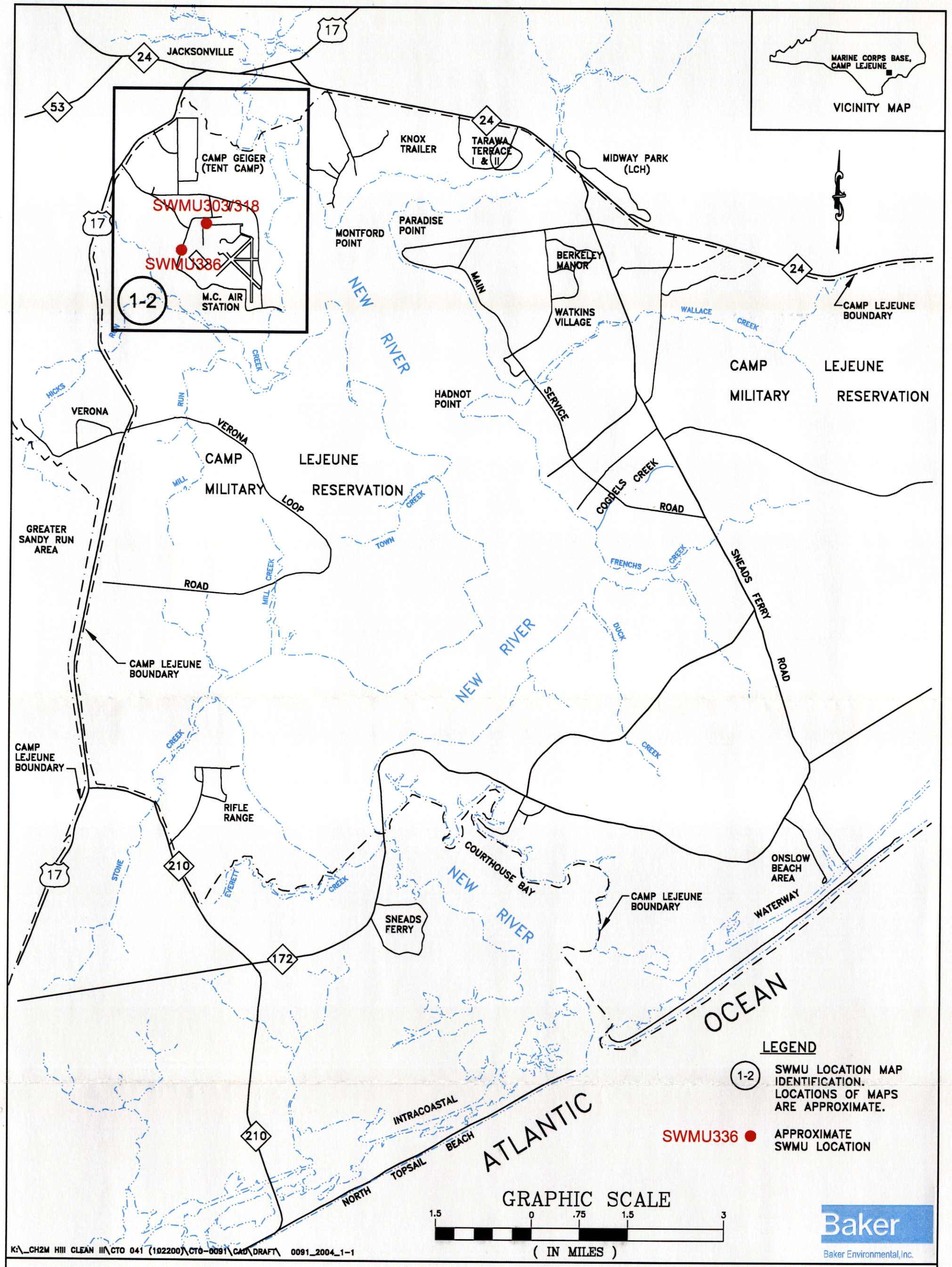

FIGURE 1-1

GENERAL LOCATION/INDEX MAP
SWMUS 303/318 AND 336
CTO - 0091

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

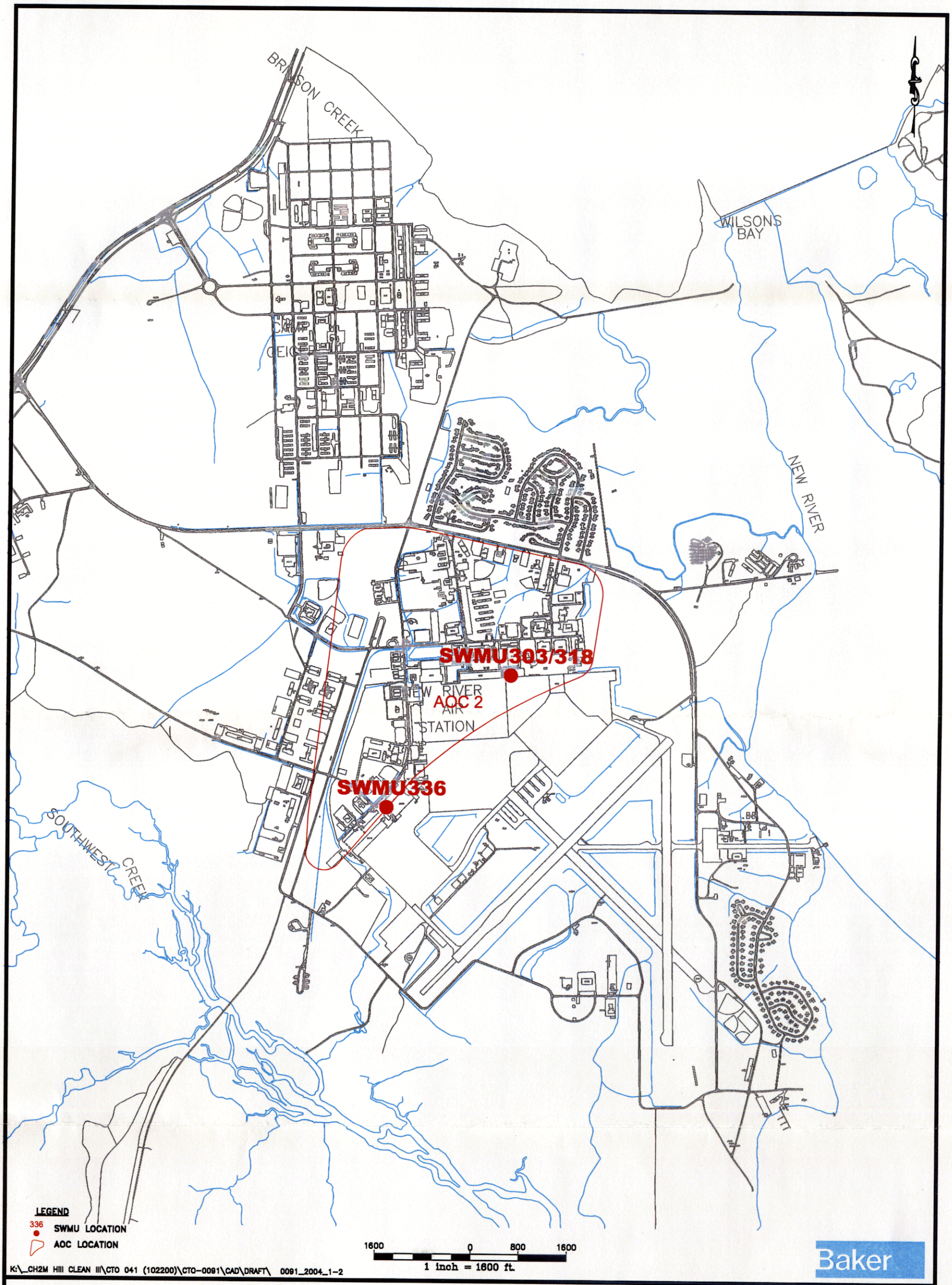

FIGURE 1-2

SWMU/RFI LOCATION PLAN
SWMUS 303/318 AND 336
CTO - 0091

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

SOURCE: MCB CAMP LEJEUNE, MARCH 2000

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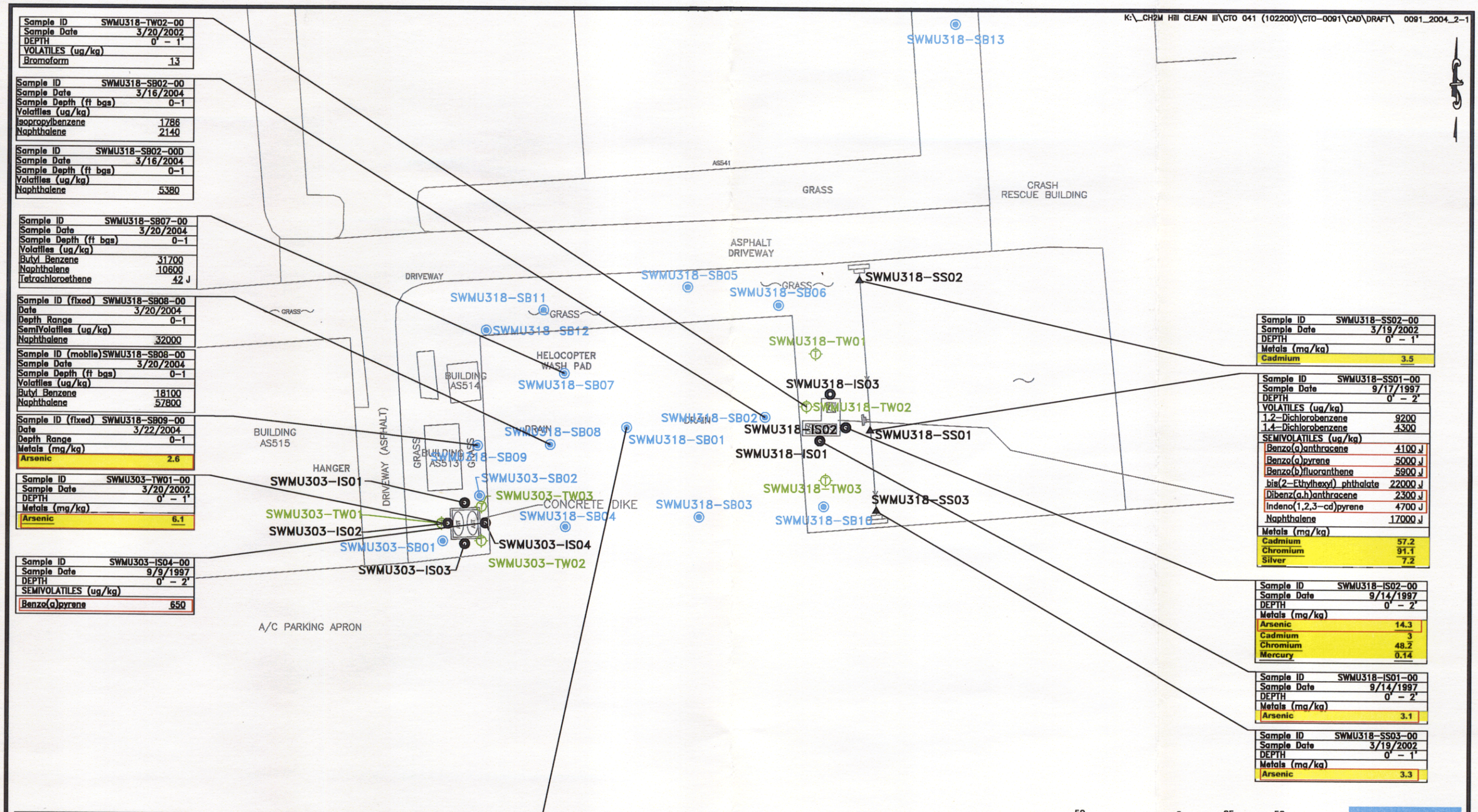

Sample ID	SWMU318-TW02-00
Sample Date	3/20/2002
DEPTH	0' - 1'
VOLATILES (ug/kg)	
Bromoform	13

Sample ID	SWMU318-SB02-00
Sample Date	3/16/2004
Sample Depth (ft bgs)	0-1
Volatiles (ug/kg)	
Isopropylbenzene	1786
Naphthalene	2140

Sample ID	SWMU318-SB02-00D
Sample Date	3/16/2004
Sample Depth (ft bgs)	0-1
Volatiles (ug/kg)	
Naphthalene	5380

Sample ID	SWMU318-SB07-00
Sample Date	3/20/2004
Sample Depth (ft bgs)	0-1
Volatiles (ug/kg)	
Butyl Benzene	31700
Naphthalene	10600
Tetrachloroethene	42 J

Sample ID (fixed)	SWMU318-SB08-00
Date	3/20/2004
Depth Range	0-1
SemiVolatiles (ug/kg)	
Naphthalene	32000

Sample ID (mobile)	SWMU318-SB08-00
Sample Date	3/20/2004
Sample Depth (ft bgs)	0-1
Volatiles (ug/kg)	
Butyl Benzene	18100
Naphthalene	57800

Sample ID (fixed)	SWMU318-SB09-00
Date	3/22/2004
Depth Range	0-1
Metals (mg/kg)	
Arsenic	2.6

Sample ID	SWMU303-TW01-00
Sample Date	3/20/2002
DEPTH	0' - 1'
Metals (mg/kg)	
Arsenic	6.1

Sample ID	SWMU303-IS04-00
Sample Date	9/9/1997
DEPTH	0' - 2'
SEMIVOLATILES (ug/kg)	
Benzo(a)pyrene	650

Sample ID (fixed)	SWMU318-SB01-00
Date	16-Mar-04
Depth Range	0-1
SemiVolatiles (ug/kg)	
Benzo(a)Anthracene	350 J
Benzo(a)Pyrene	380 J
Naphthalene	2900
Metals (ug/kg)	
Silver	4.6 J

Sample ID (mobile)	SWMU318-SB01-00
Sample Date	3/16/2004
Sample Depth (ft bgs)	0-1
Volatiles (ug/kg)	
Naphthalene	22000

Sample ID	SWMU318-SS02-00
Sample Date	3/19/2002
DEPTH	0' - 1'
Metals (mg/kg)	
Cadmium	3.5

Sample ID	SWMU318-SS01-00
Sample Date	9/17/1997
DEPTH	0' - 2'
VOLATILES (ug/kg)	
1,2-Dichlorobenzene	9200
1,4-Dichlorobenzene	4300
SEMIVOLATILES (ug/kg)	
Benzo(g)anthracene	4100 J
Benzo(g)pyrene	5000 J
Benzo(b)fluoranthene	5900 J
bis(2-Ethylhexyl) phthalate	22000 J
Dibenz(a,h)anthracene	2300 J
Indeno(1,2,3-cd)pyrene	4700 J
Naphthalene	17000 J
Metals (mg/kg)	
Cadmium	57.2
Chromium	91.1
Silver	7.2

Sample ID	SWMU318-IS02-00
Sample Date	9/14/1997
DEPTH	0' - 2'
Metals (mg/kg)	
Arsenic	14.3
Cadmium	3
Chromium	48.2
Mercury	0.14

Sample ID	SWMU318-IS01-00
Sample Date	9/14/1997
DEPTH	0' - 2'
Metals (mg/kg)	
Arsenic	3.1

Sample ID	SWMU318-SS03-00
Sample Date	3/19/2002
DEPTH	0' - 1'
Metals (mg/kg)	
Arsenic	3.3

NOTE:

Shaded - Exceeds AOC2 background concentrations for soil
Bold - Exceeds base background concentrations for soil
Underlined - Exceeds NC DENR soil to groundwater criteria
Boxed - Exceeds USEPA Region IX Industrial soil PRGs

LEGEND

- RFI SOIL BORING
- PHASE II CSI TEMPORARY WELL
- PHASE I CSI SOIL BORING
- PHASE I CSI SURFACE SOIL

FIGURE 2-1
DISTRIBUTION OF CONSTITUENTS EXCEEDING SCREENING VALUES IN SURFACE SOIL
SWMUS 303/318
CTO - 0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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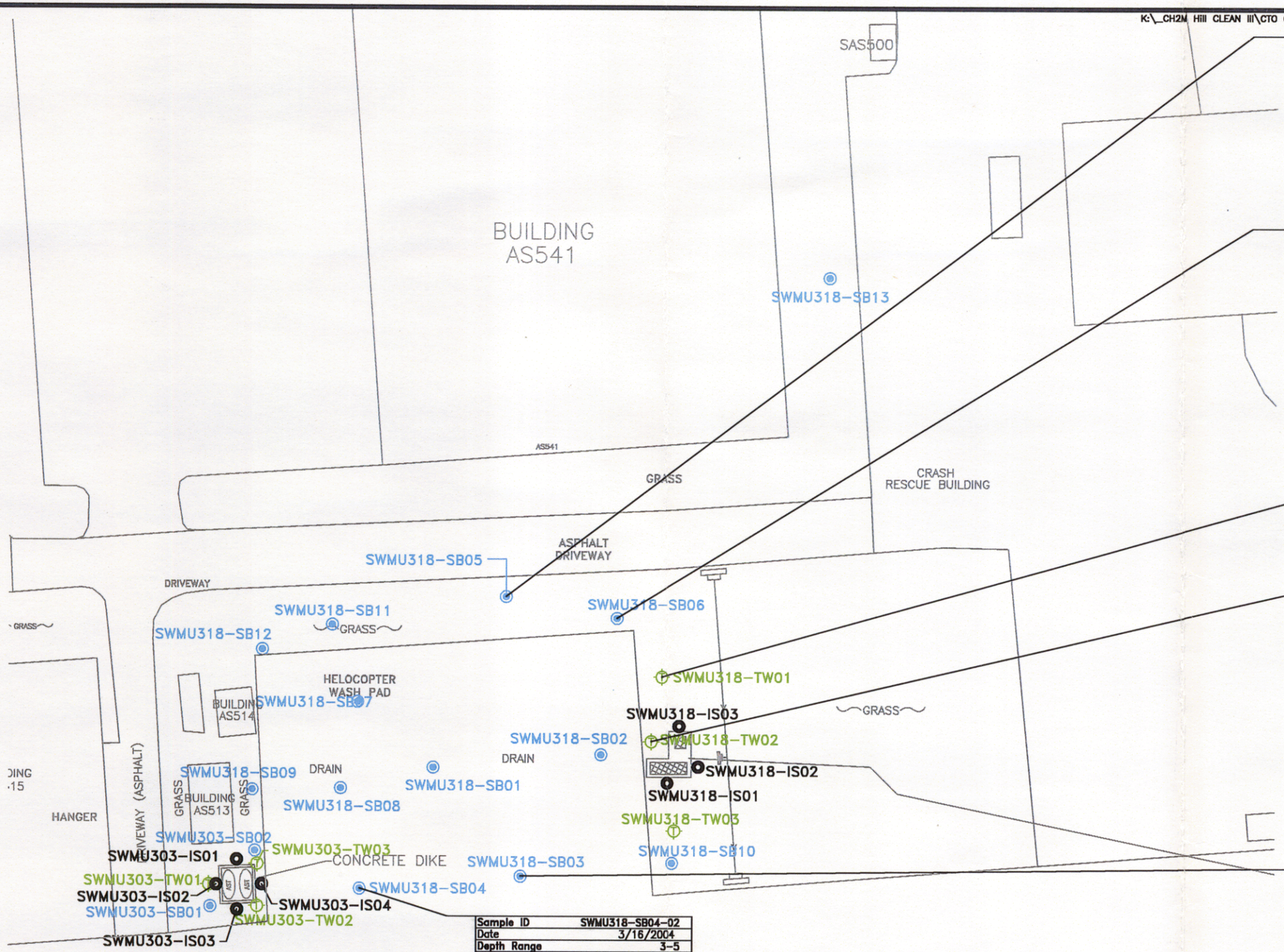

Sample ID	SWMU318-SB05-02D
Date	3/16/2004
Depth Range	3-5
Semivolatiles (ug/kg)	
Metals (ug/kg)	
Mercury	0.08 J

Sample ID	SWMU318-SB05-03
Date	3/16/2004
Depth Range	5-7
Semivolatiles (ug/kg)	
Benzo(a)Anthracene	1200
Benzo(a)Pyrene	820
Benzo(b)Fluoranthene	1500
Dibenzo(a,h)Anthracene	180 J

Sample ID	SWMU318-SB06-02
Date	3/16/2004
Depth Range	3-5
Semivolatiles (ug/kg)	
Metals (ug/kg)	
Mercury	0.11

SAMPLE ID	SWMU318-TW01-04
SAMPLE DATE	3/20/2002
DEPTH	7' - 9'
VOLATILES (ug/kg)	
Methylene Chloride	33

SAMPLE ID	SWMU318-TW02-04
SAMPLE DATE	3/20/2002
DEPTH	7' - 9'
VOLATILES (ug/kg)	
1,1,2-Trichloroethane	93
Methylene Chloride	32

SAMPLE ID	SWMU318-SB03-04
SAMPLE DATE	3/19/2004
SAMPLE DEPTH (ft bgs)	7-9
VOLATILES (ug/kg)	
Bromoform	5 J
Naphthalene	3630

Sample ID	SWMU318-SB04-02
Date	3/16/2004
Depth Range	3-5
Semivolatiles (ug/kg)	
Metals (ug/kg)	
ARSENIC	51

50 0 25 50

1 inch = 50 ft.

Baker

NOTE:

Shaded - Exceeds AOC2 background concentrations for soil
Bold - Exceeds base background concentrations for soil
Underlined - Exceeds NC DENR soil to groundwater criteria
Boxed - Exceeds USEPA Region IX Industrial soil PRGs

LEGEND

- RFI SOIL BORING
- PHASE II CSI TEMPORARY WELL
- PHASE I CSI SOIL BORING

SOURCE: MCB CAMP LEJEUNE, 2000.

FIGURE 2-2
DISTRIBUTION OF CONSTITUENTS EXCEEDING SCREENING VALUES IN SUBSURFACE SOIL
SWMUS 303/318
CTO - 0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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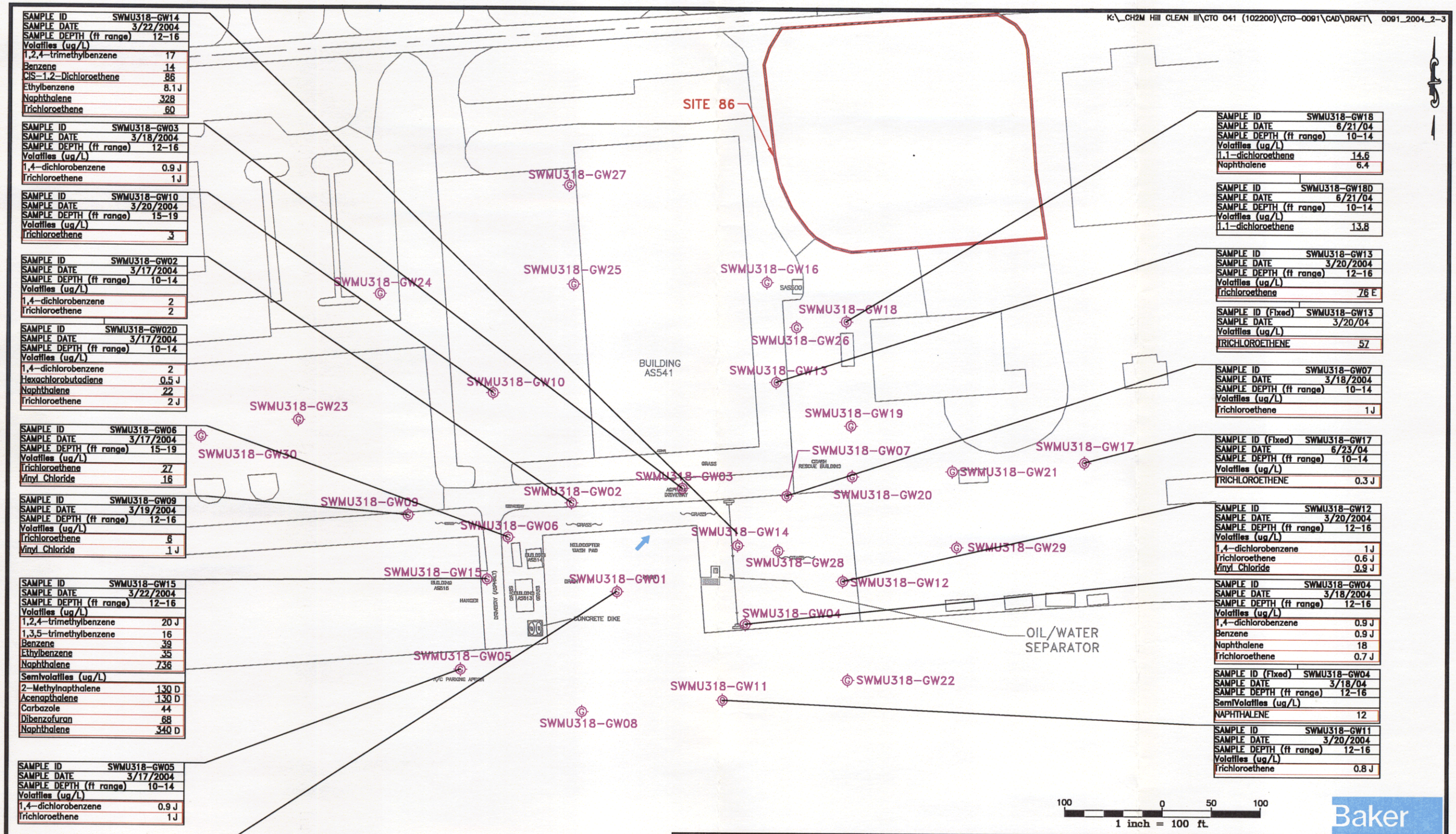

SAMPLE ID	SWMU318-GW14
SAMPLE DATE	3/22/2004
SAMPLE DEPTH (ft range)	12-16
Volatiles (ug/L)	
1,2,4-trimethylbenzene	17
Benzene	14
CIS-1,2-Dichloroethene	86
Ethylbenzene	8.1 J
Naphthalene	328
Trichloroethene	60

SAMPLE ID	SWMU318-GW03
SAMPLE DATE	3/18/2004
SAMPLE DEPTH (ft range)	12-16
Volatiles (ug/L)	
1,4-dichlorobenzene	0.9 J
Trichloroethene	1 J

SAMPLE ID	SWMU318-GW10
SAMPLE DATE	3/20/2004
SAMPLE DEPTH (ft range)	15-19
Volatiles (ug/L)	
Trichloroethene	3

SAMPLE ID	SWMU318-GW02
SAMPLE DATE	3/17/2004
SAMPLE DEPTH (ft range)	10-14
Volatiles (ug/L)	
1,4-dichlorobenzene	2
Trichloroethene	2

SAMPLE ID	SWMU318-GW02D
SAMPLE DATE	3/17/2004
SAMPLE DEPTH (ft range)	10-14
Volatiles (ug/L)	
1,4-dichlorobenzene	2
Hexachlorobutadiene	0.5 J
Naphthalene	22
Trichloroethene	2 J

SAMPLE ID	SWMU318-GW06
SAMPLE DATE	3/17/2004
SAMPLE DEPTH (ft range)	15-19
Volatiles (ug/L)	
Trichloroethene	27
Vinyl Chloride	16

SAMPLE ID	SWMU318-GW09
SAMPLE DATE	3/19/2004
SAMPLE DEPTH (ft range)	12-16
Volatiles (ug/L)	
Trichloroethene	6
Vinyl Chloride	1 J

SAMPLE ID	SWMU318-GW15
SAMPLE DATE	3/22/2004
SAMPLE DEPTH (ft range)	12-16
Volatiles (ug/L)	
1,2,4-trimethylbenzene	20 J
1,3,5-trimethylbenzene	16
Benzene	39
Ethylbenzene	35
Naphthalene	736
Semivolatiles (ug/L)	
2-Methylnapthalene	130 D
Acenapthalene	130 D
Carbazole	44
Dibenzofuran	68
Naphthalene	340 D

SAMPLE ID	SWMU318-GW05
SAMPLE DATE	3/17/2004
SAMPLE DEPTH (ft range)	10-14
Volatiles (ug/L)	
1,4-dichlorobenzene	0.9 J
Trichloroethene	1 J

SAMPLE ID	SWMU318-GW01(FIXED)
SAMPLE DATE	3/19/2004
SAMPLE DEPTH (ft range)	12-16
Volatiles (ug/L)	
Naphthalene	9 J
Trichloroethene	0.9 J

SAMPLE ID	SWMU318-GW18
SAMPLE DATE	6/21/04
SAMPLE DEPTH (ft range)	10-14
Volatiles (ug/L)	
1,1-dichloroethene	14.6
Naphthalene	6.4

SAMPLE ID	SWMU318-GW18D
SAMPLE DATE	6/21/04
SAMPLE DEPTH (ft range)	10-14
Volatiles (ug/L)	
1,1-dichloroethene	13.8

SAMPLE ID	SWMU318-GW13
SAMPLE DATE	3/20/2004
SAMPLE DEPTH (ft range)	12-16
Volatiles (ug/L)	
Trichloroethene	76 E

SAMPLE ID (Fixed)	SWMU318-GW13
SAMPLE DATE	3/20/04
Volatiles (ug/L)	
TRICHLOROETHENE	57

SAMPLE ID	SWMU318-GW07
SAMPLE DATE	3/18/2004
SAMPLE DEPTH (ft range)	10-14
Volatiles (ug/L)	
Trichloroethene	1 J

SAMPLE ID (Fixed)	SWMU318-GW17
SAMPLE DATE	6/23/04
SAMPLE DEPTH (ft range)	10-14
Volatiles (ug/L)	
TRICHLOROETHENE	0.3 J

SAMPLE ID	SWMU318-GW12
SAMPLE DATE	3/20/2004
SAMPLE DEPTH (ft range)	12-16
Volatiles (ug/L)	
1,4-dichlorobenzene	1 J
Trichloroethene	0.6 J
Vinyl Chloride	0.9 J

SAMPLE ID	SWMU318-GW04
SAMPLE DATE	3/18/2004
SAMPLE DEPTH (ft range)	12-16
Volatiles (ug/L)	
1,4-dichlorobenzene	0.9 J
Benzene	0.9 J
Naphthalene	18
Trichloroethene	0.7 J

SAMPLE ID (Fixed)	SWMU318-GW04
SAMPLE DATE	3/18/04
SAMPLE DEPTH (ft range)	12-16
SemiVolatiles (ug/L)	
NAPHTHALENE	12

SAMPLE ID	SWMU318-GW11
SAMPLE DATE	3/20/2004
SAMPLE DEPTH (ft range)	12-16
Volatiles (ug/L)	
Trichloroethene	0.8 J

NOTE:
Underlined - Exceeds NC 2L Standards
Boxed - Exceeds USEPA Region IX tap water PRGs

SOURCE: MCB CAMP LEJEUNE, 2000.

LEGEND

- RFI SOIL AND GROUNDWATER GRAB BORING
- DESIGNATES BOUNDARY OF SITE 86
- GROUNDWATER FLOW DIRECTION

Baker

FIGURE 2-3
DISTRIBUTION OF CONSTITUENTS EXCEEDING SCREENING VALUES IN GROUNDWATER (10-19 ft bgs)
SWMUS 303/318
CTO - 0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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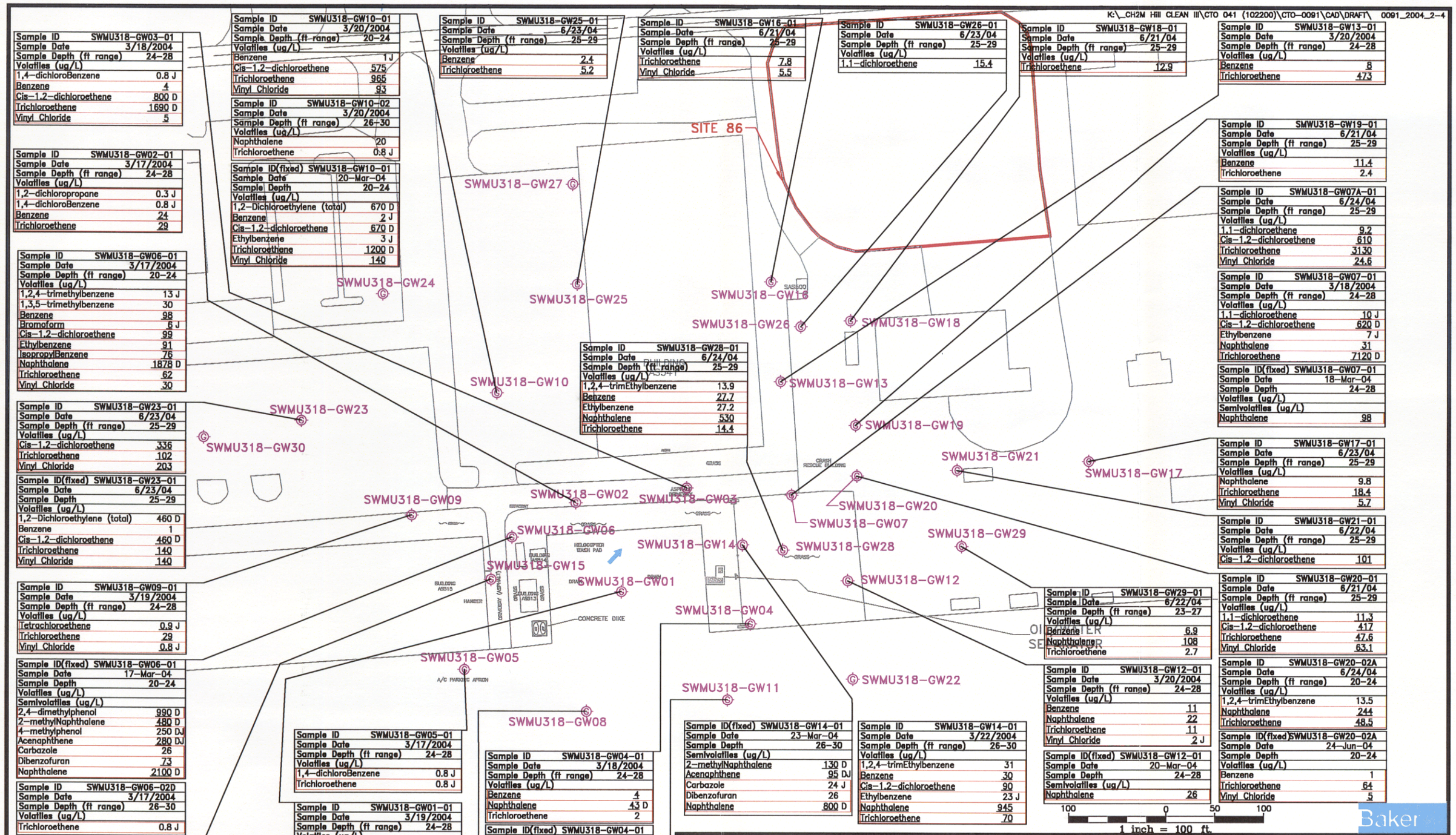


Sample ID	SWMU318-GW03-01
Sample Date	3/18/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
1,4-dichloroBenzene	0.8 J
Benzene	4
Cis-1,2-dichloroethene	800 D
Trichloroethene	1690 D
Vinyl Chloride	5

Sample ID	SWMU318-GW02-01
Sample Date	3/17/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
1,2-dichloropropane	0.3 J
1,4-dichloroBenzene	0.8 J
Benzene	24
Trichloroethene	29

Sample ID	SWMU318-GW06-01
Sample Date	3/17/2004
Sample Depth (ft range)	20-24
Volatiles (ug/L)	
1,2,4-trimethylbenzene	13 J
1,3,5-trimethylbenzene	30
Benzene	98
Bromoform	6 J
Cis-1,2-dichloroethene	99
Ethylbenzene	91
IsopropylBenzene	76
Naphthalene	1878 D
Trichloroethene	62
Vinyl Chloride	30

Sample ID	SWMU318-GW23-01
Sample Date	6/23/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
Cis-1,2-dichloroethene	336
Trichloroethene	102
Vinyl Chloride	203

Sample ID(fixed)	SWMU318-GW23-01
Sample Date	6/23/04
Sample Depth	25-29
Volatiles (ug/L)	
1,2-Dichloroethylene (total)	460 D
Benzene	1
Cis-1,2-dichloroethene	460 D
Trichloroethene	140
Vinyl Chloride	140

Sample ID	SWMU318-GW09-01
Sample Date	3/19/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
Tetrachloroethene	0.9 J
Trichloroethene	29
Vinyl Chloride	0.8 J

Sample ID(fixed)	SWMU318-GW06-01
Sample Date	17-Mar-04
Sample Depth	20-24
Volatiles (ug/L)	
Semivolatiles (ug/L)	
2,4-dimethylphenol	990 D
2-methylNaphthalene	480 D
4-methylphenol	250 DJ
Acenaphthene	280 DJ
Carbazole	26
Dibenzofuran	73
Naphthalene	2100 D

Sample ID	SWMU318-GW06-02D
Sample Date	3/17/2004
Sample Depth (ft range)	26-30
Volatiles (ug/L)	
Trichloroethene	0.8 J

Sample ID	SWMU318-GW15-01
Sample Date	3/22/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
1,2,4-trimEthylbenzene	89 J
1,3,5-trimEthylbenzene	45 J
Benzene	220
Ethylbenzene	144
Meta-xylene	272
Naphthalene	3040

Sample ID	SWMU318-GW10-01
Sample Date	3/20/2004
Sample Depth (ft range)	20-24
Volatiles (ug/L)	
Benzene	1 J
Cis-1,2-dichloroethene	575
Trichloroethene	965
Vinyl Chloride	93

Sample ID	SWMU318-GW10-02
Sample Date	3/20/2004
Sample Depth (ft range)	26-30
Volatiles (ug/L)	
Naphthalene	20
Trichloroethene	0.8 J

Sample ID(fixed)	SWMU318-GW10-01
Sample Date	20-Mar-04
Sample Depth	20-24
Volatiles (ug/L)	
1,2-Dichloroethylene (total)	670 D
Benzene	2 J
Cis-1,2-dichloroethene	670 D
Ethylbenzene	3 J
Trichloroethene	1200 D
Vinyl Chloride	140

Sample ID	SWMU318-GW25-01
Sample Date	6/23/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
Benzene	2.4
Trichloroethene	5.2

Sample ID	SWMU318-GW16-01
Sample Date	6/21/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
Trichloroethene	7.8
Vinyl Chloride	5.5

Sample ID	SWMU318-GW26-01
Sample Date	6/23/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
1,1-dichloroethene	15.4

Sample ID	SWMU318-GW18-01
Sample Date	6/21/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
Trichloroethene	12.9

Sample ID	SWMU318-GW28-01
Sample Date	6/24/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
1,2,4-trimEthylbenzene	13.9
Benzene	27.7
Ethylbenzene	27.2
Naphthalene	530
Trichloroethene	14.4

Sample ID	SWMU318-GW05-01
Sample Date	3/17/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
1,4-dichloroBenzene	0.8 J
Trichloroethene	0.8 J

Sample ID	SWMU318-GW01-01
Sample Date	3/19/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
Benzene	73
Ethylbenzene	47
Naphthalene	1970 D
Tetrachloroethene	7 J
Trichloroethene	34

Sample ID	SWMU318-GW08-01
Sample Date	3/17/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
Trichloroethene	0.9 J

Sample ID	SWMU318-GW04-01
Sample Date	3/18/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
Benzene	4
Naphthalene	43 D
Trichloroethene	2

Sample ID(fixed)	SWMU318-GW04-01
Sample Date	18-Mar-04
Sample Depth	24-28
Volatiles (ug/L)	
Benzene	5 J
Trichloroethene	2 J

Sample ID	SWMU318-GW11-01
Sample Date	3/20/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
Trichloroethene	1 J

Sample ID(fixed)	SWMU318-GW14-01
Sample Date	23-Mar-04
Sample Depth	26-30
Semivolatiles (ug/L)	
2-methylNaphthalene	130 D
Acenaphthene	95 DJ
Carbazole	24 J
Dibenzofuran	26
Naphthalene	800 D

Sample ID	SWMU318-GW14-01
Sample Date	3/22/2004
Sample Depth (ft range)	26-30
Volatiles (ug/L)	
1,2,4-trimEthylbenzene	31
Benzene	30
Cis-1,2-dichloroethene	90
Ethylbenzene	23 J
Naphthalene	945
Trichloroethene	70

Sample ID	SWMU318-GW29-01
Sample Date	6/22/04
Sample Depth (ft range)	23-27
Volatiles (ug/L)	
Benzene	6.9
Naphthalene	108
Trichloroethene	2.7

Sample ID	SWMU318-GW12-01
Sample Date	3/20/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
Benzene	11
Naphthalene	22
Trichloroethene	11
Vinyl Chloride	2 J

Sample ID(fixed)	SWMU318-GW12-01
Sample Date	20-Mar-04
Sample Depth	24-28
Semivolatiles (ug/L)	
Naphthalene	26

Sample ID	SWMU318-GW13-01
Sample Date	3/20/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
Benzene	8
Trichloroethene	473

Sample ID	SMWU318-GW19-01
Sample Date	6/21/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
Benzene	11.4
Trichloroethene	2.4

Sample ID	SWMU318-GW07A-01
Sample Date	6/24/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
1,1-dichloroethene	9.2
Cis-1,2-dichloroethene	610
Trichloroethene	3130
Vinyl Chloride	24.6

Sample ID	SWMU318-GW07-01
Sample Date	3/18/2004
Sample Depth (ft range)	24-28
Volatiles (ug/L)	
1,1-dichloroethene	10 J
Cis-1,2-dichloroethene	620 D
Ethylbenzene	7 J
Naphthalene	31
Trichloroethene	7120 D

Sample ID(fixed)	SWMU318-GW07-01
Sample Date	18-Mar-04
Sample Depth	24-28
Volatiles (ug/L)	
Semivolatiles (ug/L)	
Naphthalene	98

Sample ID	SWMU318-GW17-01
Sample Date	6/23/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
Naphthalene	9.8
Trichloroethene	18.4
Vinyl Chloride	5.7

Sample ID	SWMU318-GW21-01
Sample Date	6/22/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
Cis-1,2-dichloroethene	101

Sample ID	SWMU318-GW20-01
Sample Date	6/21/04
Sample Depth (ft range)	25-29
Volatiles (ug/L)	
1,1-dichloroethene	11.3
Cis-1,2-dichloroethene	417
Trichloroethene	47.6
Vinyl Chloride	63.1

Sample ID	SWMU318-GW20-02A
Sample Date	6/24/04
Sample Depth (ft range)	20-24
Volatiles (ug/L)	
1,2,4-trimEthylbenzene	13.5
Naphthalene	244
Trichloroethene	48.5

Sample ID(fixed)	SWMU318-GW20-02A
Sample Date	24-Jun-04
Sample Depth	20-24
Volatiles (ug/L)	
Benzene	1
Trichloroethene	64
Vinyl Chloride	5

Baker

LEGEND

- RFI SOIL AND GROUNDWATER GRAB BORING
- DESIGNATES BOUNDARY OF SITE 86
- GROUNDWATER FLOW DIRECTION

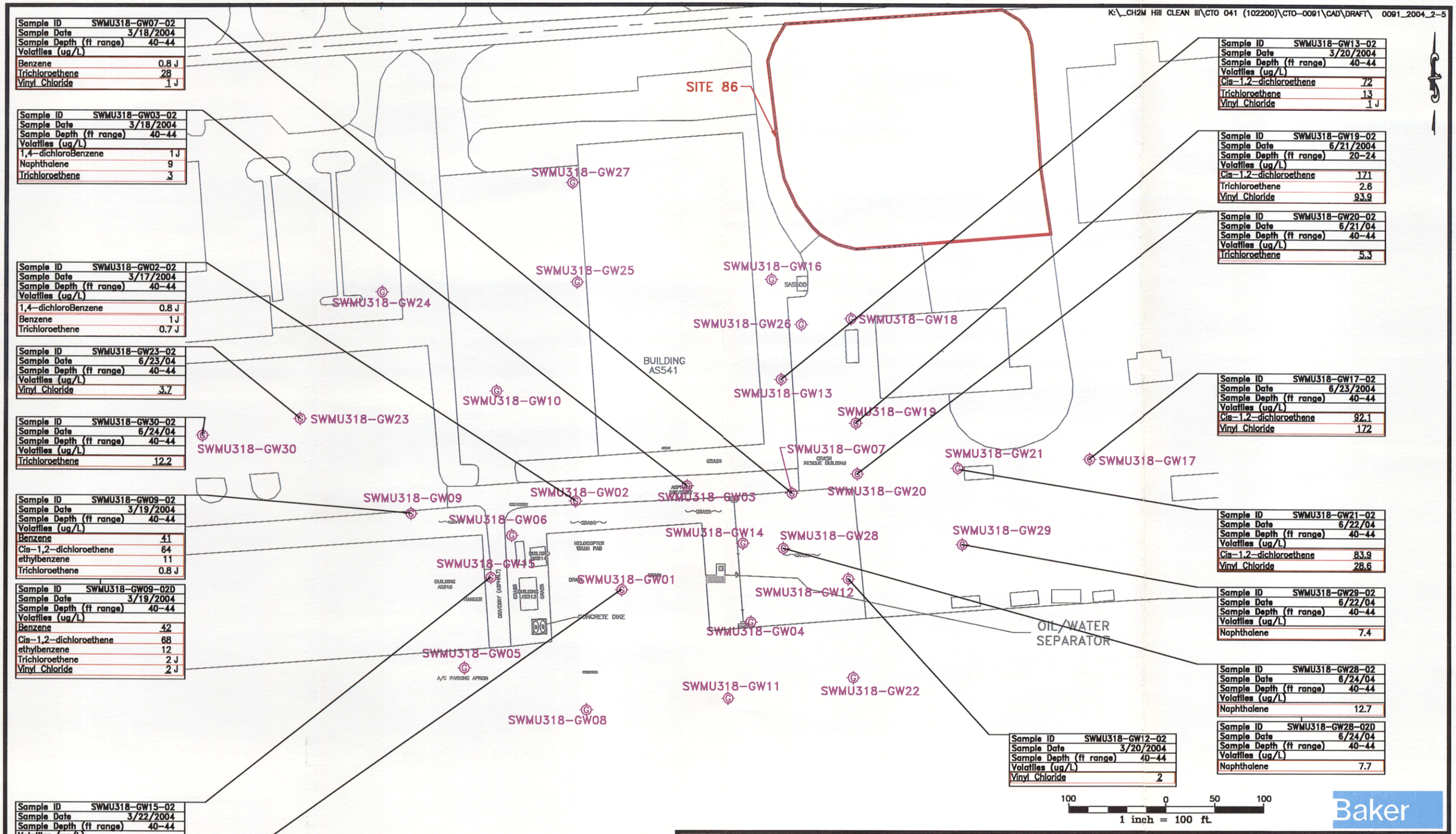
NOTE:

Underlined - Exceeds NC 2L Standards

Boxed - Exceeds USEPA Region IX tap water PRGs

FIGURE 2-4
DISTRIBUTION OF CONSTITUENTS EXCEEDING SCREENING VALUES IN GROUNDWATER (20 – 30 ft bgs)
SWMUS 303/318
CTO – 0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

K:_CH2M Hill CLEAN III\CTO 041 (102200)\CTO-0091\CAD\DRAFT\ 0091_2004_2-5



Sample ID	SWMU318-GW07-02
Sample Date	3/18/2004
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Benzene	0.8 J
Trichloroethene	28
Vinyl Chloride	1 J

Sample ID	SWMU318-GW03-02
Sample Date	3/18/2004
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
1,4-dichloroBenzene	1 J
Naphthalene	9
Trichloroethene	3

Sample ID	SWMU318-GW02-02
Sample Date	3/17/2004
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
1,4-dichloroBenzene	0.8 J
Benzene	1 J
Trichloroethene	0.7 J

Sample ID	SWMU318-GW23-02
Sample Date	6/23/04
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Vinyl Chloride	3.7

Sample ID	SWMU318-GW30-02
Sample Date	6/24/04
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Trichloroethene	12.2

Sample ID	SWMU318-GW09-02
Sample Date	3/19/2004
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Benzene	41
Cis-1,2-dichloroethene	64
ethylbenzene	11
Trichloroethene	0.8 J

Sample ID	SWMU318-GW09-02D
Sample Date	3/19/2004
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Benzene	42
Cis-1,2-dichloroethene	68
ethylbenzene	12
Trichloroethene	2 J
Vinyl Chloride	2 J

Sample ID	SWMU318-GW15-02
Sample Date	3/22/2004
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Benzene	16
ethylbenzene	3.1 J
Naphthalene	11

Sample ID	SWMU318-GW01-02
Sample Date	3/19/2004
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Naphthalene	20

Sample ID	SWMU318-GW13-02
Sample Date	3/20/2004
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Cis-1,2-dichloroethene	72
Trichloroethene	13
Vinyl Chloride	1 J

Sample ID	SWMU318-GW19-02
Sample Date	6/21/2004
Sample Depth (ft range)	20-24
Volatiles (ug/L)	
Cis-1,2-dichloroethene	171
Trichloroethene	2.6
Vinyl Chloride	93.9

Sample ID	SWMU318-GW20-02
Sample Date	6/21/04
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Trichloroethene	5.3

Sample ID	SWMU318-GW17-02
Sample Date	6/23/2004
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Cis-1,2-dichloroethene	92.1
Vinyl Chloride	172

Sample ID	SWMU318-GW21-02
Sample Date	6/22/04
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Cis-1,2-dichloroethene	83.9
Vinyl Chloride	28.6

Sample ID	SWMU318-GW29-02
Sample Date	6/22/04
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Naphthalene	7.4

Sample ID	SWMU318-GW28-02
Sample Date	6/24/04
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Naphthalene	12.7

Sample ID	SWMU318-GW28-02D
Sample Date	6/24/04
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Naphthalene	7.7

Sample ID	SWMU318-GW12-02
Sample Date	3/20/2004
Sample Depth (ft range)	40-44
Volatiles (ug/L)	
Vinyl Chloride	2

SOURCE: MCB CAMP LEJEUNE, 2000.

Baker

LEGEND

- RFI SOIL AND GROUNDWATER GRAB BORING
- DESIGNATES BOUNDARY OF SITE 86

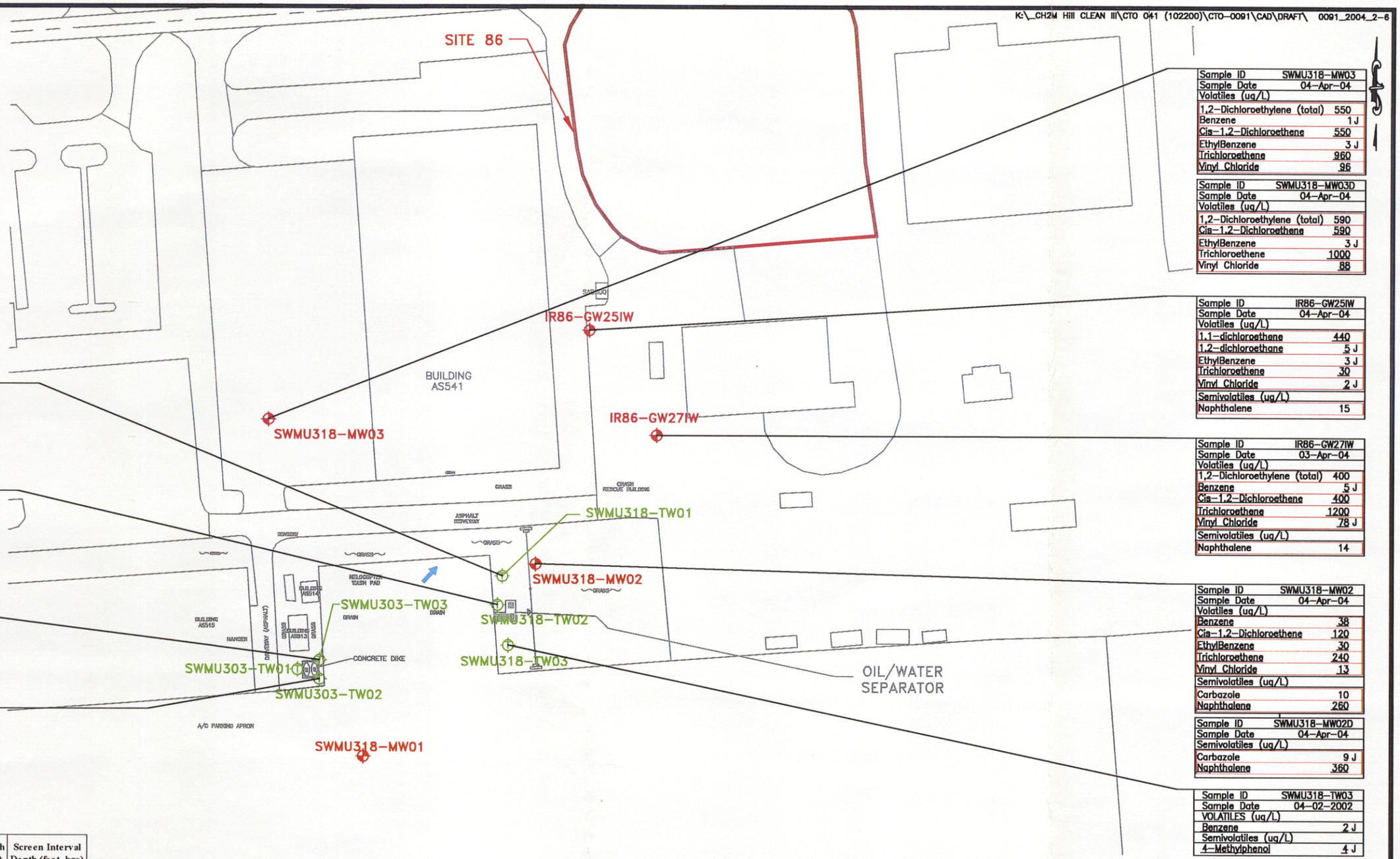
NOTE:

Underlined - Exceeds NC 2L Standards

Boxed - Exceeds USEPA Region IX tap water PRGs

FIGURE 2-5
DISTRIBUTION OF CONSTITUENTS EXCEEDING SCREENING VALUES IN GROUNDWATER (40-44 ft bgs)
SWMUS 303/318
CTO - 0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

K:_CH2M Hill CLEAN III\CTO 041 (102200)\CTO-0091\CAD\DRAFT\ 0091_2004_2-6



Sample ID	SWMU318-TW01
Sample Date	04-02-2002
VOLATILES (ug/L)	
Benzene	2 J
Trichloroethene	15
Vinyl chloride	2 J
Semivolatiles (ug/L)	
Naphthalene	40

Sample ID	SWMU318-TW02
Sample Date	04-02-2002
VOLATILES (ug/L)	
Benzene	4 J
Trichloroethene	8
Vinyl chloride	0.9 J
Semivolatiles (ug/L)	
Naphthalene	97
METALS (ug/L)	
Arsenic	**13.2 J**

Sample ID	SWMU303-TW03
Sample Date	04-02-2002
Semivolatiles (ug/L)	
4-Methylphenol	9 J
Naphthalene	140
METALS (ug/L)	
Arsenic	**19.6 J**

Sample ID	SWMU303-TW02
Sample Date	04-02-2002
Semivolatiles (ug/L)	
4-Methylphenol	4 J
METALS (ug/L)	
Arsenic	**19 J**
Chromium	**67.2 J**
Lead	**18.4 J**

Sample ID	SWMU318-MW03
Sample Date	04-Apr-04
Volatiles (ug/L)	
1,2-Dichloroethylene (total)	550
Benzene	1 J
Cis-1,2-Dichloroethene	550
EthylBenzene	3 J
Trichloroethene	960
Vinyl Chloride	96

Sample ID	SWMU318-MW03D
Sample Date	04-Apr-04
Volatiles (ug/L)	
1,2-Dichloroethylene (total)	590
Cis-1,2-Dichloroethene	590
EthylBenzene	3 J
Trichloroethene	1000
Vinyl Chloride	88

Sample ID	IR86-GW25IW
Sample Date	04-Apr-04
Volatiles (ug/L)	
1,1-dichloroethene	440
1,2-dichloroethane	5 J
EthylBenzene	3 J
Trichloroethene	30
Vinyl Chloride	2 J
Semivolatiles (ug/L)	
Naphthalene	15

Sample ID	IR86-GW27IW
Sample Date	03-Apr-04
Volatiles (ug/L)	
1,2-Dichloroethylene (total)	400
Benzene	5 J
Cis-1,2-Dichloroethene	400
Trichloroethene	1200
Vinyl Chloride	78 J
Semivolatiles (ug/L)	
Naphthalene	14

Sample ID	SWMU318-MW02
Sample Date	04-Apr-04
Volatiles (ug/L)	
Benzene	38
Cis-1,2-Dichloroethene	120
EthylBenzene	30
Trichloroethene	240
Vinyl Chloride	13
Semivolatiles (ug/L)	
Carbazole	10
Naphthalene	260

Sample ID	SWMU318-MW02D
Sample Date	04-Apr-04
Semivolatiles (ug/L)	
Carbazole	9 J
Naphthalene	360

Sample ID	SWMU318-TW03
Sample Date	04-02-2002
VOLATILES (ug/L)	
Benzene	2 J
Semivolatiles (ug/L)	
4-Methylphenol	4 J

Well No.	Well Depth (feet, bgs)	Screen Interval Depth (feet, bgs)
SWMU303-TW01	16	6-16
SWMU303-TW02	15	5-15
SWMU303-TW03	15	5-15
SWMU318-TW01	16	6-16
SWMU318-TW02	16	6-16
SWMU318-TW03	17	7-17
SWMU318-MW01	30	20-30
SWMU318-MW02	30	20-30
SWMU318-MW03	30	20-30
IR86-GW25IW	30	20-30
IR86-GW27IW	30	20-30

SOURCE: MCB CAMP LEJEUNE, 2000.

NOTE:

Underlined - Exceeds NC 2L Standards
Boxed - Exceeds USEPA Region IX tap water PRGs
Bold- Exceeds Background Concentrations

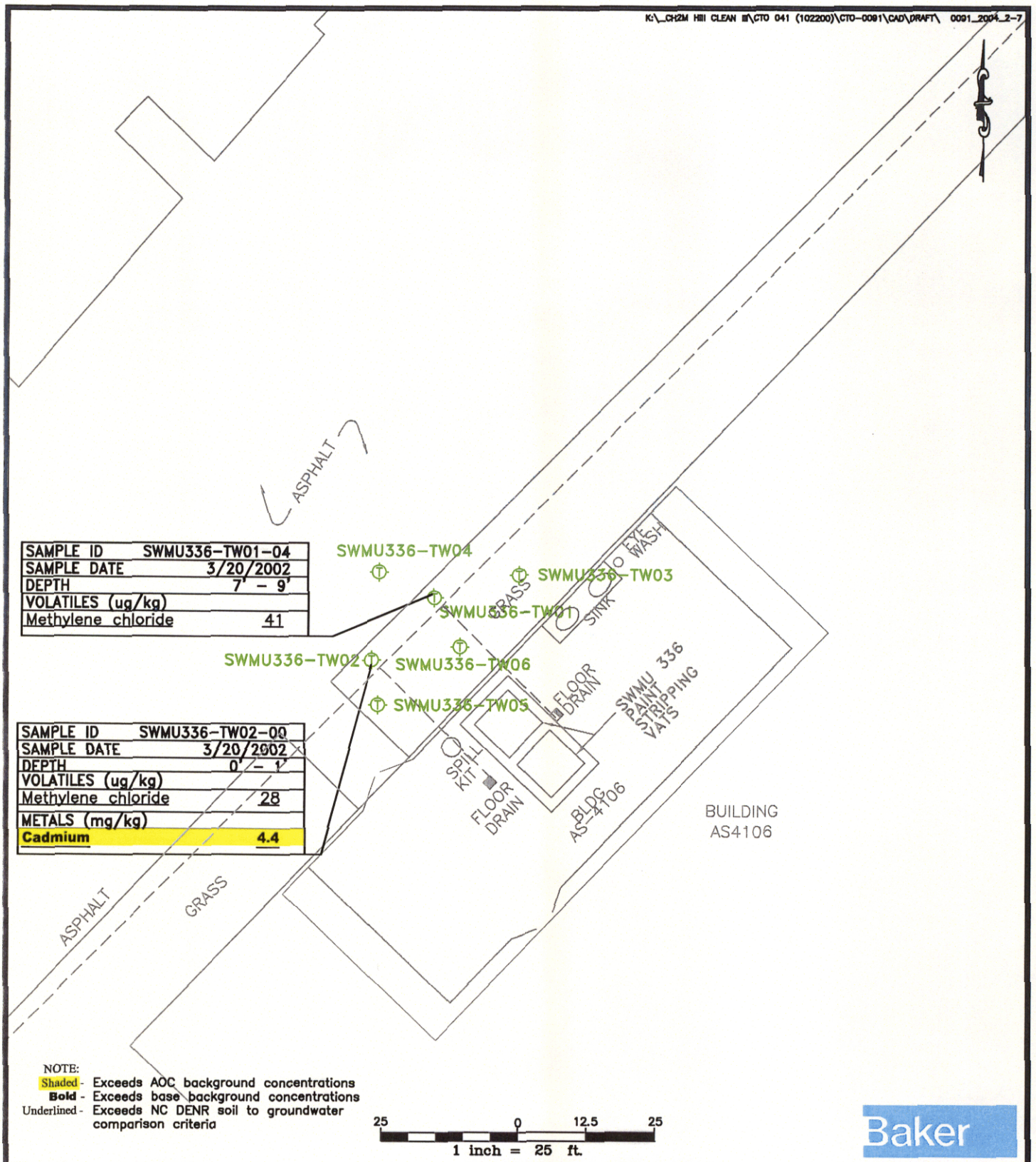
100 0 50 100
1 inch = 100 ft.

Baker

LEGEND

- MONITORING WELL (SAMPLED DURING INITIAL RFI)
- PHASE II CSI TEMPORARY WELL
- DESIGNATES BOUNDARY OF SITE 86
- GROUNDWATER FLOW DIRECTION

FIGURE 2-6
DISTRIBUTION OF CONSTITUENTS EXCEEDING SCREENING VALUES IN GROUNDWATER MONITORING WELLS
SWMUS 303/318
CTO - 0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

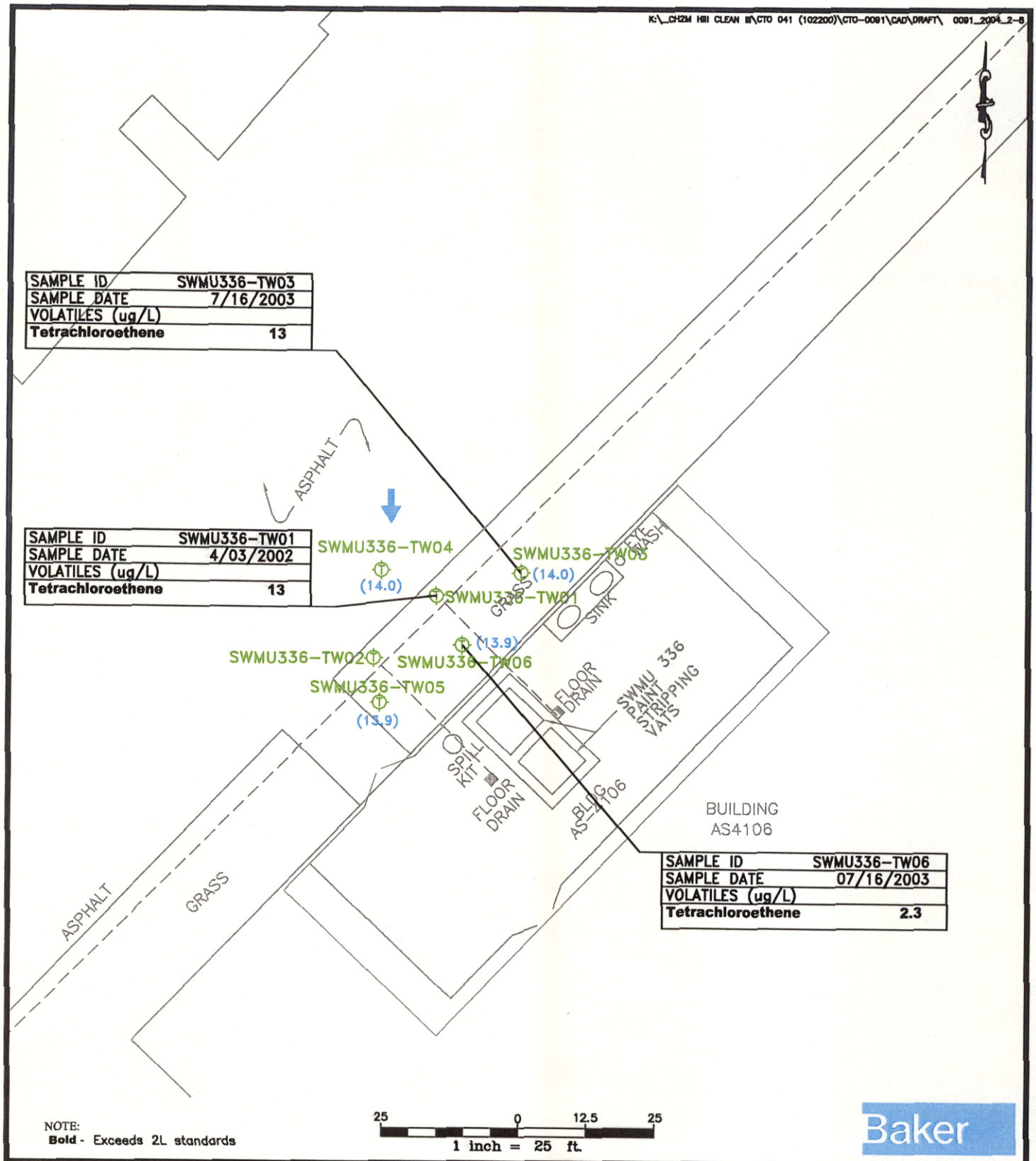


LEGEND

- PHASE II CSI TEMPORARY WELL
- UNDERGROUND LINE

SOURCE: MCB CAMP LEJEUNE MARCH 2000

FIGURE 2-7
DISTRIBUTION OF CONSTITUENTS EXCEEDING SCREENING VALUES IN SOIL
SWMU 336
CTO-0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



LEGEND

- PHASE II CSI TEMPORARY WELL
- GROUNDWATER FLOW DIRECTION
- (12.3) – GROUNDWATER ELEVATION (ft msl, 2003)
- UNDERGROUND LINE

SOURCE: MCB CAMP LEJEUNE MARCH 2000

FIGURE 2-8
DISTRIBUTION OF CONSTITUENTS EXCEEDING SCREENING VALUES IN GROUNDWATER
SWMU 336
CTO-0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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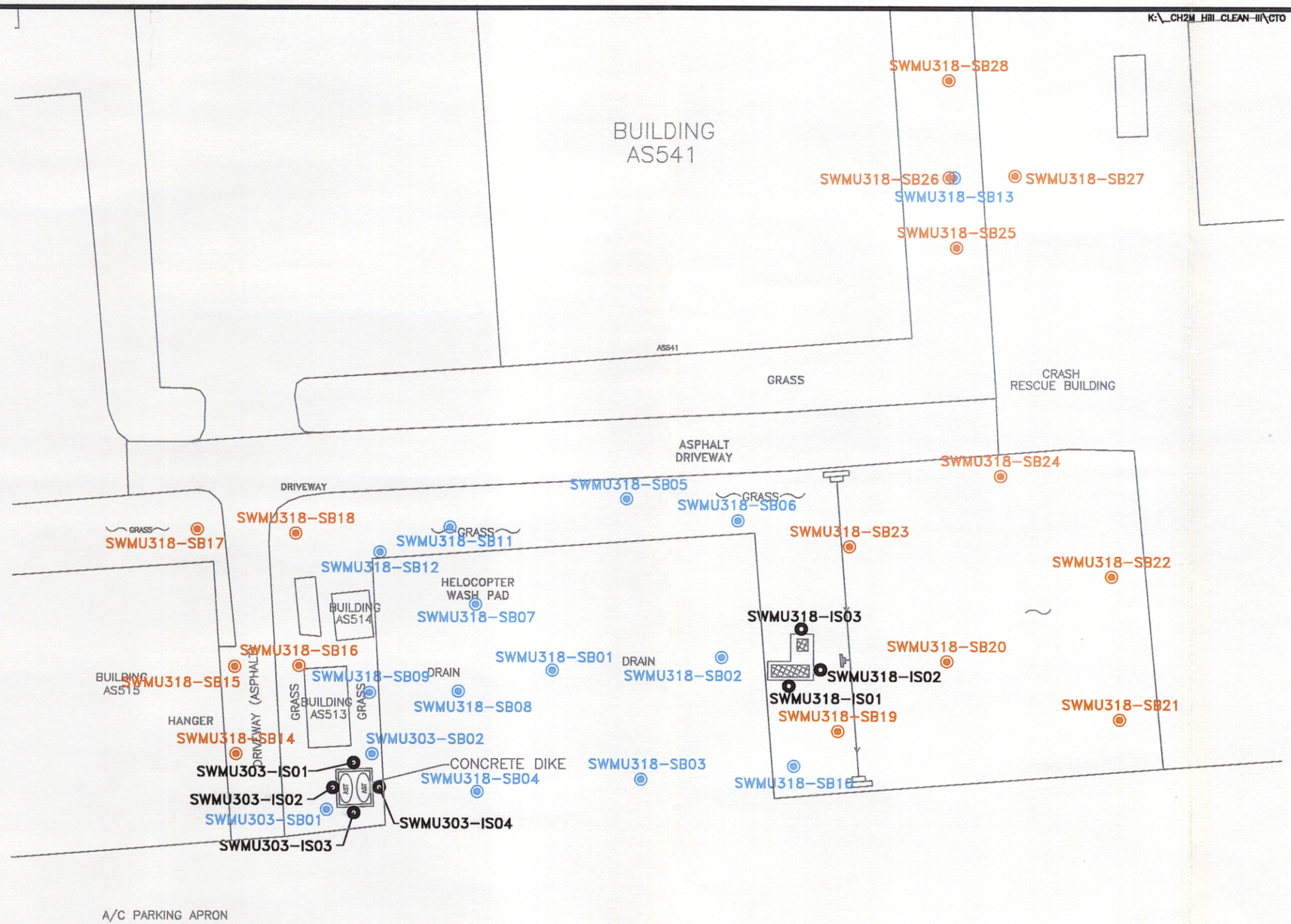


50 0 25 50
1 inch = 50 ft.

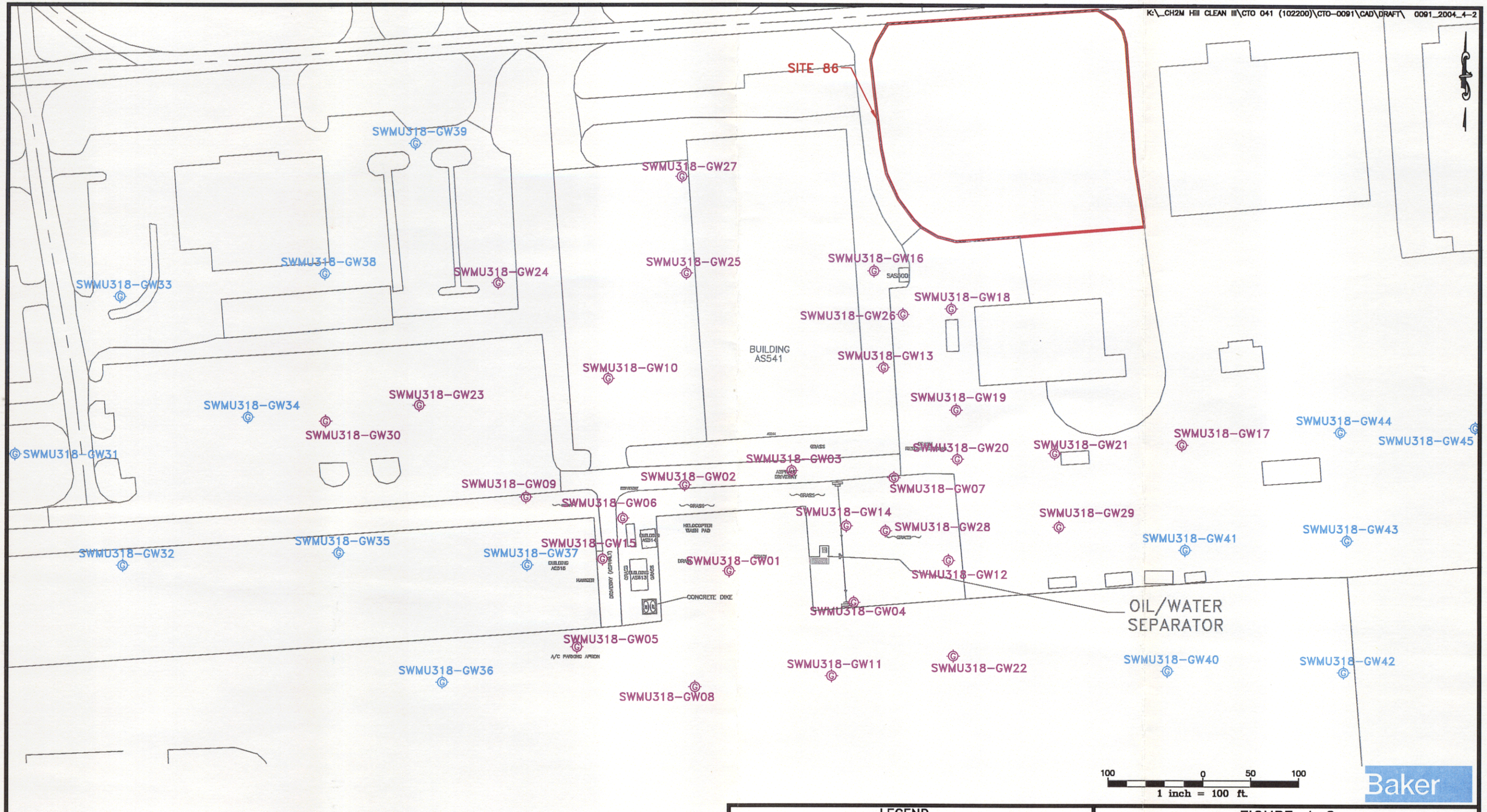
Baker

LEGEND

- INITIAL RFI SOIL BORING
- PROPOSED ADDITIONAL RFI SOIL BORING
- PHASE I CSI SOIL BORING

FIGURE 4-1
PROPOSED SOIL BORING LOCATION MAP
SWMUS 303/318
CTO - 0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

K:_CH2M Hill CLEAN III\CTO 041 (102200)\CTO-0091\CAD\DRAFT\ 0091_2004_4-2



LEGEND

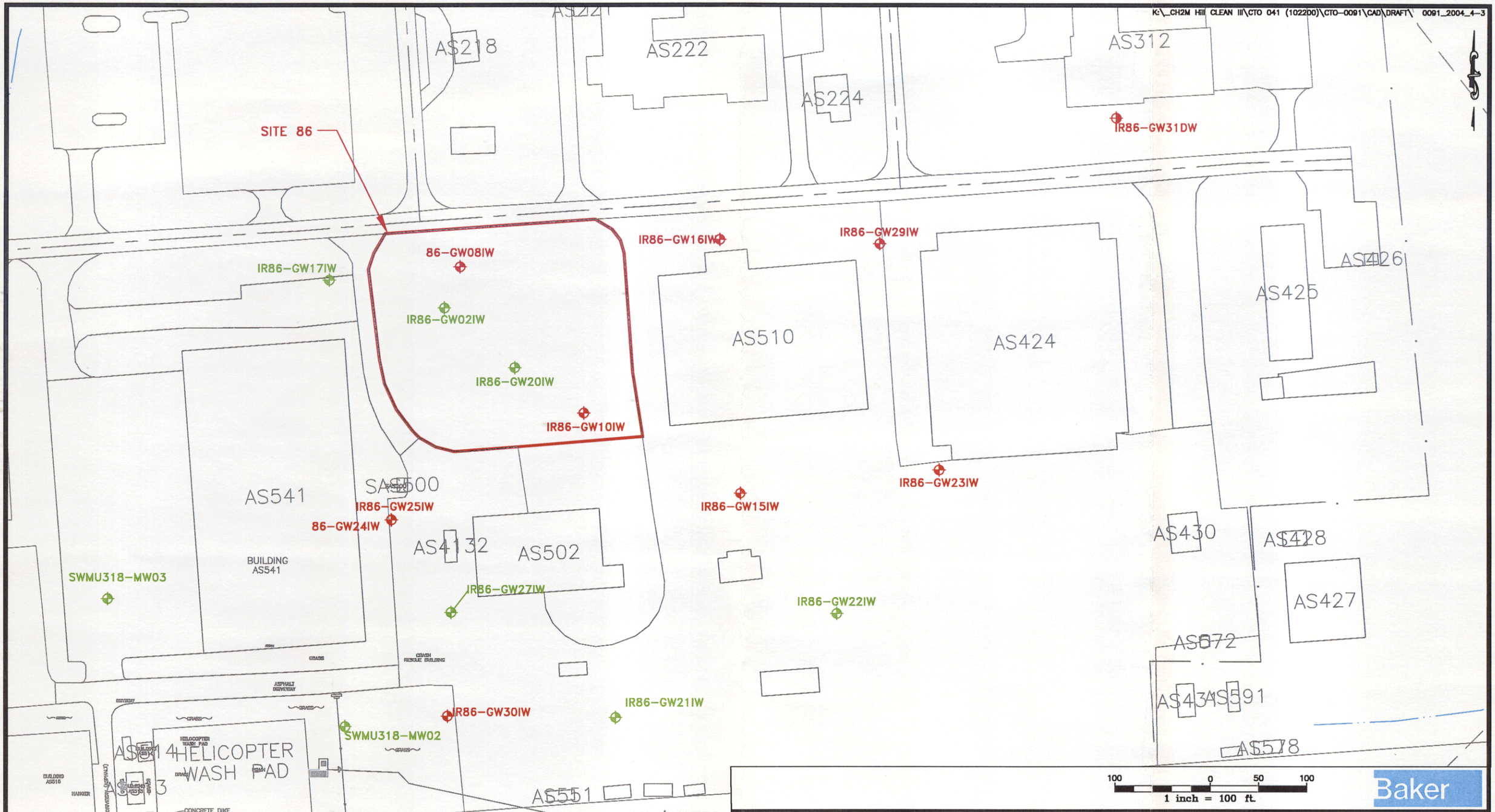
- INITIAL RFI SOIL AND GROUNDWATER GRAB BORING
- PROPOSED RFI GROUNDWATER GRAB BORING
- DESIGNATES BOUNDARY OF SITE 86

FIGURE 4-2
PROPOSED GROUNDWATER GRAB BORING LOCATION MAP
SWMUS 303/318

CTO – 0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

SOURCE: MCB CAMP LEJEUNE, 2000.

K:_CH2M HILL CLEAN III\CTO 041 (102200)\CTO-0091\CAD\DRAFT\ 0091_2004_4-3



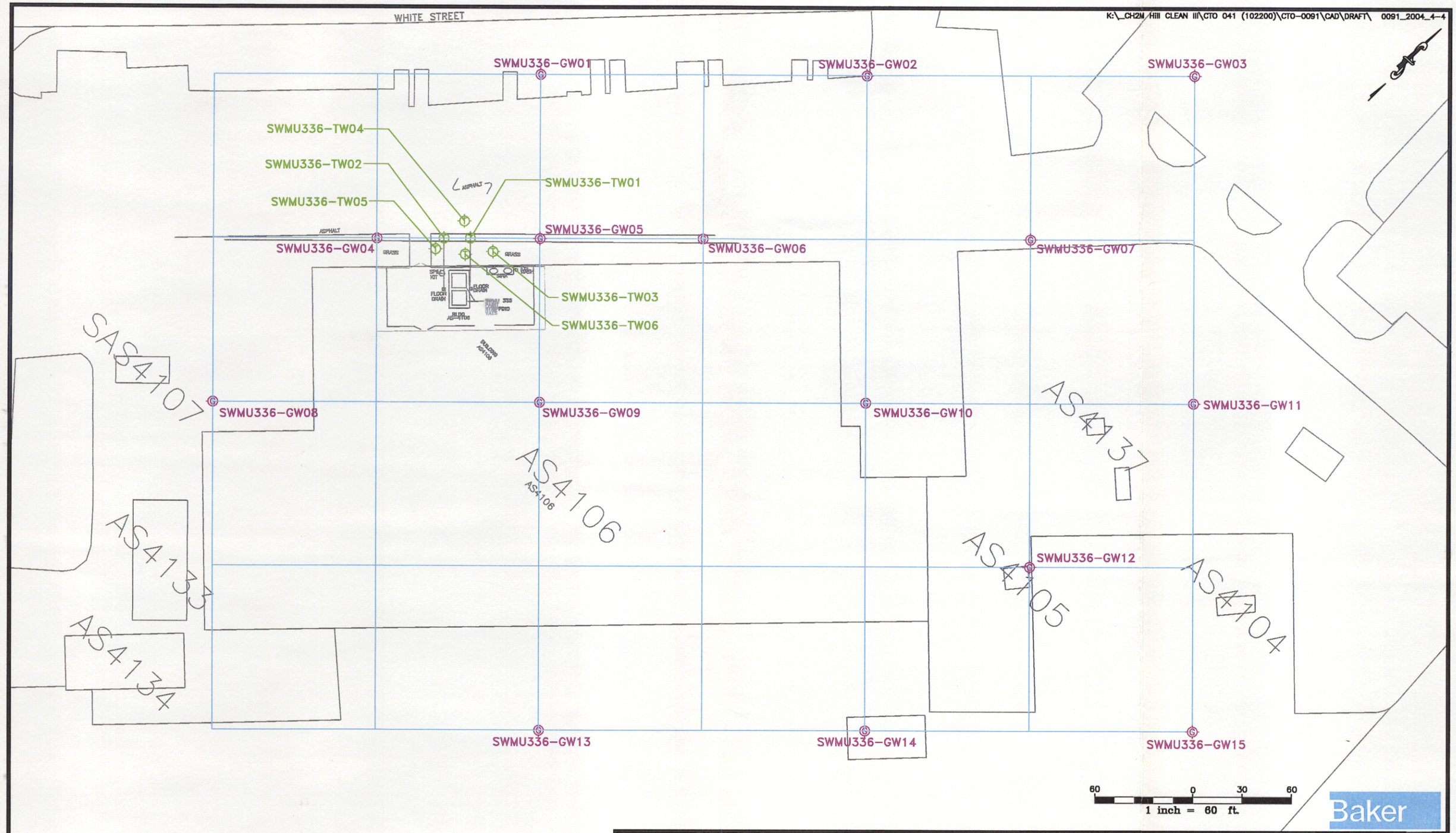
SOURCE: MCB CAMP LEJEUNE, 2000.

LEGEND

- MONITORING WELL (MOST RECENT DATA FROM LTM PROGRAM TO BE USED)
- MONITORING WELL (TO BE SAMPLED)
- DESIGNATES BOUNDARY OF SITE 86

NOTE:
318-MW04 THRU MW06 WILL BE LOCATED IN THE FIELD BASED ON THE RESULTS OF THE GW GRAB SAMPLES

FIGURE 4-3
MONITORING WELL LOCATION MAP
SWMUS 303/318
CTO - 0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



LEGEND

- PHASE II CSI TEMPORARY WELL
- PROPOSED RFI SOIL AND GROUNDWATER GRAB BORING

SOURCE: MCB CAMP LEJEUNE, 2000.

FIGURE 4-4
PROPOSED SOIL BORING AND GROUNDWATER GRAB SAMPLE LOCATION MAP
SWMU 336
CTO - 0091
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

FIGURE 5-1

PROJECT TEAM ORGANIZATION
RCRA FACILITY INVESTIGATION (RFI) WORK PLAN (CTO-0091)
MCB, CAMP LEJEUNE, NORTH CAROLINA

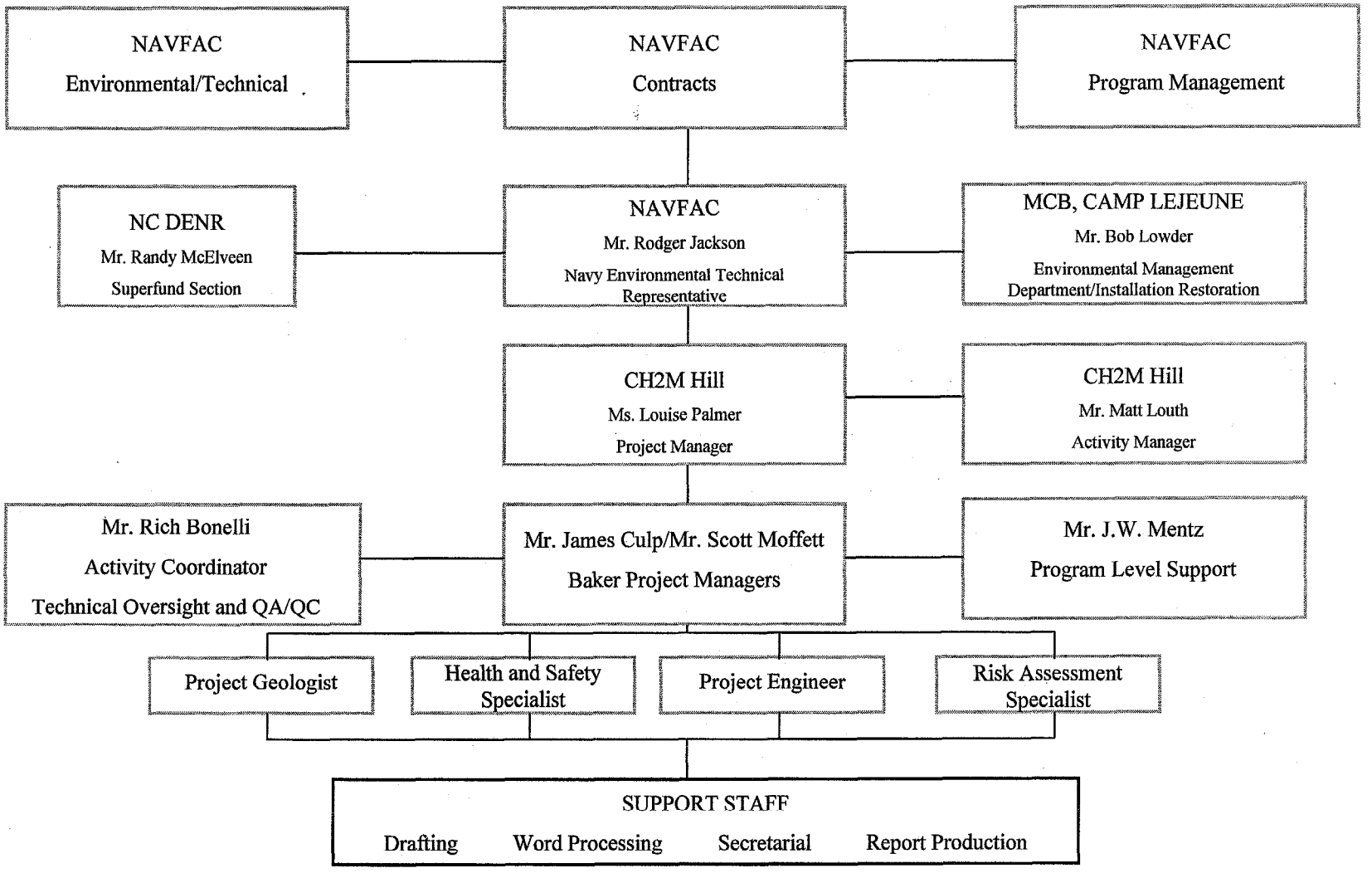
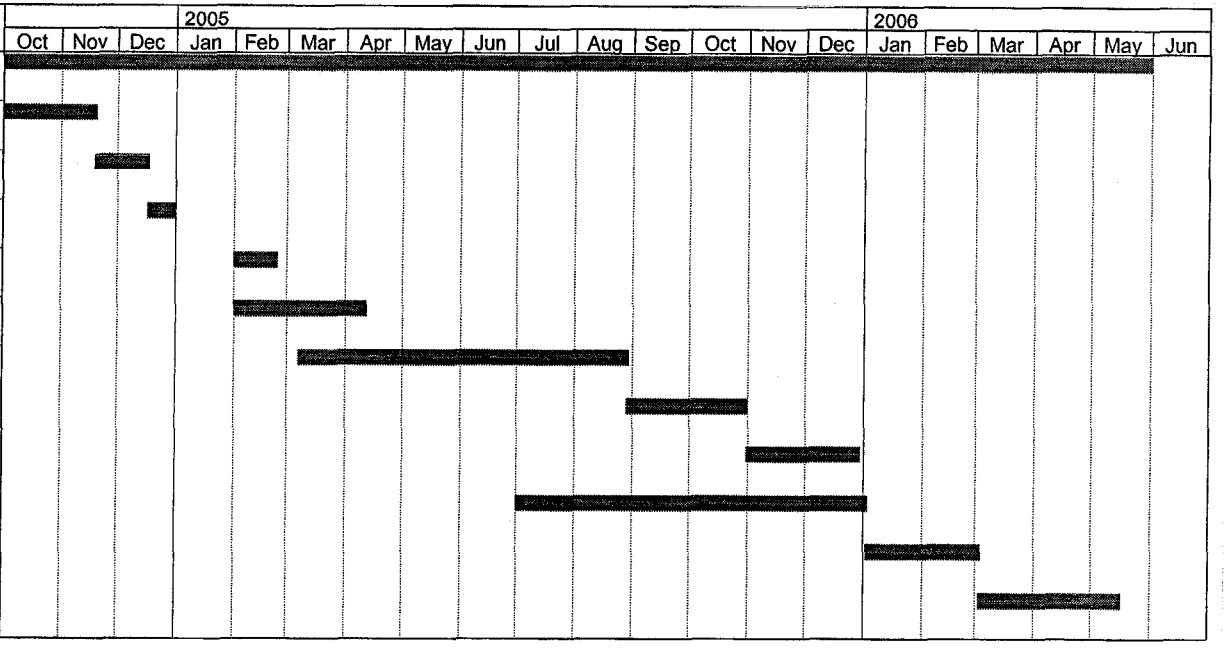


FIGURE 6-1

Proposed Project Schedule
RCRA Facility Investigation (RFI) Work Plan (CTO-0091)
MCB, Camp Lejeune, North Carolina

Task Name	Duration	Start	Finish
Project Management	435 days	10/1/04	5/31/06
Draft Project Plans	36 days	10/1/04	11/19/04
Agency Review	21 days	11/19/04	12/17/04
Final Project Plans	11 days	12/17/04	12/31/04
RFI Field Investigation	18 days	2/1/05	2/23/05
Laboratory Analyses/Data Validation	51 days	2/1/05	4/11/05
Draft RFI Report	126 days	3/7/05	8/29/05
Agency Review	46 days	8/29/05	10/31/05
Final RFI Report	44 days	10/31/05	12/29/05
Draft CMS Report	132 days	7/1/05	1/2/06
Agency Review	45 days	1/2/06	3/3/06
Final CMS Report	53 days	3/3/06	5/16/06



Project: CTO-0091
Date: 2/7/05

Task

Milestone

APPENDIX A
IDW MANAGEMENT SOP

Standard Operating Procedure
For the Management of Investigative Derived Waste
Aboard Marine Corps Base, Camp Lejeune

Purpose:

This Standard Operating Procedure (SOP) is intended to provide guidance for proper Investigative Derived Waste (IDW) management aboard Marine Corps Base, Camp Lejeune.

Background:

Marine Corps Base (MCB), Camp Lejeune's Environmental Quality Branch is responsible for the implementation of the Installation Restoration (IR) Program, the Leaking Underground Storage Tank (UST) Program, and the Solid Waste Management Unit (SWMU) Program. Field investigation activities associated with these programs often result in the generation and handling of potentially contaminated materials that must be properly managed to protect the public and the environment, as well as to meet legal requirements. These materials are known as IDW, and may consist of:

-Drill cuttings
-Decontamination Fluids
-Drilling mud
-Development and Purge Water
-Personal Protective Equipment
-Others

In the past, IDW management has required extensive coordination from the investigative contractors, remedial contractors, and base personnel. Poor management practices and a lack of proper coordination often resulted in IDW being misplaced, labeled incorrectly, and/or staged for extensive periods of time prior to disposal. These management practices not only reflect poorly on MCB, Camp Lejeune and the contractors, and stand in violation of Federal and State Regulations regarding hazardous waste management. It is in an effort to prevent these situations from arising and preclude regulatory action that this SOP for IDW Management is being implemented.

For the purposes of the SOP, IDW Management will include the following six phases:

1- Documentation
2- Generation
3- Containerization
4- On-Site Staging
5- Secondary Staging
6- Sampling/Analysis
7- Disposal

Responsibilities:

A. The Investigative Contractor will be responsible for the documentation, generation, containerization, and on-site staging of IDW. Prior to commencing fieldwork, the Investigative Contractor will contact the Remedial Action Contractor (RAC) and complete an IDW Management Form. During fieldwork, IDW will be placed in the containers specified on the IDW Management Form and a copy of the same form will be placed in a sealed plastic sleeve and secured to the container. The container will then be labeled (visible marker) corresponding to the appropriate IDW Classification (IDW1, IDW2, IDW3, etc). All IDW will be staged at the location specified on the IDW Management Form. At completion of the field effort, the Investigative Contractor will complete an IDW List and contact the RAC to have the IDW containers removed from the Site. The Investigative Contractor will also be responsible for providing site-specific data to the RAC if required. All IDW management actions should be documented in the Weekly Reports.

B. The RAC will be responsible for the documentation, secondary staging, sampling and analysis, and disposal of IDW. The RAC will provide the Investigative Contractor an IDW Management Form and assist in its completion prior to the field effort and maintain a copy at all times. Following completion of the field effort, the RAC will meet the Investigative Contractor at the specified on-site staging area, check to see that all IDW Management Forms are complete and correct and transport the IDW containers to the secondary staging area. The RAC will then perform appropriate sampling/analysis of the IDW and/or review site-specific data to characterize the IDW for disposal. The RAC will coordinate with the Resource Conservation Recovery Section (RCRS) and provide the required analytical results for any IDW requiring disposal at the Base landfill or at a licensed TSD Facility. Once RCRS has concurred on the disposal plan and properly manifested the IDW, the RAC will carry out disposal at the appropriate facility. All IDW management actions should be documented in Weekly Reports.

IDW Management Form
(One Form Per Site or Location)

Form must be submitted to the following within 10 business days prior to start of work

Thomas Burton / EMD: burtonth@lejeune.usmc.mil /910-451-9612
Ron Kenyon / Shaw E&I: ronald.kenyon@shawgrp.com/770-663-1453
Randy Smith / Shaw E&I: randy.smith@shawgrp.com/ Field
Contact in field 910-389-4345 Mobile 910-451-2390 Office

Investigative Contractor: _____

Point of Contact (Field):

Name	Office Phone No.	E-Mail Address
_____	_____	_____
Cell Phone No.	Pager No.	
_____	_____	

Field Effort: Estimated Start Date _____

Estimated Completion Date _____

Wells Type _____

Quantity _____

Anticipated Waste: (Quantity Needed) Drums _____

Rolloffs _____

Tanks Size = 1000, Total = 3750, 4 Truck events, One Event per week

*Note: RAC Contractor will provide all drums, tanks and rolloffs needed.

Form Completed by

Name _____
Phone No. _____
E-mail _____
Date _____

Baker

RCRA - IDW LIST

Date:	
Time:	

PROJECT: RCRA Facility Investigation at SWMUs 303/318 and 336

PROJ. NO.:

Location:

Areas:

BAKER REP:

Location	Type	Container Type	Quantity	Comments
SWMU 303/318				
AS515 - O/W Separator				
SWMU 336				
AS4106 - Paint Stripper				

HASP ADDENDUM

FINAL

SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR SWMUs 303/318 and 336

RCRA PROGRAM
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0091

FEBRUARY 2005

Prepared for:

DEPARTMENT OF THE NAVY
MID-ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

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LIST OF ACRONYMS AND ABBREVIATIONS

AFETA	Armed Forces Experimental Training Activity
ALR	Air-Line Respirator
AOC	Area of Concern
APR	Air-Purifying Respirator
Baker	Baker Environmental, Inc.
BZ	Breathing Zone
CFR	Code of Federal Regulations
CPG	Certified Professional Geologist
CPR	Cardiopulmonary Resuscitation
CSI	Confirmatory Sampling Investigation
CSP	Certified Safety Professional
EO	equipment operator
FSAP	Field Sampling and Analysis Plan
F	Fahrenheit
HASP	Health and Safety Plan
IDLH	Immediately Dangerous to Life and Health values
IR	Installation Restoration
kV	kilovolt
LANTDIV	Naval Facilities Engineering Command, Atlantic Division
LEL	Lower Explosive Limit
MCAS	Marine Corps Air Station
MCB	Marine Corp. Base
mg/m^3	milligram per meter cubed
MSDS	Material Safety Data Sheet
mu	meter unit
NC DENR	North Carolina Department of Environmental and Natural Resources
NTCRA	non-time critical removal action
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PHSO	Project Health and Safety Officer
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	Parts per Million
PRG	Preliminary Remediation Goal
RCRA	Resource Conservation and Recovery Act

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

REL	NIOSH Recommended Exposure Limit
RFI	RCRA Facility Investigation
SCBA	Self Contained Breathing Apparatus
SHSO	Site Health and Safety Officer
STEL	Short Term Exposure Limit
SVOCs	Semivolatile Organic Compounds
SWMU	Solid Waste Management Unit
TLV	Threshold Limit Values
TWA	Time Weighed Average
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

PREFACE

This Health and Safety Plan (HASP) Addendum provides specific health and safety information for the RCRA Facility Investigations (RFIs) at:

- SWMUs 303/318 - Aboveground Storage Tank (SWMU 303)/AS515 Oil/Water Separator (SWMU 318)
- SWMU 336 – AS4106 Paint Stripper

All of these SWMUs are located at Marine Corps Base (MCB) Camp Lejeune, North Carolina. This HASP Addendum is designed to be used in conjunction with the Master Site HASP for Camp Lejeune contained in the Master Project Plans (Baker, 2003). General information that is required for this HASP Addendum is presented in the Master HASP and identified in the Table of Contents with *italicized* print. Site-specific information is presented in the Table of Contents in bold print using the same section numbers as the Master HASP. Site personnel are required to review the information presented in both the Master HASP and this HASP Addendum prior to conducting field activities. This plan references the documents that will be used and available on site in accordance with Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120 Hazardous Waste Operations. This plan will be used by Baker and their subcontractors to identify and mitigate potential site and task-specific hazards and to select appropriate health and safety protective measures to be used during future tasks and operations at the Activity.

EXECUTIVE SUMMARY

This Health and Safety Plan (HASP) Addendum is to be referenced for the additional RFI activities at SWMU 303/318 and RFI activities at SWMU 336 located at MCB Camp Lejeune, North Carolina.

The known chemical hazards associated with the tasks at these sites are minor concentrations of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and RCRA metals associated with the soil and groundwater. The physical hazards include:

- Working around heavy equipment at the site
- Falling and flying objects
- Slip, trip, and fall
- Underground/overhead utilities
- Vehicle traffic
- Thermal stress
- Noise
- Explosion
- Ultraviolet radiation
- Hazardous flora and fauna

Personnel and their responsibilities related to these physical hazards are discussed in Section 2.0. The environmental hazards include potentially hazardous flora and fauna. Each of these hazards is described in Section 3.0.

Section 5.0 describes the environmental monitoring requirements, which consist of using a photoionization detector (PID), detector tubes, and a Combustible Gas Meter.

The levels of personal protection assigned for work tasks and other operations will be Level D with protection upgrades/downgrades dependent on monitoring results and the Site Health and Safety Officers discretion for all field activities. Section 6.0 describes the personal protection equipment (PPE) to be used.

Section 8.0 describes emergency procedures, and includes Figure 8-1 (General Hospital Location Map) and Figure 8-2 (Emergency Route – Onslow County Hospital from MCAS), This section also includes first aid procedures, communication procedures and other emergency procedures.

2.2 Site-Specific Personnel

The following personnel will be responsible for the activities to be performed during the RFIs (the responsibilities for these personnel are described in Section 2.2 of the Master Site HASP):

Activity Coordinator:	Mr. Richard Bonelli, P.G.
Project Managers:	Mr. James S. Culp, P.G. Mr. Scott K. Moffett, P.G.
Project Health and Safety Officer:	Mr. Brian F. Karlovich, CIH
Site Health and Safety Officer/ Site Manager:	Mr. Robert M. Sok II, P.G.

3.2 Description of SWMUs 303/318 and 336

3.2.1 SWMUs 303/318 - Aboveground Storage Tank/AS515 Oil/Water Separator

SWMU 303/318 is located in the MCAS New River area east of Bancroft Street and adjacent to a helicopter wash pad (see Figure 1-2). SWMU 303 consists of two steel, ASTs that are contained within a concrete, bermed structure. The tanks were installed in 1983 and are labeled as "Hydraulic Fluid, Engine and Transmission Oils Only, No Solvents or Other Chemicals". SWMU 318 is a concrete, multi-chambered oil/water separator and grit chamber associated with the helicopter wash pad. The primary function of SWMU 318 is to collect water, soap, oil, grease, and dirt from the wash pad; separate the solids from the liquids; and then segregate the oil and grease from the remaining liquids. The helicopter wash pad is a concrete structure with raised edges. Each half of the wash pad slopes to a drain that is connected to the oil/water separator via underground piping. The area surrounding SWMU 303/318 is covered with grass. The area to the south is covered with concrete and used for aircraft parking and traffic. A drainage ditch that collects stormwater run-off from the surrounding area is located adjacent to the oil/water separator. A map depicting current conditions at the SWMU is presented in the workplan as Figure 2-1.

Several environmental investigations have been conducted at SWMU 303/318 since 1997, including a Phase I Confirmatory Sampling Investigation (CSI), Phase II CSI, and RFI. The following paragraphs present a brief summary of these investigations. Detailed descriptions of the investigations are presented in the reports referenced herein.

The CSI was completed in two phases. Phase I (Baker, 2001a) was conducted in September 1997 and included a soil investigation in the vicinity of the SWMUs. Phase II (Baker, 2002a) was conducted in March/April 2002 and included additional soil sampling and a groundwater investigation. The purpose of the CSI was to evaluate potential impacts to soil and groundwater in the vicinity of the SWMUs. The field investigations included the following:

- Soil sampling at six soil borings and three temporary well borings advanced around the perimeter of SWMU 303

- Soil sampling at three soil borings and three temporary well borings advanced around the perimeter of SWMU 318

- Surface soil sampling at three locations within the drainage ditch adjacent to SWMU 318

- Groundwater sampling at the temporary wells

The samples were submitted to the laboratory and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and/or RCRA metals. Based on evaluation of the results from SWMU 303, one VOC (acetone), a few SVOCs, and one metal (arsenic) were detected in soil at concentrations exceeding the screening values. In addition, SVOCs (4-methylphenol and naphthalene) and metals (arsenic, chromium, and lead) were detected in groundwater at concentrations exceeding the screening values.

Based on evaluation of the results from SWMU 318, a number of VOCs, SVOCs, and metals were detected in soil at concentrations exceeding the screening values. In addition, VOCs (benzene, trichloroethene [TCE], and vinyl chloride [VC]), SVOCs (4-methylphenol and naphthalene) and metals (arsenic) were detected in groundwater at concentrations exceeding the screening values.

In 2003, the helicopter wash pad associated with SWMU 318 was scheduled to be demolished/replaced by the Base. However, during demolition activities, evidence of black petroleum-stained/saturated soils was identified beneath the concrete in the northeast portion of the pad. As a result, the demolition activities were terminated and Shaw Environmental, Inc. (Shaw) patched the disturbed portions of the wash pad with new concrete to cap the suspect contamination until a more comprehensive investigation could be conducted.

Based on the results of the Phase I and Phase II CSIs and observations made during demolition of a portion of the helicopter wash pad, it was evident that soil and groundwater have been impacted as a result of a release(s) from SWMU 303/318. An RFI was warranted to adequately characterize the SWMUs and determine the potential for future corrective action (if any) based on risks to human health and the environment. As previously discussed, these two SWMUs, as well as the helicopter wash pad, were combined into one RFI because of their close proximity and relationship to each other.

The field investigation for the RFI was conducted from February through April 2004. A supplemental field investigation was conducted in June 2004 under CTO-0191. The investigations included the following:

- Soil sampling at 13 borings
- Groundwater grab sampling at 30 borings
- Installation of three groundwater monitoring wells
- Groundwater sampling at the three new wells and three existing wells at Site 86

Based on evaluation of the results, soil contamination appears to be primarily related to petroleum constituents and generally has been delineated around the wash pad, both horizontally and vertically. The exception is naphthalene, which has not been delineated in soil immediately above the water table south of boring SWMU318-SB03. Chlorinated solvent contamination in soil was limited.

There appears to be little correlation between petroleum constituents and chlorinated solvents in soil and groundwater at this point in the investigation. Groundwater contamination related to petroleum constituents is present in upper portion (10 to 19 feet below ground surface [bgs]) of the shallow aquifer mainly in the vicinity of the northeast and northwest corners of the wash pad. While these locations appear reasonable given SWMU-related activities, they are not directly below observed soil contamination. Groundwater contamination related to chlorinated solvents is likely attributable to SWMU-related activities, but there is no clear source evident in soil at this point in the investigation.

Contaminant concentrations in groundwater appear to be highest and more widely distributed in the deeper portion of the shallow aquifer immediately above/within the Belgrade formation (24 to 30 feet bgs). Benzene, naphthalene, and cis-1,2-dichloroethene (cDCE) exhibit an east-west distribution pattern despite a northeast groundwater flow direction. TCE also exhibits an east-west distribution, but trends to the northeast based on the presence of elevated levels of TCE at Installation Restoration (IR) Site 86. The pattern of TCE suggests that it has migrated to Site 86 since 1995.

Groundwater contamination generally decreases significantly below the Belgrade formation in the deepest interval sampled (40 to 44 feet below ground surface), but still exhibits concentrations of

benzene, TCE, and VC above the regulatory-driven screening values. This suggests that the Belgrade formation may be inhibiting vertical constituent migration.

cDCE has been sufficiently delineated both horizontally and vertically at this point. Naphthalene has been delineated vertically, but has not been delineated horizontally in the shallow or intermediate zones. Benzene, TCE and VC have not been delineated vertically or horizontally.

3.2.2 SWMU 336 – AS4106 Paint Stripper

SWMU 336 consists of a pair of paint stripping vats located in a separate room within Building AS-4106 at MCAS New River. The floor beneath the vats is concrete. Two floor drains are located on either side of the vats. These drains exit the building and are assumed to connect to the sanitary sewer. A spill kit is located near the exit doors. Spills that occur are properly contained and cleaned up according to Base personnel.

Sediment samples were proposed to be collected from the floor drains as part of the Phase I CSIs that were conducted in September 1997. The purpose of the sediment sampling was to determine if a release(s) occurred at the SWMU because the contaminated material would most likely exit the SWMU via the floor drains. However, the floor drains contained no sediment that could be sampled.

The Phase II CSI (Baker, 2002a) was conducted in March/April 2002. Additional samples were collected during a supplemental Phase II investigation conducted in June/July 2003. The purpose of the CSI was to evaluate potential impacts to soil and groundwater in the vicinity of the SWMU. The field investigations included the following:

- Soil sampling at six temporary well borings advanced within the vicinity of the drain lines exiting the room with the paint stripping vats

- Groundwater sampling at six temporary wells

The soil and groundwater samples were submitted to the laboratory and analyzed for VOCs, SVOCs, and RCRA metals. Based on evaluation of the results, one VOC (methylene chloride) and one metal (cadmium) were detected in soil at concentrations exceeding the screening values. The isolated and limited extent of methylene chloride and cadmium suggest that neither constituent represents a confirmed release from the SWMU, nor do they represent a significant

impact to soil. Tetrachloroethene (PCE) was detected in groundwater at concentrations exceeding the screening value.

Based on the results of the Phase II CSI, it was evident that groundwater has been impacted as a result of a release(s) from the SWMU. An RFI was required to adequately characterize the SWMU and determine the potential for future corrective action (if any) based on risks to human health and the environment. These activities would primarily include addressing the extent of PCE in groundwater and identifying a potential source in soil.

3.3 Hazard Evaluation

The pre-entry and subsequent safety meetings will serve to address the hazards particular to the RFI activities. If additional hazards are identified to the Site Health and Safety Officer (SHSO) or other site personnel, they will be added to this HASP Addendum, and the Project Health and Safety Officer (PHSO) and Project Manager will be informed.

3.3.1 Chemical Hazards

Hazardous chemicals can be absorbed into the body through various pathways. These pathways include:

- Inhalation of vapors, gases or particulates
- Ingestion of contaminated particulates from hand-to-mouth contact
- Dermal and eye absorption from direct, unprotected contact, or from exposure to airborne concentrations

Intravenous and intraperitoneal routes are also absorption pathways, but are not typical routes of concern for on-site activities. The pathway of greatest concern for potentially acute exposures would be inhalation. It is important to note that compounds present in environmental media (i.e., soil and groundwater) at diluted concentrations, would demonstrate hazards that are substantially less than those identified with exposure to pure compounds.

The chemical exposure potential for personnel performing RFI activities at Camp Lejeune relates directly to the potential or exposure to chemicals or hazardous materials that were reportedly disposed of, stored or used at the site. Any debris encountered during the RFI field activities at

the site will be logged. Any debris that appears to have the potential to produce a chemical exposure to personnel will be evaluated and PPE will be upgraded if deemed necessary.

Potential chemical hazards that are known to be present and are likely to be encountered on the site include those identified in Table 3-1. Table 3-1 shows the 8-hour Time Weighted Average (TWA) OSHA Permissible Exposure Limit (PEL), NIOSH Recommended Exposure Limit (REL), ACGIH Threshold Limit Values (TLV), or other exposure standards (i.e. Ceiling values, Short Term Exposure Limits (STEL), or Immediately Dangerous to Life and Health (IDLH) values).

TABLE 3-1
CHEMICAL HAZARDS

Chemical	Occupational Exposure Limits
Arsenic	PEL – 0.01 mg/m^3
Barium	PEL – 0.5 mg/m^3
Benzene	TLV – 0.5 ppm STEL – 2.5 ppm May be absorbed through skin.
Benz(a)anthracene	ACGIH – as low as possible
Benzo(a)pyrene	ACGIH – as low as possible
Benzo(b)flouranthene	ACGIH – as low as possible
Bromoform	PEL – 0.5 ppm May be absorbed through skin.
Cadmium	PEL – 0.005 mg/m^3
Chlorobenzene	TLV – 10 ppm
Chloroform	TLV – 10 ppm Ceiling – 50 ppm
Chromium	TLV - 0.5 mg/m^3 (Chromium III) TLV – 0.05 mg/m^3 (Chromium VI - soluble) TLV – 0.01 mg/m^3 (Chromium VI – insoluble) Ceiling – 0.1 mg/m^3 as CrO_3
DCE	PEL – 200 ppm
Dibenz(a,h)anthracene	No exposure limit
1,2-Dichlorobenzene	TLV – 25 ppm Ceiling – 50 ppm
1,4-Dichlorobenzene	TLV – 10 ppm PEL – 75 ppm STEL – 110 ppm

Chemical	Occupational Exposure Limits
Bis(2-Ethylhexyl)phthalate (DEHP)	PEL – 5 mg/m^3
Ethylbenzene	PEL – 100 ppm STEL – 125 ppm
Indeno(1,2,3-cd)pyrene	No exposure limit
Lead	PEL – 0.05 mg/m^3
Mercury	TLV – 0.025 mg/m^3 Ceiling 0.1 mg/m^3 May be absorbed through skin.
Methylene Chloride	PEL – 25 ppm STEL – 125 ppm
2-Methylnaphthalene	No exposure limit
4-Methylphenol (Cresol)	PEL – 5 ppm May be absorbed through skin.
Naphthalene	PEL – 10 ppm STEL – 15 ppm May be absorbed through skin.
1,1,2-Trichloroethane	PEL – 10 ppm May be absorbed through skin.
Trichloroethene (TCE)	TLV – 50 ppm STEL – 200 ppm
Tetrachloroethene (PCE)	TLV – 25 ppm STEL – 100 ppm
Vinyl Chloride	PEL – 1 ppm STEL – 5 ppm

PELs and TLVs are 8-hour time weighted average (TWA) values. Short Term Exposure Limits (STEL) are 15-minute exposures that should not be exceeded. Exposures at the STEL may occur no more than 4 times per day, and 60 minutes time must elapse between exposures at the STEL. Ceiling values should never be exceeded.

Monitoring procedures are described in Section 5.0. More specific chemical hazard data can be found in Appendix A.

3.3.2 Physical Hazards

The physical hazards associated with the RFIs at SWMUs 303/318 and 336 include working around heavy equipment, falling and flying objects, vehicle traffic, underground and overhead utilities, noise, explosion, slips/trips/falls, hazardous flora and fauna, ultraviolet radiation, and working within active compounds.

3.3.5 Task-Specific Hazards

Baker personnel will be conducting the following activities:

- Oversight of Geoprobe soil borings and concurrent collection of soil and groundwater samples
- Oversight of overburden monitoring well installations
- Development and sampling of groundwater monitoring wells

Tables listed below describe the Job Safety Analyses for these tasks

JOB SAFETY ANALYSIS FOR OVERSIGHT OF SOIL BORING AND MONITORING WELL DRILLING/INSTALLATIONS AND CONCURRENT SOIL AND GROUNDWATER SAMPLING			
Potential Hazards	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Underground /Overhead Utilities	• Identify all utilities around the site before work commences • Cease work immediately if unknown utility markers are uncovered • Use manual excavation within 3 feet of known utilities • For overhead lines 0 to 50 kilovolts (kV), the minimum distance between the line and drill rig mast is 10 feet. Lines carrying over 50 kV require that equipment maintain a distance of 10 feet plus an additional 0.4-inch for each 1 kV over 50.		
Struck By Heavy Equipment	• Use orange or yellow reflective warning vests when exposed to vehicular traffic • Isolate equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals	Hard hat, safety glasses with side shields, reflective vests (as necessary)	
Pinched By / Caught In Moving Parts of Heavy Equipment	• Avoid moving parts • Contain long hair • Do not wear loose-fitting clothing and jewelry		

JOB SAFETY ANALYSIS FOR OVERSIGHT OF SOIL BORING AND MONITORING WELL DRILLING/INSTALLATIONS AND CONCURRENT SOIL AND GROUNDWATER SAMPLING			
Potential Hazards	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Falling and Flying Objects	• Avoid standing directly beneath drill rig downhole equipment that hangs from mast	Hard hat, safety glasses with side shields, steel toed boots	
Sharp Objects	• Wear cut resistant work gloves over the chemical-resistant nitrile gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects	Leather gloves	
High Noise Levels	• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)	Ear plugs (as necessary)	
Slips, Trips, Falls	• Clear walkways and work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions		
Inhalation and Contact with Hazardous Substances	• Provide workers with proper skin, eye, and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin • Monitor breathing zone air to determine levels of contaminants	Safety glasses with side shields, nitrile gloves, half mask air purifying respirator (as necessary)	PID and Detector Tubes
Explosion	• Conduct air monitoring • Minimize spark-producing activities		Combustible Gas Meter
Ultraviolet Radiation from Sun Exposure	• Reduce the amount of exposed skin when outdoors during the months of April to October • Apply sunscreen to exposed skin	Sunscreen with an SPF of at least 15	
High/Low Ambient Temperature	• Monitor for Heat stress and Cold Stress in accordance with Master Site HASP • Provide fluids to prevent worker dehydration • Take breaks in cool or warm environments, as appropriate		Weather reports/ Heat and Cold Stress Monitoring
Hazardous Flora and Fauna	• Examine environment initially and periodically • Avoid areas of hazardous flora and fauna • Examine clothing and skin periodically	Insect repellant	Observe environment, clothing, and skin

JOB SAFETY ANALYSIS FOR MONITORING WELL DEVELOPMENT AND GROUNDWATER SAMPLE COLLECTION			
Potential Hazards	**Critical Safety Practices**	**Personal Protective Clothing and Equipment**	**Monitoring Devices**
Slips, Trips, Falls	• Clear walkways and work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions		
Inhalation and Contact with Hazardous Substances	• Provide workers with proper skin, eye and respiratory protection based on the exposure hazards present • Review hazardous properties of site contaminants with workers before operations begin • Monitor breathing zone air to determine levels of contaminants	Safety glasses with side shields, nitrile gloves, half mask air purifying respirator (as necessary)	PID and Detector Tubes
Ultraviolet Radiation from Sun Exposure	• Reduce the amount of exposed skin when outdoors from April to October • Apply sunscreen to exposed skin	Sunscreen with an SPF of at least 15	
Hazardous Flora and Fauna	• Examine environment initially and periodically • Avoid areas of hazardous flora and fauna • Examine clothing and skin periodically	Insect repellant	Observe environment, clothing, and skin
High/Low Ambient Temperature	• Monitor for Heat stress and Cold Stress in accordance with Master Site HASP • Provide fluids to prevent worker dehydration • Take breaks in cool or warm environments, as appropriate		Weather reports/ Heat and Cold Stress Monitoring

5.0 ENVIRONMENTAL MONITORING

Environmental monitoring will be conducted at the site. The paragraphs below identify general procedures that will be followed.

5.1 Personal Monitoring

Personal monitoring will be accomplished using real time environmental monitoring instrumentation in the breathing zone (BZ), which is defined as the volume encompassed by a 10-inch radius in all directions from the nose, of work party personnel. Instrumentation will consist of a PID and detector tubes. The action levels are outlined in the table below.

Monitoring Device	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	Action
PID with 11.7 electron volt (eV) lamp	Baker Field Personnel Breathing Zone (BZ), Equipment Operator (EO) BZ.	At least every 15 minutes	≤ 1 ppm*	Continue Monitoring
			1-10 ppm*	1. Cease activities. 2. Leave work area. 3. Contact PHSO. 4. Upgrade to Level C respiratory protection. 5. Conduct BZ monitoring with Draeger vinyl chloride and benzene detector tubes, and immediately report results to PHSO.
			>10 ppm*	1. Cease activities. 2. Contact PHSO.

*Sustained levels above background in breathing zone for 3 minutes.

5.2 Point Source Monitoring

Point source monitoring, which is defined as monitoring performed at the source of the sampling/investigative activity, may be conducted. Instrumentation will consist of a PID and a combustible gas meter. The action levels are outlined in the table below.

Monitoring Device	Monitoring Location	Monitoring Frequency	Action Level	Action
PID with 11.7 electron volt (eV) lamp	Work Area Near Sampling/ Investigative Activity	At discretion of SHSO	None – See BZ Action Levels	None
Combustible Gas Meter	Work Area Near Sampling/ Investigative Activity	At least every 15 minutes during trenching activities. Otherwise, at discretion of SHSO.	< 10 % LEL** ≥10 % LEL**	Continue Monitoring 1. Cease activities. 2. Cease spark producing activities. 3. Leave work area. 4. Monitor again after 10 minutes. 5. Contact PHSO if levels continue at ≥ 10 % LEL.

**Sustained levels in work area for 1 minute.

As work progresses, the scope of monitoring may be extended or reduced based on monitoring results, odor detection, changing work conditions, and signs or symptoms of exposure. Any or all of these conditions will be immediately investigated and acted upon by the SHSO.

6.0 Personal Protection Equipment Requirements

The assigned levels of protection for the field activities to be conducted are listed below. The personal protection equipment (PPE) items applicable to anticipated field activities are also outlined below. A complete list of PPE items can be found in the Master Site HASP. Field Activities will be performed in Level D, as provided below. The Site Health and Safety Officer (SHSO) will provide direction as to the upgrading/downgrading of the level of protection. Changes to the level of protection will be based on environmental monitoring (i.e., real time) and visual observations of soil and debris being excavated from the disposal areas after reaching native/undisturbed soil or groundwater.

Job Task	Level of Protection				
	A	B	C	D+	D
General Site Activities (i.e., Mob/Demob)					X
Oversight of Soil Boring and Monitoring Well Drilling/Installation and Concurrent Soil and Groundwater Sampling				X	
Groundwater Monitoring Well Development and Sampling				X	

Notes:

X Level of Protection for the task identified

Level D protection will consist of the following:

Level D

- Normal work clothes or coveralls
- Work gloves, cloth or leather (as needed)
- Steel toed boots
- Safety glasses with side shields
- Hard hat (when working around Geoprobe, Drill Rig, or Excavator)

Level D+ (Modified Level D) protection will consist of the following:

Level D+

- Work clothes
- Chemical-resistant gloves (nitrile)
- Steel toed boots
- Safety glasses with side shields
- Hard Hat (when working around Geoprobe, Drill Rig, or Excavator)

Level C protection will consist of the following:

Level C

- Air-purifying respirator (APR), half-face, with P100/organic vapor cartridges
- Safety glasses with side shields
- Hard hat (when working around Geoprobe, Drill Rig, or Excavator)
- Chemical-resistant clothing (Polycoated Tyvek)
- Chemical-resistant gloves (nitrile, double layer)
- Chemical resistant steel toed boots (such as neoprene) or steel toed boots with chemical resistant boot cover (disposable)

Level B protection will consist of the following:

Level B

- Full-face air-supplied respirator (with 5-minute escape pack) or Self Contained Breathing Apparatus (SCBA)
- Hard hat (when working around Geoprobe, Drill Rig, or Excavator)
- Chemical-resistant clothing (Polycoated Tyvek)
- Chemical-resistant gloves (nitrile, double layer)
- Chemical resistant steel toed boots (such as neoprene) or steel toed boots with chemical resistant boot cover (disposable)

8.0 EMERGENCY PROCEDURES

Much of the information regarding emergency procedures is presented in the Master Site HASP. However, this information is of such importance that some sections are repeated here with some additional information.

8.5 Emergency Medical Treatment and Telephone Numbers

The emergency medical treatment facility information and emergency telephone numbers, as identified below (and in Table 8-1), will be posted in the Baker Field Trailer at Lot 203 and maintained in each Baker field vehicle. A telephone is located at the Baker trailer at Lot 203. Additionally, cellular telephones will be with each field team for external communication. If possible, two-way radios will be utilized for internal communication between field personnel. In the event of an emergency, the Site Manager or other field personnel will contact the local ambulance service, or other emergency personnel. If needed, the local ambulance service will transport the injured personnel to Onslow County Memorial Hospital.

Emergency Medical Services

For nonchemical exposure incidents (i.e., cuts, bruises, sprains, heat or cold stress, etc.), the nearest public hospital is:

Name:	Onslow County Memorial Hospital
Address:	317 Western Blvd.
On-Base Telephone No.	557-2240
Off-Base Telephone No.	910-557-2240

Note: In extreme emergencies at MCB Camp Lejeune, personnel may be transported to Building NH100 (Naval Hospital) for initial treatment.

A general hospital location map depicting MCB Camp Lejeune and the location of Onslow County Memorial Hospital and the Naval Hospital is provided as Figure 8-1.

Local ambulance service is available from the base ambulance service at 911 and the City of Jacksonville at 910-455-9119. Contact will be made with emergency personnel prior to the start of activities, when deemed necessary.

Emergency Telephone Numbers

The emergency telephone number at Camp Lejeune for all emergencies is:

On-Base Telephone:	**(910) 451-9111**
Off-Base Telephone:	**911**

A list of emergency telephone numbers is also provided in Table 8-1.

8.6 Emergency Hospital Route

An emergency hospital route map and written directions to the hospitals will be posted in the Baker Field Trailer and maintained in the Baker Field Vehicle. Personnel will be informed of the location of the maps and the directions to the hospitals during the pre-entry briefing. This map is presented as Figure 8-2.

8.7 Injuries

If injuries are not serious or life threatening, affected personnel may be transported by other site personnel to the local medical facility, if necessary. First aid kits will be available at the Baker trailer at Lot 203 and with each Baker field team/vehicle. Emergency medical response personnel will be contacted in the event of serious or multiple injuries. Medical personnel will be provided with all available information regarding the nature of the incident, chemicals involved, etc. Instances requiring treatment beyond "first aid" will be handled at appropriate facilities and reported to the Project Manager and PHSO within 24 hours. Subcontractors will be responsible for securing proper medical attention for their employees. Baker may assist the subcontractor as necessary.

8.7.1 Physical Injury

If an employee working in a contaminated area is physically injured, first aid procedures will be followed. Depending on the severity of the injury, emergency medical response from Camp Lejeune Naval Hospital (Building NH100) personnel may be sought to stabilize the victim for transport to a public hospital. If the employee can be moved, the individual will be taken to the

edge of the work area and decontaminated, if necessary (refer to Section 8.8 of the Master Site HASP). If circumstances permit, emergency first aid will be administered, and the victim will be transported to an awaiting ambulance or a local emergency medical facility.

8.7.2 Chemical Injury

If the injury to a worker is chemical in nature (e.g., direct contact or exposure), the following first aid procedures will be instituted immediately:

- Eye Exposure – If contaminated solid or liquid gets into the eyes, wash the eyes immediately at a 15-minute emergency eyewash station or with the emergency eye wash bottle when an eye wash station is not available. Obtain medical attention immediately.

NOTE: Contact lenses ***will not*** be worn while working at any site.

- Skin Exposure – If contaminated solid or liquid gets on the skin, promptly wash the contaminated skin using soap or mild detergent and water. If solids or liquids penetrate through the clothing, remove the clothing immediately and wash the skin using soap or mild detergent and water. Obtain medical attention immediately.

- Swallowing – If contaminated solid or liquid has been swallowed, immediately contact the Duke Regional Poison Control Center at **1-800-672-1697**. Do not induce vomiting in an unconscious person. Obtain medical attention as directed by the Poison Control Center.

- Breathing – If a person has difficulty breathing, move the exposed person to fresh air at once. If breathing is not evident, check for pulse and perform appropriate first aid, either rescue breathing or CPR, depending on the condition. Obtain medical attention immediately.

8.7.3 Snakebite Injury

In the event of a snakebite injury, the following procedures will be followed:

- Look for signs or symptoms such as the characteristic appearance of two small holes, usually about a half-inch apart, with surrounding discoloration, swelling and pain. Systemic signs, which may or may not occur, include weakness, sweating, faintness and signs of shock.

- Provide treatment as follows:

  1. Calm the victim and keep affected area still.

  2. Contact ambulance if you cannot provide victim with transportation to the nearest hospital.

  3. Wash the wound.

  4. Keep the affected area below the level of the heart, if bite is on arm or leg.

  5. Treat for shock.

  6. Monitor airway, breathing and circulation.

  7. Obtain physical description of snake, if possible.

  8. Provide the emergency medical responder, either the ambulance attendant or the emergency room at the hospital, with all pertinent information such as: how long ago the bite occurred, the type of snake (if known), any known allergic conditions (if known), etc.

  9. Inform the SHSO as soon as possible.

8.7.4 Spider Bite Injury

The emergency treatment for the black widow spider bite is basic life support. Sometimes the individual is not even aware of having been bitten, or where. Apply a cold compress to the site of the bite if it can be identified. There is a specific antivenom for this spider bite that must be

administered by a physician. It is particularly important to identify the spider and bring it in, if possible.

8.7.5 Tick Borne Diseases

The following sections present information on diseases transmitted by ticks. Ticks can be abundant at certain times of the year at Camp Lejeune.

8.7.5.1 Lyme Disease

Lyme disease is an illness caused by a bacterium that is transmitted by the bite of a tick (*Ixodes dammini*) commonly referred to as the "Deer Tick". The tick is about the size of a sesame seed and is significantly smaller than the "Dog Tick". The Deer Tick is principally found along the Atlantic coast, lives in grassy and wooded areas, and feeds on mammals such as mice, shrews, birds, raccoons, opossums, deer, and humans. Not all ticks are infected with the bacterium. When an infected tick bites, the bacterium is passed into the bloodstream of the host where it multiplies. The various stages and symptoms of the disease are well recognized and, if detected early, can be treated with antibiotics.

Removal of ticks is best accomplished using small tweezers. Do not squeeze the tick's body. Grasp it where the mouthparts enter the skin and tug gently, not firmly, until it releases its hold on the skin. Save the tick in a jar labeled with the date, body location of the bite, and the place where it may have been acquired. Wipe the bite thoroughly with an antiseptic and seek medical attention as soon as possible.

Lyme disease typically occurs in the summer months and is characterized by a slowly expanding red rash, which develops a few days to a few weeks after the bite of an infected tick. This may be accompanied by flu-like symptoms such as headache, stiff neck, fever, muscle aches, and/or general malaise. At this stage, treatment by a physician is usually effective, but if left alone, these early symptoms may disappear and more serious problems may follow. The most common late symptom of the untreated disease is arthritis. Other possible problems include meningitis and/or neurological and cardiac abnormalities. It is important to note that some people do not get the characteristic rash but progress directly to the later manifestations. Treatment of follow-up symptoms is more difficult than early symptoms and is not always successful.

When in an area suspected of harboring ticks (grassy, bushy, or woodland areas), the following precautions can minimize the chances of being bitten by a tick:

- Wear long pants and long sleeved shirts that fit tightly at the ankles and wrists
- Wear light colored clothing so ticks can be easily spotted
- Use tick repellents
- Inspect clothing frequently while in tick habitat
- Inspect head and body thoroughly when you return from the field
- Remove any ticks by tugging with tweezers; do not squeeze or crush the tick

8.7.5.2 Rocky Mountain Spotted Fever

In the Eastern United States, Rocky Mountain spotted fever is transmitted by infected Dog Ticks (*Dermacentor variabilis*). It is important to note that the Dog Tick is significantly larger than the Deer Tick. Nearly all cases of infection occur in the spring and summer, generally several days after exposure to infected ticks. The onset of illness is abrupt and often accompanied by high fever, headache, chills, and severe weakness. After the fourth day of fever, victims develop a spotted pink rash that usually starts on the hands and feet and gradually extends to most of the body. As with Lyme Disease, early detection and treatment significantly reduces the severity of illness. The disease responds to antibiotic therapy with tetracycline or chloramphenicol.

8.7.5.3 Other Tick Borne Diseases

Ticks transmit several other diseases, most of which are rare and occur only in other areas of the country.

8.7.6 Poison Ivy (RHUS Radicans)

Poison Ivy may be found at the site. It is highly recommended that all personnel entering into an area with poison ivy wear a minimum of Tyvek coveralls to avoid skin contact. The majority of skin reactions following contact with offending plants are allergic in nature and symptoms are characterized by:

- Headache and fever
- Itching

- Redness
- Rash

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

A barrier cream, e.g. Stokogard Outdoor Cream (Stockhousen, Inc. 1-800-334-0242) should be applied to the exposed skin before entering and working in areas with possible poisonous plants.

Distinguishing Features of Poison Ivy Group Plants

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

First Aid

- Remove contaminated clothing and wash all exposed areas thoroughly with soap and water, followed by rubbing alcohol. 1% hydrocortisone cream (over-the-counter) will aid in healing and reducing itch.

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

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

Contaminated Clothing

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

11.0 HEALTH AND SAFETY PLAN ADDENDUM APPROVAL

This HASP Addendum for the RFIs at SWMUs 303/318 and 336 has been reviewed and signed by the following personnel prior to final submission to LANTDIV and MCB Camp Lejeune.

Name	Role	Signature
Mr. James S. Culp, P.G.	Project Manager	
Mr. Scott K. Moffett, P.G.	Project Geologist	
Mr. Brian F. Karlovich, CIH	PHSO	
Mr. Robert M. Sok, P.G.	Site Manager	

12.0 DECLARATION OF HASP REVIEW

All site personnel indicated below have reviewed and are familiar with the Master Site HASP and this HASP Addendum for the RFI activities at MCB Camp Lejeune.

(Name – Print)	(Company)
(Signature)	(Date/Time)
(Name – Print)	(Company)
(Signature)	(Date/Time)
(Name – Print)	(Company)
(Signature)	(Date/Time)
(Name – Print)	(Company)
(Signature)	(Date/Time)
(Name – Print)	(Company)
(Signature)	(Date/Time)
(Name – Print)	(Company)
(Signature)	(Date/Time)

* This page is to be reproduced to accommodate the number of personnel who receive training prior to performing activities or visiting a Site Area, and is to remain on site in the Baker Field Vehicle until demobilization.

Page _____ of _____

HASP ADDENDUM TABLES

TABLE 8-1

EMERGENCY CONTACT NUMBERS
MCB CAMP LEJEUNE, NORTH CAROLINA

Agency/Facility	Phone Number Off-Base	Contact
Security	(910) 451-2555	Response Operator
Ambulance (On-base)	(910) 451-3004 or (910) 451-3005	Base Fire Dept. Dispatcher
Ambulance (Public)	(910) 451-9111	Response Operator
Hospital Emergency Room (On-base)	(910) 451-4840 (910) 451-4841 (910) 451-4842	Response Operator
Onslow County Hospital (Off-base)	(910) 577-2240	Response Operator
Emergency One Call	911 or (910) 451-9111 (910) 451-3004 or (910) 451-3005	Response Operator Base Fire Dept. Dispatcher
On-Scene Coordinator	(910) 451-5815	Fire Chief
Environmental Management Division (EMD)	(910) 451-9607	Mr. Bob Lowder
Duke Regional Poison Control Center	1-800-672-1697	Response Operator
National Response Center	1-800-424-8802	Response Operator
CHEMTREC	1-800-424-9300	Response Operator
ATSDR	1-404-639-0700	Response Operator

HASP ADDENDUM FIGURES

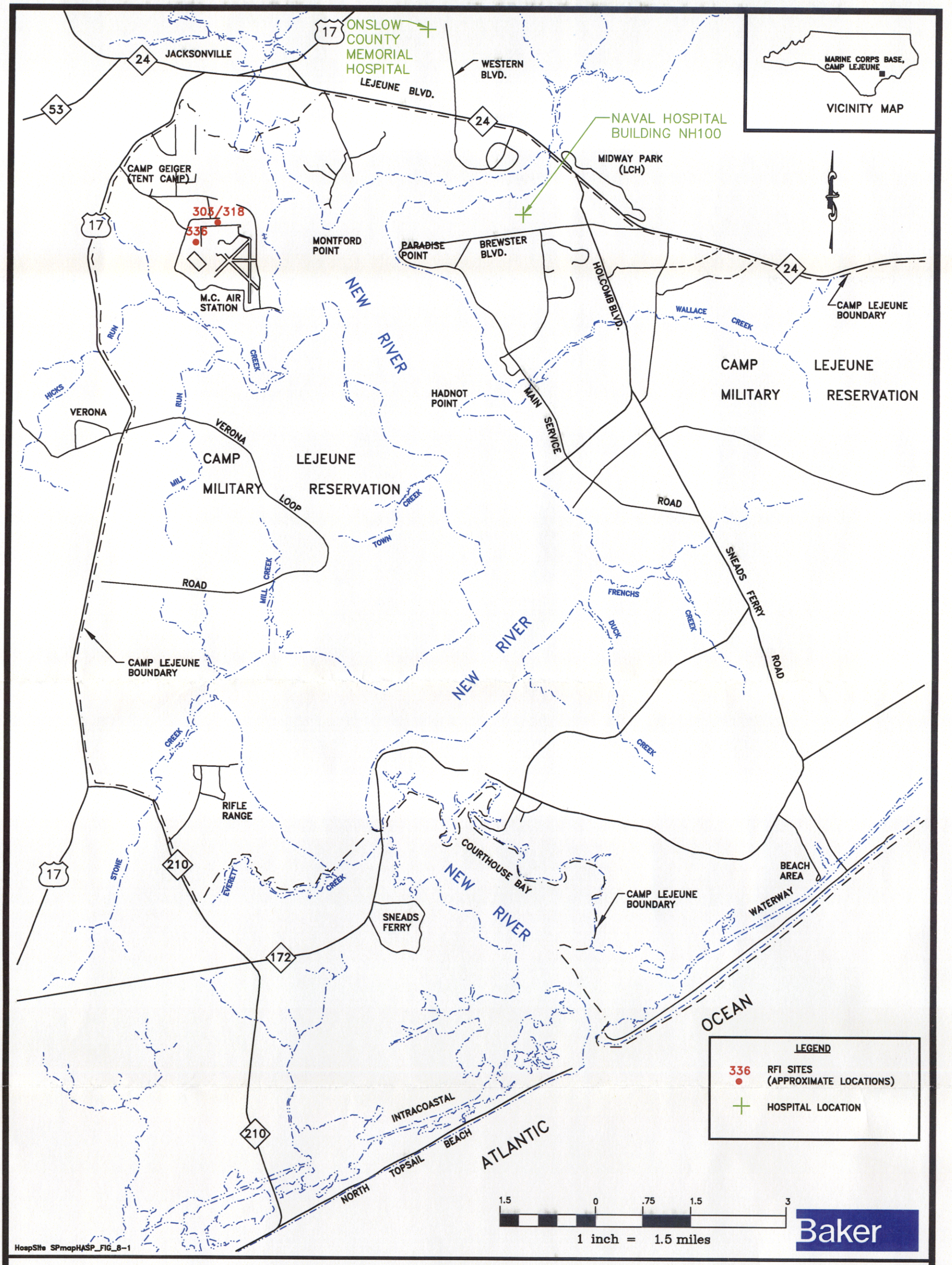

FIGURE 8-1

GENERAL HOSPITAL LOCATION MAP
RCRA FACILITY INVESTIGATIONS
CTO - 0091

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

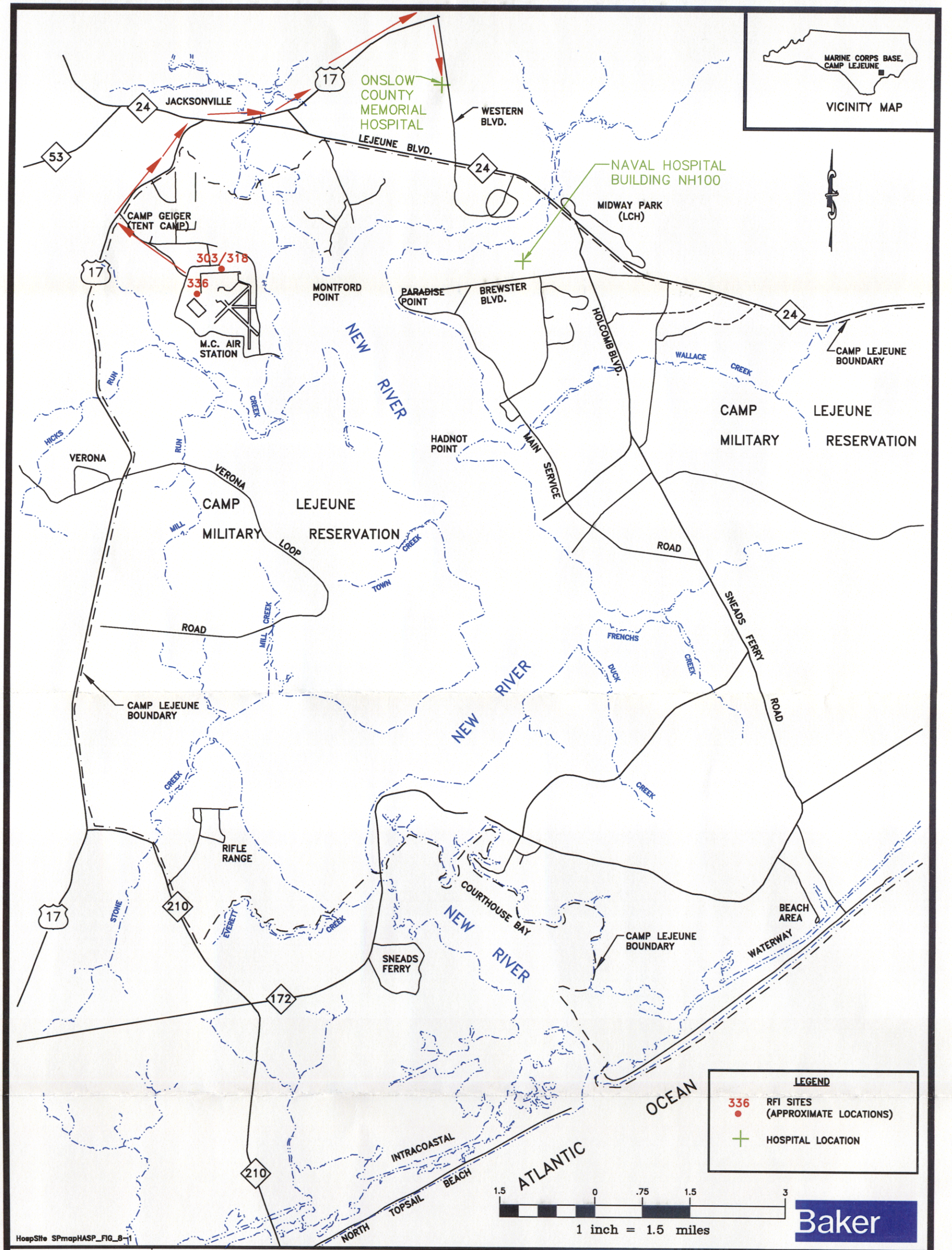

FIGURE 8-2

EMERGENCY ROUTE – ONSLOW COUNTY MEMORIAL HOSPITAL FROM MCAS AREA (SWMUs 303/318 and 336)

RCRA FACILITY INVESTIGATION (RFI) HASP

CTO – 0091

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

FIGURE 8-2

DIRECTIONS TO HOSPITALS FROM RFI LOCATIONS

Directions to **Onslow County Memorial Hospital [(910) 557-2240]** are as follows:

1. SWMUs 303/318 and 336 – Take Curtis Drive from MCAS out the Air Station Gate and make a right onto Route 17. Follow Route 17 north approximately 5 miles and make a right onto Western Blvd. The hospital is approximately 3 miles on the right.

2. Follow signs to the Emergency Room.

APPENDIX A
CHEMICAL HAZARD INFORMATION

Alconox® Material Safety Data Sheet

Alconox, Inc.
30 Glenn Street, Suite 309
White Plains, NY 10603

24 Hour Emergency Number - Chem-Tel (800) 255-3924

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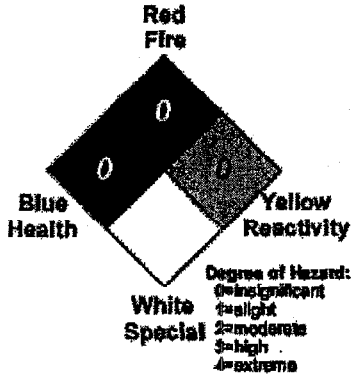
I. Identification

Product Name (shown on label):	ALCONOX
CAS Registry Number:	Not Applicable
Effective Date:	January 1, 2001
Chemical Family:	Anionic Powdered Detergent
Mfr. Catalog #s for Sizes:	1104, 1125, 1150, 1101, 1103, 1112

National Fire Protection Association 704 Labeling:



NJTSRN: 1100

II. Hazardous Ingredients/Identity Information

There are no hazardous ingredients in ALCONOX as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

III. Physical/Chemical Characteristics

Boiling Point (F):	Not Applicable
Vapor Pressure (mm Hg):	Not Applicable
Vapor Density (AIR=1):	Not Applicable
Specific Gravity (Water=1):	Not Applicable
Evaporation Rate (Butyl Acetate=1):	Not Applicable
Melting Point:	Not Applicable
Solubility in Water:	Appreciable-Soluble to 10% at ambient conditions
Appearance:	White powder interspersed with cream colored flakes.
pH:	9.5 (1%)

IV. Fire and Explosion Data

Flash Point (Method Used):	None
Flammable Limits:	LEL: No Data UEL: No Data
Extinguishing Media:	Water, dry chemical, CO_2, foam
Special Fire fighting Procedures:	Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.
Unusual Fire and Explosion Hazards:	None

V. Reactivity Data

Stability:	Stable
Hazardous Polymerization:	Will not occur
Incompatibility (Materials to Avoid):	None
Hazardous Decomposition or Byproducts:	May release CO_2 on burning

VI. Health Hazard Data

Route(s) of Entry:	Inhalation? Yes Skin? No Ingestion? Yes
Health Hazards (Acute and Chronic):	Inhalation of powder may prove locally irritating to mucous membranes. Ingestion may cause discomfort and/or diarrhea. Eye contact may prove irritating.
Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure:	Exposure may irritate mucous membranes. May cause sneezing.
Medical Conditions Generally Aggravated by Exposure:	Not established. Unnecessary exposure to this product or any industrial chemical should be avoided. Respiratory conditions may be aggravated by powder.
Emergency and First Aid Procedures:	Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician. Skin: Flush with plenty of water. Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs administer fluids. See a physician for discomfort.

VII. Precautions for Safe Handling and Use

Steps to be Taken if Material is Released or Spilled:	Material foams profusely. Recover as much as possible and flush remainder to sewer. Material is biodegradable.
Waste Disposal Method:	Small quantities may be disposed of in sewer. Large quantities should be disposed of in accordance with local ordinances for detergent

	products.
Precautions to be Taken in Storing and Handling:	Material should be stored in a dry area to prevent caking.
Other Precautions:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

VII. Control Measures

Respiratory Protection (Specify Type):	Dust mask - Recommended
Ventilation:	Local Exhaust-Normal Special-Not Required Mechanical-Not Required Other-Not Required
Protective Gloves:	Impervious gloves are useful but not required.
Eye Protection:	Goggles are recommended when handling solutions.
Other Protective Clothing or Equipment:	None
Work/Hygienic Practices:	No special practices required

THE INFORMATION HEREIN IS GIVEN IN GOOD FAITH BUT NO WARRANTY IS EXPRESSED OR IMPLIED.

30 Glenn Street, Suite 309 White Plains, NY 10603 USA Ph: (914) 948-4040 Fax: (914) 948-4088

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Liqui-nox® Material Safety Data Sheet

Alconox, Inc.
30 Glenn Street, Suite 309
White Plains, NY 10603

24 Hour Emergency Number - Chem-Tel (800) 255-3924

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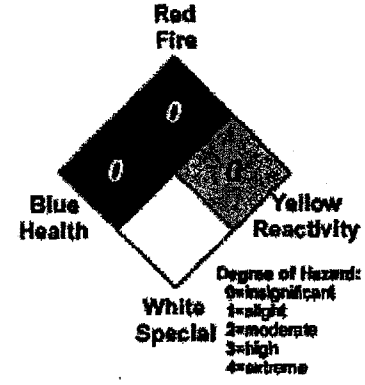
I. Identification

Product Name (shown on label):	LIQUI-NOX
CAS Registry Number:	Not Applicable
Effective Date:	January 1, 2001
Chemical Family:	Anionic Liquid Detergent
Mfr. Catalog #s for Sizes:	1232, 1201, 1215, 1255

National Fire Protection Association 704 Labeling:



NJTSRN: 1200

II. Hazardous Ingredients/Identity Information

There are no hazardous ingredients in LIQUI-NOX™ as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

III. Physical/Chemical Characteristics

Boiling Point (F):	214°F
Vapor Pressure (mm Hg):	No Data
Vapor Density (AIR=1):	No Data
Specific Gravity (Water=1):	1.075
Evaporation Rate (Butyl Acetate=1):	Slower
Melting Point:	No Data
Solubility in Water:	Completely soluble in all proportions
Appearance:	Yellow liquid, nearly odorless
pH:	8.5 (1%)

IV. Fire and Explosion Data

Flash Point (Method Used):	None (Cleveland Open Cup)

Flammable Limits:	LEL: No Data UEL: No Data
Extinguishing Media:	Water, dry chemical, CO_2, foam
Special Fire fighting Procedures:	Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.
Unusual Fire and Explosion Hazards:	None

V. Reactivity Data

Stability:	Stable
Hazardous Polymerization:	Will not occur.
Incompatibility (Materials to Avoid):	Oxidizing agents.
Hazardous Decomposition or Byproducts:	May release SO_2 on burning.

VI. Health Hazard Data

Route(s) of Entry:	Inhalation? No Skin? Yes Ingestion? Yes
Health Hazards (Acute and Chronic):	Skin contact may prove locally irritating, causing drying and/or chapping. Ingestion may cause discomfort and/or diarrhea.
Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure:	Prolonged skin contact may cause drying and/or chapping.
Medical Conditions Generally Aggravated by Exposure:	Not established. Unnecessary exposure to this product or any industrial chemical should be avoided.
Emergency and First Aid Procedures:	Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician. Skin: Flush with plenty of water. Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs administer fluids. See a physician for discomfort.

VII. Precautions for Safe Handling and Use

Steps to be Taken if Material is Released or Spilled:	Material foams profusely. For small spills recover as much as possible with absorbent material and flush remainder to sewer. Material is biodegradable.
Waste Disposal Method:	Small quantities may be disposed of in sewer. Large quantities should be disposed of in accordance with local ordinances for detergent products.
Precautions to be Taken in Storing and	No special precautions in storing. Use

Handling:	protective equipment when handling undiluted material.
Other Precautions:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

VII. Control Measures

Respiratory Protection (Specify Type):	None Required
Ventilation:	Local Exhaust-Normal Special-Not Required Mechanical-Not Required Other-Not Required
Protective Gloves:	Impervious gloves are recommended.
Eye Protection:	Goggles and/or splash shields are recommended.
Other Protective Clothing or Equipment:	Not required
Work/Hygienic Practices:	No special practices required.

THE INFORMATION HEREIN IS GIVEN IN GOOD FAITH BUT NO WARRANTY IS EXPRESSED OR IMPLIED.

30 Glenn Street, Suite 309 White Plains, NY 10603 USA Ph: (914) 948-4040 Fax: (914) 948-4088

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New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **ISOPROPYL ALCOHOL**

CAS Number: 67-63-0
DOT Number: UN 1219

RTK Substance number: 1076
Date: February 1989 Revision: January 1997

HAZARD SUMMARY

* **Isopropyl Alcohol** can affect you when breathed in and by passing through your skin.
* There is an increased risk of cancer associated with the manufacture of **Isopropyl Alcohol**.
* Contact can irritate and burn the skin and eyes. Repeated skin exposure can cause itching, rash, drying and cracking.
* Breathing **Isopropyl Alcohol** can irritate the nose and throat.
* Overexposure can cause headache, drowsiness, unconsciousness and death.
* **Isopropyl Alcohol** is a FLAMMABLE LIQUID and a FIRE HAZARD.

IDENTIFICATION

Isopropyl Alcohol is a colorless liquid. It is used as a solvent and in making many commercial products. *Rubbing alcohol* is a solution of **Isopropyl Alcohol**.

REASON FOR CITATION

* **Isopropyl Alcohol** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NFPA and NIOSH.
* This chemical is on the Special Health Hazard Substance List because it is **FLAMMABLE**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from your employer.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

* **ODOR THRESHOLD = 22 ppm.**
* The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **400 ppm** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **400 ppm** averaged over a 10-hour workshift and **500 ppm** not to be exceeded during any 15 minute work period.

ACGIH: The recommended airborne exposure limit is **400 ppm** averaged over an 8-hour workshift and **500 ppm** as a STEL (short term exposure limit).

* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Isopropyl Alcohol** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Isopropyl Alcohol** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Isopropyl Alcohol**:

* Contact can irritate and burn the skin and eyes.
* Breathing **Isopropyl Alcohol** can irritate the nose and throat.
* Overexposure can cause headache, drowsiness, a loss of coordination, unconsciousness and death.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Isopropyl Alcohol** and can last for months or years:

Cancer Hazard

* There is an increased incidence of nasal sinus cancer in workers involved in the manufacture of **Isopropyl Alcohol** by the strong-acid process. However, **Isopropyl Alcohol** has been tested and has not been shown to cause cancer in animals.

Reproductive Hazard

* According to the information presently available to the New Jersey Department of Health and Senior Services, **Isopropyl Alcohol** has been tested and has not been shown to affect reproduction.

Other Long-Term Effects

* Repeated skin exposure can cause itching, redness, rash, drying and cracking.
* This chemical has not been adequately evaluated to determine whether brain or other nerve damage could occur with repeated exposure. However, many solvents and other petroleum-based chemicals have been shown to cause such damage. Effects may include reduced memory and concentration, personality changes (withdrawal, irritability), fatigue, sleep disturbances, reduced coordination, and/or effects on nerves supplying internal organs (autonomic nerves) and/or nerves to the arms and legs (weakness, "pins and needles").

MEDICAL

Medical Testing

If symptoms develop or overexposure is suspected, the following may be useful:

* There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.
* Interview for brain effects, including recent memory, mood (irritability, withdrawal), concentration, headaches, malaise and altered sleep patterns. Consider cerebellar, autonomic and peripheral nervous system evaluation. Positive and borderline individuals should be referred for neuropsychological testing.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid **Isopropyl Alcohol** from drums or other storage containers to process containers.
* Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria document: *Isopropyl Alcohol #76-142.*
* Before entering a confined space where **Isopropyl Alcohol** may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Isopropyl Alcohol** should change into clean clothing promptly.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Isopropyl Alcohol**.
* On skin contact with **Isopropyl Alcohol**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Isopropyl Alcohol**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Isopropyl Alcohol** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Isopropyl Alcohol**. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* ACGIH recommends *Natural Rubber, Neoprene, Nitrile* or *Polyvinyl Chloride* as protective materials.

Eye Protection

* Wear splash-proof chemical goggles and face shield when working with liquid, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposures over **400 ppm**, use a MSHA/ NIOSH approved full facepiece respirator with an organic vapor cartridge/canister. Even greater protection is provided by a powered-air purifying respirator.
* If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect **Isopropyl Alcohol**, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters, cartridges, or canisters to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
* Where the potential for high exposures exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **2,000 ppm** is immediately dangerous to life and health. If the possibility of exposure above **2,000 ppm** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in continuous flow or other positive pressure mode.

HANDLING AND STORAGE

* Prior to working with **Isopropyl Alcohol** you should be trained on its proper handling and storage.
* **Isopropyl Alcohol** must be stored to avoid contact with STRONG OXIDIZERS (such as CHLORINE, BROMINE and FLUORINE) since violent reactions occur.

* Store in tightly closed containers in a cool, well-ventilated area away from HEAT.
* Sources of ignition, such as smoking and open flames, are prohibited where **Isopropyl Alcohol** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.
* Metal containers involving the transfer of **Isopropyl Alcohol** should be grounded and bonded.
* Use only non-sparking tools and equipment, especially when opening and closing containers of **Isopropyl Alcohol**.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

The following information is available from:

New Jersey Department of Health and
Senior Services
Occupational Disease and Injury Services
Trenton, NJ 08625-0360
(609) 984-1863

Industrial Hygiene Information
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health and Senior Services physician who can help you find the services you need.

Public Presentations
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **ISOPROPYL ALCOHOL**
DOT Number: **UN 1219**
NAERG Code: **129**
CAS Number: **67-63-0**

Hazard rating	NJ DOH	NFPA
FLAMMABILITY	-	3
REACTIVITY	-	0
POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Isopropyl Alcohol** is a FLAMMABLE LIQUID.
* Vapors may travel to a source of ignition and flash back.
* CONTAINERS MAY EXPLODE IN FIRE.
* Use dry chemical, CO_2, water spray, or alcohol foam extinguishers.
* POISONOUS GASES ARE PRODUCED IN FIRE.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Isopropyl Alcohol** is spilled or leaked, take the following steps:

* Restrict persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Remove all ignition sources.
* Ventilate area of spill or leak.
* Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
* Keep **Isopropyl Alcohol** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
* It may be necessary to contain and dispose of **Isopropyl Alcohol** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, POISON INFORMATION 1-800-962-1253

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

Breathing

* Remove the person from exposure.
* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 33 mm Hg at 68°F (20°C)
Flash Point: 53°F (11.6°C)
Water Solubility: Miscible

OTHER COMMONLY USED NAMES

Chemical Name:
2-Propanol
Other Names:
Dimethylcarbinol; Isopropanol; sec-Propyl Alcohol

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
CN 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **NITRIC ACID**

CAS Number: 7697-37-2
DOT Number: UN 2031
UN 2032 (fuming)

RTK Substance number: 1356
Date: March 1995 Revision: May 2001

HAZARD SUMMARY

* **Nitric Acid** can affect you when breathed in and by passing through your skin.
* **Nitric Acid** is a CORROSIVE CHEMICAL and contact can severely irritate and burn the skin and eyes with possible eye damage.
* Breathing **Nitric Acid** can irritate the nose and throat.
* Breathing **Nitric Acid** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
* Exposure to the vapor may cause erosion of the teeth.

IDENTIFICATION

Nitric Acid is a colorless, yellow or red fuming (smoking) liquid with a strong odor. It is used in making fertilizers, dyes, explosives, and other chemicals.

REASON FOR CITATION

* **Nitric Acid** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, DEP, NFPA and EPA.
* This chemical is on the Special Health Hazard Substance List because it is CORROSIVE.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The recommended airborne exposure limit is 2 ppm averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is 2 ppm averaged over a 10-hour workshift and 4 ppm, not to be exceeded during any 15 minute work period.

ACGIH: The recommended airborne exposure limit is 2 ppm averaged over an 8-hour workshift and 4 ppm as a STEL (short term exposure limit).

* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Nitric Acid** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Nitric Acid** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Nitric Acid**

* Contact can severely irritate and burn the skin and eyes with possible eye damage.
* Breathing **Nitric Acid** can irritate the nose and throat.
* Breathing **Nitric Acid** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Nitric Acid** and can last for months or years:

Cancer Hazard

* According to the information presently available to the New Jersey Department of Health and Senior Services, **Nitric Acid** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

* According to the information presently available to the New Jersey Department of Health and Senior Services, **Nitric Acid** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

* Exposure to the vapor may cause erosion of the teeth.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

* Lung function tests.

If symptoms develop or overexposure is suspected, the following is recommended:

* Consider chest x-ray after acute overexposure.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

* Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

* Where possible, automatically pump liquid **Nitric Acid** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Nitric Acid** should change into clean clothing promptly.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Nitric Acid**
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Nitric Acid**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Nitric Acid**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Nitric Acid** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Nitric Acid** Wear acid-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* ACGIH recommends *Butyl, Butyl/Neoprene, Natural Rubber, Natural Rubber/Neoprene Mix, Polyethylene, Viton* and *Viton/Neoprene* as protective materials.

Eye Protection

* Wear indirect-vent, impact and splash resistant goggles when working with liquids.
* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
* Contact lenses should not be worn when working with this substance.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposure over **2 ppm**, use a MSHA/NIOSH approved full facepiece respirator with an acid gas cartridge which is specifically approved for **Nitric Acid** Increased protection is obtained from full facepiece powered-air purifying respirators.
* If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Nitric Acid**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
* Where the potential for high exposure exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **25 ppm** is immediately dangerous to life and health. If the possibility of exposure above **25 ppm** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

* Prior to working with **Nitric Acid** you should be trained on its proper handling and storage.
* **Nitric Acid** is not compatible with METALLIC POWDERS; HYDROGEN SULFIDE; CARBIDES; ALCOHOLS; REDUCING AGENTS; ALKALI METALS; BRASS; COPPER; COPPER ALLOYS; GALVANIZED IRON; ALUMINUM; AMINES; ORGANIC MATERIALS; OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); and STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE).
* Store in tightly closed containers in a cool, well-ventilated area away from WATER, HEAT, COMBUSTIBLES (such as WOOD, PAPER and OIL) and LIGHT.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>EMERGENCY INFORMATION<<<<<<<<<<<<<<<<<

Common Name: **NITRIC ACID**
DOT Number: **UN 2031**
UN 2032 (fuming)
NAERG Code: **157**
CAS Number: **7697-37-2**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	0
REACTIVITY	-	1
CORROSIVE POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Nitric Acid** is noncombustible. However, it can increase the flammability of combustible, organic, and readily oxidizable materials or cause ignition of some of these materials.
* Extinguish fire using an agent suitable for type of surrounding fire. **Nitric Acid** itself does not burn.
* POISONOUS GASES ARE PRODUCED IN FIRE, including *Nitrogen Oxides*.
* CONTAINERS MAY EXPLODE IN FIRE.
* Use water spray to keep fire-exposed containers cool.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Nitric Acid** is spilled or leaked, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
* Ventilate and wash area after clean-up is complete.
* It may be necessary to contain and dispose of **Nitric Acid** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, for POISON INFORMATION call 1-800-764-7661

Eye Contact

* Immediately flush with large amounts of water. Continue without stopping for at least 30 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention immediately.

Breathing

* Remove the person from exposure.
* Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.
* Medical observation is recommended for 24 to 48 hours after breathing overexposure, as pulmonary edema may be delayed.

PHYSICAL DATA

Vapor Pressure: 6.8 to 113 mm Hg at 68°F (20°C)
Water Solubility: Miscible (mixes in water)

OTHER COMMONLY USED NAMES

Chemical Name:
Nitric Acid
Other Names:
Hydrogen Nitrate; Azotic Acid

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **ARSENIC**

CAS Number: 7440-38-2
DOT Number: UN 1558

RTK Substance number: 0152
Date: June 1992 Revision: June 1998

HAZARD SUMMARY

* **Arsenic** can affect you when breathed in and may enter through the skin.
* **Arsenic** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
* **Arsenic** can cause reproductive damage. Handle with extreme caution.
* Skin contact can cause irritation, burning, itching, thickening and color changes.
* Eye contact can cause irritation and burns.
* Breathing **Arsenic** can irritate the nose and throat.
* Long-term exposure can cause an ulcer or hole in the "bone" dividing the inner nose.
* High or repeated exposure can damage the nerves, with "pins and needles," burning, numbness, and weakness of arms and legs.
* Repeated exposure can damage the liver and cause stomach problems.

IDENTIFICATION

Arsenic is a silver-gray or white metallic solid. It is used as an alloying agent for heavy metals, and in solders, medicines, and herbicides.

REASON FOR CITATION

* **Arsenic** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NIOSH, IARC, DOT, NTP, DEP, HHAG and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a CARCINOGEN.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

The following exposure limits are for *Inorganic Arsenic* (measured as *Arsenic*):

OSHA: The legal airborne permissible exposure limit (PEL) is **0.010 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **0.002 mg/m^3** not to be exceeded during any 15 minute work period.

ACGIH: The recommended airborne exposure limit is **0.01 mg/m^3** averaged over an 8-hour workshift.

* **Arsenic** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* A regulated, marked area should be established where **Arsenic** is handled, used, or stored as required by the OSHA standard 1910.1018.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Arsenic** and upon exiting a regulated area.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Arsenic** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Arsenic**:

* Skin contact can cause irritation, burning, itching and a rash.
* Eye contact can cause irritation, burns, and red and watery eyes.
* Breathing **Arsenic** can irritate the nose and throat.
* High exposure can cause poor appetite, nausea, vomiting and muscle cramps.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Arsenic** and can last for months or years:

Cancer Hazard

* **Arsenic** is a CARCINOGEN in humans. It has been shown to cause skin and lung cancer.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* There is limited evidence that **Arsenic** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

Other Long-Term Effects

* Long-term exposure can cause an ulcer or hole in the "bone" dividing the inner nose. Hoarseness and sore eyes also occur.
* High or repeated exposure can damage the nerves, with "pins and needles," burning, numbness, and weakness of arms and legs.
* Repeated skin contact can cause thickening and color changes (patchy areas of darkening and loss of pigment). Some persons develop white lines on the nails.
* Repeated exposure can damage the liver and cause stomach problems.

MEDICAL

Medical Testing

Before first exposure and every 6 to 12 months thereafter, OSHA 1910.1018 requires your employer to provide (for persons exposed to **0.005 mg/m^3** of *Arsenic*) a medical history and exam which shall include:

* Chest x-ray.
* Exam of the nose, skin, and nails.
* Sputum cytology examination.
* Test for urine **Arsenic** (may not be accurate within 2 days of eating shellfish or fish; most accurate at the end of a workday). Levels should not be greater than **100 micrograms per gram** creatinine in the urine.
* Exam of the nervous system.

After suspected overexposure, repeat these tests and consider complete blood count and liver function tests. Also, examine your skin periodically for abnormal growths. Skin cancer from **Arsenic** can be easily cured when detected early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

* Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

Conditions Made Worse By Exposure

* Many scientists believe that skin changes, such as thickening and pigment changes, make those skin areas more likely to develop skin cancer.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA standard: 29 CFR 1910.1018.
* A Class I, Type B, biological safety hood should be used when mixing, handling, or preparing **Arsenic**.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Arsenic** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Arsenic**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Arsenic**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Arsenic**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Arsenic** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
* Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
* When vacuuming, a high efficiency particulate absolute (HEPA) filter should be used, not a standard shop vacuum.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Arsenic**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

* Wear dust-proof goggles and face shield when working with powders or dust, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* NIOSH has established new testing and certification requirements for negative pressure, air purifying, particulate filter and filtering facepiece respirators. The filter classifications of dust/mist/fume, paint spray or pesticide pre-filters, and filters for radon daughters, have been replaced with the N, R, and P series. Each series has three levels of filtering efficiency: 95%, 99%, and 99.9%. Check with your safety equipment supplier or your respirator manufacturer to determine which respirator is appropriate for your facility.
* If while wearing a filter, cartridge or canister respirator, you can smell, taste, or otherwise detect **Arsenic**, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter, cartridge, or canister. If the seal is no longer good, you may need a new respirator.
* Where the potential exists for exposures over **0.002 mg/m^3**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **5 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **5 mg/m^3** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

* Prior to working with **Arsenic** you should be trained on its proper handling and storage.
* A regulated, marked area should be established where **Arsenic** is handled, used, or stored.
* **Arsenic** may react with ACIDS, ACTIVE METALS (such as IRON, ALUMINUM or ZINC), and HYDROGEN GAS releasing ARSINE, a very deadly gas.
* **Arsenic** must be stored to avoid contact with BROMINE PENTAFLUORIDE and CHLORINE TRIFLOURIDE since violent reactions occur.
* **Arsenic** is not compatible with HEAT, OXIDIZERS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES and NITRATES), STRONG OXIDIZERS (such as CHLORINE, BROMINE and FLUORINE), and BROMINE AZIDE.
* Store in tightly closed containers in a cool well-ventilated area away from FOOD and AIR.

* Sources of ignition, such as smoking and open flames, are prohibited where **Arsenic powders or dust** are used, handled, or stored in a manner that could create a potential fire or explosion hazard.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Who is at the greatest risk from reproductive hazards?
A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Should I be concerned if a chemical is a teratogen in animals?
A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

The New Jersey State Department of Health and Senior Services, Occupational Disease and Injury Services offers multiple services in occupational health. These include: Right to Know Information Resources, Public Presentations, General References, Industrial Hygiene Information, Surveys and Investigations, and Medical Evaluation. Consult another Fact Sheet for a more detailed description of these services or call (609) 984-2202.

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IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

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mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

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NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<<<

Common Name: **ARSENIC**
DOT Number: **UN 1558**
NAERG Code: **152**
CAS Number: **7440-38-2**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	-
REACTIVITY	-	-
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Arsenic metal** is NONCOMBUSTIBLE, however, **Arsenic dust** can be FLAMMABLE when exposed to HEAT or FLAME.
* Use dry chemical, CO_2, or foam extinguishers.
* POISONOUS GASES ARE PRODUCED IN FIRE.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Arsenic** is spilled, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill until clean-up is complete.
* Remove all ignition sources.
* Cover spill with dry lime or soda ash and collect powdered material in a safe manner. Deposit in sealed containers.
* Ventilate the area after clean-up is complete.
* It may be necessary to contain and dispose of **Arsenic** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, POISON INFORMATION 1-800-764-7661

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Breathing

* Remove the person from exposure.
* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

Antidotes and Special Procedures

* For severe poisoning BAL has been used. For milder poisoning Penicillamine (not penicillin) has been used, both with mixed success. Side effects occur with such treatment and it is NEVER a substitute for controlling exposure. It can only be done under strict medical care.

PHYSICAL DATA

Vapor Pressure: 1 mm Hg at 372°F (189°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Arsenic
Other Names:
Arsenicals; Colloidal Arsenic; Metallic Arsenic; Arsenia

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BENZENE**

CAS Number: 71-43-2
DOT Number: UN 1114

RTK Substance number: 0197
Date: November 1994 Revision: January 2001

HAZARD SUMMARY

* **Benzene** can affect you when breathed in and by passing through your skin.
* **Benzene** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
* **Benzene** can irritate the eyes and skin with drying and scaling of the skin.
* Exposure can irritate the nose and throat.
* **Benzene** can cause symptoms of dizziness, lightheadedness, headache and vomiting. Convulsions and coma, or sudden death from irregular heart beat, may follow high exposure.
* Repeated exposure can cause damage to the blood cells (aplastic anemia).
* **Benzene** is a FLAMMABLE LIQUID and a FIRE HAZARD.

IDENTIFICATION

Benzene is a colorless liquid with a pleasant odor. It is used mainly in making other chemicals and plastics, as a solvent, and is found in trace amounts in gasoline.

REASON FOR CITATION

* **Benzene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, NTP, DEP, IARC, HHAG, NFPA and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN** and **MUTAGEN** and is **FLAMMABLE**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
* **ODOR THRESHOLD = 61 ppm.**
* The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **1 ppm** averaged over an 8-hour workshift and **5 ppm**, not to be exceeded during any 15 minute work period.

NIOSH: The recommended airborne exposure limit is **0.1 ppm** averaged over a 10-hour workshift and **1 ppm**, not to be exceeded during any 15 minute work period.

ACGIH: The recommended airborne exposure limit is **0.5 ppm** averaged over an 8-hour workshift and **2.5 ppm** as a STEL (short term exposure limit).

* **Benzene** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* A regulated, marked area should be established where **Benzene** is handled, used, or stored as required by the OSHA Standard 1910.1028.
* Wash thoroughly immediately after exposure to **Benzene** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Benzene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzene**:

* **Benzene** can irritate the eyes and skin.
* Exposure can irritate the nose and throat.
* **Benzene** can cause symptoms of dizziness, lightheadedness, headache and vomiting. Convulsions and coma, or sudden death from irregular heart beat, may follow high exposure.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzene** and can last for months or years:

Cancer Hazard

* **Benzene** is a CARCINOGEN in humans. It has been shown to cause leukemia.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* There is limited evidence that **Benzene** is a teratogen in animals. Until further testing has been done, it should be treated as a possible teratogen in humans.

Other Long-Term Effects

* **Benzene** can cause drying and scaling of the skin.
* Repeated exposure can cause damage to the blood cells (aplastic anemia).

MEDICAL

Medical Testing

Before beginning employment and at regular times after that, the following is recommended:

* Complete blood count.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid **Benzene** from drums or other storage containers to process containers.
* Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA Standard 1910.1028.
* Before entering a confined space where **Benzene** may be present, check to make sure that an explosive concentration does not exist.
* A Class I, Type B, biological safety hood should be used when mixing, handling, or preparing **Benzene**.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Benzene** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Benzene**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Benzene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Benzene**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Benzene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Who is at the greatest risk from reproductive hazards?
A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

Q: Should I be concerned if a chemical is a teratogen in animals?
A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **BENZENE**
DOT Number: **UN 1114**
NAERG Code: **130**
CAS Number: **71-43-2**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	3
REACTIVITY	-	0
CARCINOGEN FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Benzene** is a FLAMMABLE LIQUID.
* Use dry chemical, CO_2, water spray, or foam extinguishers.
* POISONOUS GASES ARE PRODUCED IN FIRE.
* CONTAINERS MAY EXPLODE IN FIRE.
* Use water spray to keep fire-exposed containers cool.
* Vapors may travel to a source of ignition and flash back.
* Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.
* **Benzene** floats on water and may spread fire.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Benzene** is spilled or leaked, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Remove all ignition sources.
* Cover with an activated charcoal adsorbent and place in covered containers for disposal.
* Ventilate and wash area after clean-up is complete.
* Keep **Benzene** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
* It may be necessary to contain and dispose of **Benzene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ for POISON INFORMATION call 1-800-764-7661

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention.

Breathing

* Remove the person from exposure.
* Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 75 mm Hg at 68°F (20°C)
Flash Point: 12°F (-11°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Benzene
Other Names:
Benzol; Coal Naphtha; Phenyl Hydride

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BENZO(a)PYRENE**

CAS Number: 50-32-8
DOT Number: None

RTK Substance number: 0207
Date: August 1992 Revision: July 1998

HAZARD SUMMARY

* **Benzo(a)pyrene** can affect you when breathed in and by passing through your skin.
* **Benzo(a)pyrene** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
* Exposure may damage the developing fetus.
* **Benzo(a)pyrene** can cause skin irritation with rash and/or burning sensations. Repeated exposure can cause skin changes such as thickening and darkening.
* Exposure can irritate and/or burn the eyes on contact.
* Except in laboratories, **Benzo(a)pyrene** is usually mixed with other "Coal Tar Pitch" chemicals. CONSULT THE NEW JERSEY DEPARTMENT OF HEALTH and SENIOR SERVICES HAZARDOUS SUBSTANCE FACT SHEETS ON COAL TAR SUBSTANCES.

IDENTIFICATION

Benzo(a)pyrene is a pale yellow, crystalline solid or a powder. In its pure form it is used as a laboratory reagent. **Benzo(a)pyrene** also forms as a gaseous by-product when certain carbon substances burn, such as coal tar pitch chemicals.

REASON FOR CITATION

* **Benzo(a)pyrene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, IARC, NIOSH, NTP, EPA, HHAG and DOT.
* This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN** and a **MUTAGEN**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) for *Coal Tar Pitch Volatiles* (*benzene*-soluble fraction) is **0.2 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit for *Coal Tar Pitch Volatiles* (*cyclohexane*-extractable fraction) is **0.1 mg/m^3** averaged over a 10-hour workshift.

ACGIH: ACGIH recommends that worker exposures, by all routes, be controlled to levels as low as can be reasonably achieved.

* **Benzo(a)pyrene** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* A regulated, marked area should be established where **Benzo(a)pyrene** is handled, used, stored, or formed.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Benzo(a)pyrene** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Benzo(a)pyrene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzo(a)pyrene**:

* **Benzo(a)pyrene** can cause skin irritation with rash and/or burning sensations. Exposure to sunlight and the chemical together can increase these effects.
* Exposure can irritate and/or burn the eyes on contact.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Benzo(a)pyrene** and can last for months or years:

Cancer Hazard

* **Benzo(a)pyrene** is a PROBABLE CARCINOGEN in humans. There is some evidence that it causes skin, lung, and bladder cancer in humans and in animals.
* **Benzo(a)pyrene** has caused CANCER in the offspring of animals exposed to the substance during pregnancy.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* **Benzo(a)pyrene** may damage the developing fetus.
* There is some evidence that **Benzo(a)pyrene** may affect sperm and testes (male reproductive glands).
* **Benzo(a)pyrene** may be transferred to nursing infants through the exposed mother's milk.

Other Long-Term Effects

* Repeated exposure to **Benzo(a)pyrene** can cause skin changes such as thickening, darkening, and pimples. Later skin changes include loss of color, reddish areas, thinning of the skin, and warts.

MEDICAL

Medical Testing

If warts or other growths on the skin get larger or change color, they should be examined by a doctor for possible early skin cancer. Skin cancer is very often easily cured when detected early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

* Sunlight may cause a rash to develop in people exposed to **Benzo(a)pyrene** and increases the risk of skin cancer.
* Tobacco smoke also contains **Benzo(a)pyrene**. Smoking may increase the risk of lung cancer with exposure to **Benzo(a)pyrene**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically transfer **Benzo(a)pyrene** from drums or other storage containers to process containers.
* Use a Class I, Type B, biological safety hood when working with **Benzo(a)pyrene** in a laboratory.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Benzo(a)pyrene** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Benzo(a)pyrene**.

* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Benzo(a)pyrene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Benzo(a)pyrene**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where the above chemicals or **Benzo(a)pyrene** are handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
* In laboratories DO NOT DRY SWEEP for clean-up. Use a vacuum or a wet method to reduce dust during clean-up.
* When vacuuming, a high efficiency particulate absolute (HEPA) filter should be used, not a standard shop vacuum.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Benzo(a)pyrene**. Wear protective gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

* Wear dust-proof goggles and face shield when working with powders or dust, unless full facepiece respiratory protection is worn.
* Where exposure to volatilized *Coal Tar* products may occur, wear gas-proof goggles and face shield, unless full facepiece respiratory protection is worn.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposures over **0.1 mg/m^3**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **80 mg/m^3** of *Coal Tar Pitch Volatiles* is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m^3** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?

A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?

A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: But aren't pregnant women at the greatest risk from reproductive hazards?

A: Not necessarily. Pregnant women are at greatest risk from chemicals which harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Disease and Injury Services
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Disease and Injury Services, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

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DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

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mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

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NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<<<

Common Name: **BENZO(a)PYRENE**
DOT Number: **None**
NAERG Code: **No Citation**
CAS Number: **50-32-8**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	1	-
REACTIVITY	0	-
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Benzo(a)pyrene** may burn, but does not readily ignite.
* Use dry chemical, CO_2, water spray, or foam extinguishers.
* POISONOUS GASES ARE PRODUCED IN FIRE, including *Carbon Monoxide.*
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Benzo(a)pyrene** or other *Coal Tar* Products are spilled, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill until clean-up is complete.
* Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
* Ventilate the area after clean-up is complete.
* It may be necessary to contain and dispose of **Benzo(a)pyrene** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

HANDLING AND STORAGE

* Prior to working with **Benzo(a)pyrene** you should be trained on its proper handling and storage.
* A regulated, marked area should be established where **Benzo(a)pyrene** is handled, used, stored, or formed.
* **Benzo(a)pyrene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE)
* Store in tightly closed containers in a cool, well-ventilated area.

FIRST AID

In NJ, POISON INFORMATION 1-800-764-7661

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Breathing

* Remove the person from exposure.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: Greater than 1 mm Hg at 68°F (20°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Benzo(a)pyrene
Other Names:
B(a)P; BP; 3,4-Benzopyrene

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NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **CADMIUM**

CAS Number: 7440-43-9
DOT Number: UN 2570

RTK Substance number: 0305
Date: April 1994 Revision: December 1999

HAZARD SUMMARY

* **Cadmium** can affect you when breathed in.
* **Cadmium** is a CARCINOGEN and a TERATOGEN – HANDLE WITH EXTREME CAUTION.
* **Cadmium** can cause a flu-like illness with chills, headache, aching and/or fever.
* High exposure to **Cadmium** may cause nausea, salivation, vomiting, abdominal cramps and diarrhea.
* Breathing **Cadmium** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
* Repeated low exposures can cause kidney and liver damage, anemia, and loss of smell.

IDENTIFICATION

Cadmium is a blue-white solid or gray-black powder. It is used in silver solder, making batteries and metal plating, for plastics and pigments, and as a catalyst.

REASON FOR CITATION

* **Cadmium** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, NTP, DEP, IARC, HHAG and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN** and a **TERATOGEN**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **0.005 mg/m^3** for **Cadmium** *dust* or *fume* averaged over an 8-hour workshift.

OSHA has recognized that some processes in certain industries may be unable to achieve the **0.005 mg/m^3** limit through engineering and work practices. These industries must follow SECALs (separate engineering control air limits) of either **0.015** or **0.05 mg/m^3**.

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: The recommended airborne exposure limit is **0.01 mg/m^3** for *elemental* **Cadmium** and **0.002 mg/m^3** for **Cadmium** *compounds* (*respirable fraction*), averaged over an 8-hour workshift.

* **Cadmium** is a PROBABLE CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

WAYS OF REDUCING EXPOSURE

* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* A regulated, marked area should be established where **Cadmium** is handled, used, or stored as required by the OSHA Standard: 29 CFR 1910.1027.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Cadmium** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Cadmium** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Metal, metal compounds and alloys are often used in "hot" operations in the workplace. These may include, but are not limited to, welding, brazing, soldering, plating, cutting, and metallizing. At the high temperatures reached in these operations, metals often form metal fumes which have different health effects and exposure standards than the original metal or metal compound and require specialized controls. Your workplace can be evaluated for the presence of particular fumes which may be generated. Consult the appropriate New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheets.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Cadmium**:

* **Cadmium** can cause a flu-like illness with chills, headache, aching and/or fever.
* High exposure to **Cadmium** may cause nausea, salivation, vomiting, abdominal cramps and diarrhea.
* Breathing **Cadmium** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Cadmium** and can last for months or years:

Cancer Hazard

* **Cadmium** is a PROBABLE CARCINOGEN in humans. There is some evidence that it causes prostate and kidney cancer in humans and it has been shown to cause lung and testes cancer in animals.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* **Cadmium** is a PROBABLE TERATOGEN in humans.
* **Cadmium** may damage the testes (male reproductive glands) and may affect the female reproductive cycle.

Other Long-Term Effects

* **Cadmium** can irritate the lungs. Repeated exposure may cause bronchitis to develop with cough, phlegm, and/or shortness of breath.
* Repeated low exposures can cause permanent kidney damage which can lead to kidney stones.
* Long term exposure can cause anemia, loss of sense of smell, fatigue and/or yellow staining of teeth.
* **Cadmium** can damage the liver.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following are recommended before beginning work and at regular times after that:

* Blood test for **Cadmium** (levels should be less than **5 micrograms per liter** of whole blood).
* Urine test for **Cadmium** (levels should be less than **3 micrograms per liter** of urine).
* Urine test for Beta-2-microglobulin to detect kidney damage.
* Urinalysis (UA).
* Lung function tests.
* Liver function tests.
* Complete blood count.
* Consider chest x-ray after acute overexposure.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

* Cigarette smoke contains some **Cadmium**. Because it is hard for the body to eliminate **Cadmium**, it tends to build up in the body. Any workplace exposure adds to these levels.
* Smoking cigarettes near **Cadmium** increases release of toxic fumes. Also, because both smoking and **Cadmium** can cause emphysema, lung effects may be greater in smokers.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* If **Cadmium** is used in a "hot" process such as smelting, steel fabricating or melting **Cadmium** *ingots*, **Cadmium** *fume* may be released. This is more acutely toxic than **Cadmium** *dust* and proper controls and protective equipment are necessary.
* Where possible, automatically transfer **Cadmium** from drums or other storage containers to process containers.
* Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA Standards: 1910.1027, 1915.1027, 1926.63, and 1928.1027.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Cadmium** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Cadmium**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Cadmium**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Cadmium**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Cadmium** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
* Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Cadmium**. Wear protective gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

* Wear impact resistant eye protection with side shields or goggles.
* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposure over **0.002 mg/m^3**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **9 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **9 mg/m^3** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

* Prior to working with **Cadmium** you should be trained on its proper handling and storage.
* A regulated, marked area should be established where **Cadmium** is handled, used, or stored as required by the OSHA Standard: 1910.1027.
* **Cadmium** *powder* and *metal* must be stored to avoid contact with POTASSIUM, HYDRAZOIC ACID, and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) since violent reactions occur.
* **Cadmium** may react with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) to release flammable *Hydrogen gas*.
* **Cadmium** *powder* is not compatible with SULFUR, SELENIUM, TELLURIUM, AMMONIUM NITRATE, and ZINC.
* Store in tightly closed containers in a cool, well-ventilated area away from AIR.

* Sources of ignition, such as smoking and open flames, are prohibited where **Cadmium** *powder* is used, handled, or stored.
* Store **Cadmium** *powder* under *Nitrogen*.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?
A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **CADMIUM**
DOT Number: **UN 2570**
NAERG Code: **154**
CAS Number: **7440-43-9**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	Not Found	Not Rated
REACTIVITY	Not Found	Not Rated
CARCINOGEN FLAMMABLE IN POWDER FORM TOXIC FUMES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Cadmium** is a noncombustible solid but finely divided **Cadmium** *powder* is FLAMMABLE.
* Use dry chemical or CO_2 extinguishers for **Cadmium** *powder*.
* FIRE MAY RESTART AFTER IT HAS BEEN EXTINGUISHED.
* TOXIC FUMES ARE PRODUCED IN A FIRE.
* CONTAINERS MAY EXPLODE IN FIRE.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Cadmium** *powder* is spilled, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill until clean-up is complete.
* Remove all ignition sources.
* Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
* Ventilate and wash area after clean-up is complete.
* It may be necessary to contain and dispose of **Cadmium** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ, for POISON INFORMATION call 1-800-764-7661

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

* Remove contaminated clothing. Wash contaminated skin with soap and water.

Breathing

* Remove the person from exposure.
* Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.
* Medical observation is recommended for 24 to 48 hours after breathing overexposure, as pulmonary edema may be delayed.

PHYSICAL DATA

Vapor Pressure: 0 mm Hg at 68°F (20°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Cadmium
Other Names:
C.I. 77180; Colloidal Cadmium

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NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **CHROMIUM**

CAS Number: 7440-47-3
DOT Number: None

RTK Substance number: 0432
Date: April 1994 Revision: January 2000

HAZARD SUMMARY

* **Chromium** can affect you when breathed in.
* Exposure to **Chromium** *fumes* can cause *"metal fume fever."* This is a flu-like illness with symptoms of metallic taste, fever and chills, aches, chest tightness and cough.
* **Chromium** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
* **Chromium** *ore* has been reported to cause lung allergy. Once allergy develops, even small future exposure may cause coughing, wheezing or shortness of breath.

IDENTIFICATION

Chromium is a steel-gray, lustrous metal or a metallic grey powder. It is used in stainless and alloy steels, refractory products, tanning agents for leather, pigments, electroplating, catalysts, and corrosion-resistant products.

REASON FOR CITATION

* **Chromium** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NIOSH, DEP and EPA.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **1 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **0.5 mg/m^3** averaged over a 10-hour workshift.

ACGIH: The recommended airborne exposure limit is **0.5 mg/m^3** averaged over an 8-hour workshift.

* **Chromium** may form metal fumes which present different hazards than the substance itself.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Chromium** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Chromium** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Metal, metal compounds and alloys are often used in "hot" operations in the workplace. These may include, but are not limited to, welding, brazing, soldering, plating, cutting, and metallizing. At the high temperatures reached in these operations, metals often form metal fumes which have different health effects and exposure standards than the original metal or metal compound and require specialized controls. Your workplace can be evaluated for the presence of particular fumes which may be generated. Consult the appropriate New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheets.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chromium**:

* Exposure to **Chromium** *fumes* can cause *"metal fume fever."* This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Chromium** and can last for months or years:

Cancer Hazard

* There is no evidence that **Chromium** *metal* is a CARCINOGEN. Roasting of *Chromite ore* is suspected of having CARCINOGENIC potential.

Reproductive Hazard

* There is no evidence that **Chromium** affects reproduction. This is based on test results presently available to the New Jersey Department of Health and Senior Services from published studies.

Other Long-Term Effects

* **Chromium** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
* *Chromite ore* has been reported to cause lung allergy. Once allergy develops, even small future exposure may cause coughing, wheezing, or shortness of breath.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

* Lung function tests. These may be normal if the person is not having an attack at the time of the test.

If symptoms develop or overexposure is suspected, the following is recommended:

* Evaluation by a qualified allergist, including careful exposure history and special testing, may help diagnose skin allergy.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

* Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

* Where possible, automatically transfer **Chromium** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Chromium** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Chromium**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Chromium**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Chromium**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Chromium** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
* Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Chromium**. Wear protective gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

* Wear impact resistant eye protection with side shields or goggles.
* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* NIOSH has established new testing and certification requirements for negative pressure, air purifying, particulate filter and filtering facepiece respirators. The filter classifications of dust/mist/fume, paint spray or pesticide prefilters, and filters for radon daughters, have been replaced with the N, R, and P series. Each series has three levels of filtering efficiency: 95%, 99%, and 99.9%. Check with your safety equipment supplier or your respirator manufacturer to determine which respirator is appropriate for your facility.
* If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Chromium**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
* Where the potential for high exposure exists, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **250 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **250 mg/m^3** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?

A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?

A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>EMERGENCY INFORMATION<<<<<<<<<<<<<<<<<<

Common Name: **CHROMIUM**
DOT Number: **None**
NAERG Code: **No Citation**
CAS Number: **7440-47-3**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	Not Found	Not Rated
REACTIVITY	Not Found	Not Rated
POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* Extinguish fire using an agent suitable for type of surrounding fire. **Chromium** itself does not burn.
* POISONOUS GASES ARE PRODUCED IN FIRE.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Chromium** is spilled, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill until clean-up is complete.
* Cover with dry lime, sand or soda ash, and place in covered containers for disposal.
* Ventilate and wash area after clean-up is complete.
* It may be necessary to contain and dispose of **Chromium** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

HANDLING AND STORAGE

* Prior to working with **Chromium** you should be trained on its proper handling and storage.
* **Chromium** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC).

FIRST AID

In NJ, for POISON INFORMATION call 1-800-764-7661

Eye Contact
* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention.

Skin Contact
* Remove contaminated clothing. Wash contaminated skin with soap and water.

Breathing
* Remove the person from exposure.
* Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 0 mm Hg at 68°F (20°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Chromium
Other Names:
Chrome

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **ETHYL BENZENE**

CAS Number: 100-41-4
DOT Number: UN 1175

RTK Substance number: 0851
Date: February 1996 Revision: April 2002

HAZARD SUMMARY

* **Ethyl Benzene** can affect you when breathed in and by passing through your skin.
* **Ethyl Benzene** can irritate the eyes, nose and throat.
* Contact with **Ethyl Benzene** can irritate the skin. Prolonged exposure can causing drying, scaling and even blistering of the skin.
* Exposure to high concentration can cause you to become dizzy, lightheaded, and to pass out. Very high levels can cause trouble breathing and even death.
* High exposure may damage the liver.
* **Ethyl Benzene** is a FLAMMABLE LIQUID and a FIRE HAZARD.

IDENTIFICATION

Ethyl Benzene is a colorless liquid. It is used in the production of *Styrene* and synthetic polymers, as a solvent, and as a component of automotive and aviation fuels.

REASON FOR CITATION

* **Ethyl Benzene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, DEP, HHAG, NFPA and EPA.
* This chemical is on the Special Health Hazard Substance List because it is **FLAMMABLE**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **100 ppm** averaged over a 10-hour workshift and **125 ppm**, not to be exceeded during any 15 minute work period.

ACGIH: The recommended airborne exposure limit is **100 ppm** averaged over an 8-hour workshift and **125 ppm** as a STEL (short-term exposure limit).

* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Ethyl Benzene** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Ethyl Benzene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Ethyl Benzene**:

* **Ethyl Benzene** can irritate the eyes, nose and throat.
* Contact with **Ethyl Benzene** can irritate the skin.
* Exposure to high concentration can cause you to become dizzy, lightheaded and to pass out. Very high levels can cause trouble breathing and even death.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Ethyl Benzene** and can last for months or years:

Cancer Hazard

* There is limited evidence that **Ethyl Benzene** causes cancer in animals. It may cause cancer of the kidneys.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* There is limited evidence that **Ethyl Benzene** may damage the developing fetus.

Other Long-Term Effects

* Prolonged exposure can cause drying, scaling and even blistering of the skin.
* High exposure may damage the liver.
* This chemical has not been adequately evaluated to determine whether brain or other nerve damage could occur with repeated exposure. However, many solvents and other petroleum-based chemicals have been shown to cause such damage. Effects may include reduced memory and concentration, personality changes (withdrawal, irritability), fatigue, sleep disturbances, reduced coordination, and/or effects on nerves supplying internal organs (autonomic nerves) and/or nerves to the arms and legs (weakness, "pins and needles").

MEDICAL

Medical Testing

If symptoms develop or overexposure is suspected, the following are recommended:

* Liver function tests.
* Evaluate for brain effects such as changes in memory, concentration, sleeping patterns and mood (especially irritability and social withdrawal), as well as headaches and fatigue. Consider evaluations of the cerebellar, autonomic and peripheral nervous systems. Positive and borderline individuals should be referred for neuropsychological testing.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

* Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by **Ethyl Benzene**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically pump liquid **Ethyl Benzene** from drums or other storage containers to process containers.
* Before entering a confined space where **Ethyl Benzene** may be present, check to make sure that an explosive concentration does not exist.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Ethyl Benzene** should change into clean clothing promptly.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Ethyl Benzene**.
* Eye wash fountains should be provided in the immediate work area for emergency use.

* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Ethyl Benzene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Ethyl Benzene**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Ethyl Benzene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Ethyl Benzene**. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* ACGIH recommends *Teflon* as a protective material.

Eye Protection

* Wear indirect-vent, impact and splash resistant goggles when working with liquids.
* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
* Contact lenses should not be worn when working with this substance.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposure over **100 ppm**, use a NIOSH approved full facepiece respirator with an organic vapor cartridge. Increased protection is obtained from full facepiece powered-air purifying respirators.
* If while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Ethyl Benzene**, or if while wearing particulate filters abnormal resistance to breathing is experienced, or eye irritation occurs while wearing a full facepiece respirator, leave the area immediately. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
* Be sure to consider all potential exposures in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
* Where the potential for high exposure exists, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **800 ppm** is immediately dangerous to life and health. If the possibility of exposure above **800 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

* Prior to working with **Ethyl Benzene** you should be trained on its proper handling and storage.
* **Ethyl Benzene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and NITRIC ACID.
* Store in tightly closed containers in a cool, well-ventilated area.
* Sources of ignition, such as smoking and open flames, are prohibited where **Ethyl Benzene** is used, handled, or stored.
* Metal containers involving the transfer of **Ethyl Benzene** should be grounded and bonded.
* Use only non-sparking tools and equipment, especially when opening and closing containers of **Ethyl Benzene**.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?
A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?
A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

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Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

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mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

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NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **ETHYL BENZENE**
DOT Number: **UN 1175**
NAERG Code: **129**
CAS Number: **100-41-4**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	3
REACTIVITY	-	0
FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Ethyl Benzene** is a FLAMMABLE LIQUID.
* Use dry chemical, CO_2, alcohol or polymer foam extinguishers, as water may not be effective in fighting fires.
* POISONOUS GASES ARE PRODUCED IN FIRE.
* CONTAINERS MAY EXPLODE IN FIRE.
* Use water spray to keep fire-exposed containers cool.
* Vapors may travel to a source of ignition and flash back.
* Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Ethyl Benzene** is spilled or leaked, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Remove all ignition sources.
* Cover with an activated charcoal adsorbent and place in covered containers for disposal.
* Ventilate and wash area after clean-up is complete.
* Keep **Ethyl Benzene** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
* It may be necessary to contain and dispose of **Ethyl Benzene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

HANDLING AND STORAGE (See page 3)

FIRST AID

For POISON INFORMATION call 1-800-222-1222

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Breathing

* Remove the person from exposure.
* Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 7.1 mm Hg at 68°F (20°C)
Flash Point: 70°F (21°C)
Water Solubility: Slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:
Benzene, Ethyl-
Other Names:
Ethylbenzol; Phenylethane

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NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **TETRACHLOROETHYLENE**

CAS Number: 127-18-4
DOT Number: UN 1897

RTK Substance number: 1810
Date: April 1996 Revision: March 2002

HAZARD SUMMARY

* **Tetrachloroethylene** can affect you when breathed in and by passing through your skin.
* **Tetrachloroethylene** should be handled as a CARCINOGEN–WITH EXTREME CAUTION.
* **Tetrachloroethylene** can cause reproductive damage. Handle with extreme caution.
* Contact can cause skin irritation, burns and drying and cracking of the skin.
* Exposure to **Tetrachloroethylene** can irritate the eyes, nose, mouth and throat.
* High exposure can cause headache, dizziness, lightheadedness, nausea, vomiting and even passing out.
* Breathing **Tetrachloroethylene** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
* **Tetrachloroethylene** may damage the liver and kidneys and affect the nervous system.

IDENTIFICATION

Tetrachloroethylene is a clear liquid with a sweet *Chloroform*-like odor. It is used in dry cleaning and metal degreasing.

REASON FOR CITATION

* **Tetrachloroethylene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, NTP, DEP, IARC, HHAG, NFPA and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a CARCINOGEN.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
* **ODOR THRESHOLD = 47 ppm.**
* The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift, **200 ppm** not to be exceeded during any 15 minute work period, and **300 ppm** for 5 minutes during any 3 hours.

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: The recommended airborne exposure limit is **25 ppm** averaged over an 8-hour workshift and **100 ppm** as a STEL (short-term exposure limit).

* **Tetrachloroethylene** may be a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Tetrachloroethylene** and at the end of the workshift.

* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Tetrachloroethylene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Tetrachloroethylene**:

* Contact can cause skin irritation and burns.
* Exposure to **Tetrachloroethylene** can irritate the eyes, nose, mouth and throat.
* High exposure can cause headache, dizziness, lightheadedness, nausea, vomiting and even passing out.
* Breathing **Tetrachloroethylene** can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Tetrachloroethylene** and can last for months or years:

Cancer Hazard

* **Tetrachloroethylene** may be a CARCINOGEN in humans since it has been shown to cause liver cancer in animals.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* **Tetrachloroethylene** may damage the developing fetus.

Other Long-Term Effects

* **Tetrachloroethylene** may damage the liver and kidneys and affect the nervous system.
* Long-term exposure can cause drying and cracking of the skin.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the PEL or greater, or significant skin contact), the following are recommended before beginning work and at regular times after that:

* Liver and kidney function tests.
* Exam of the nervous system.

If symptoms develop or overexposure is suspected, the following is recommended:

* Consider chest x-ray after acute overexposure.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

* Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by **Tetrachloroethylene**.
* Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

* Where possible, automatically pump liquid **Tetrachloroethylene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Tetrachloroethylene** should change into clean clothing promptly.

* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Tetrachloroethylene**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Tetrachloroethylene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Tetrachloroethylene**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Tetrachloroethylene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Tetrachloroethylene**. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* ACGIH recommends *Nitrile Rubber, Polyvinyl Alcohol* and *Viton* as protective materials.

Eye Protection

* Wear indirect-vent, impact and splash resistant goggles when working with liquids.
* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
* Contact lenses should not be worn when working with this substance.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposure over **25 ppm**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **150 ppm** is immediately dangerous to life and health. If the possibility of exposure above **150 ppm** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?

A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?

A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?

A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 984-7407 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know Survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEL is the Permissible Exposure Limit which is enforceable by the Occupational Safety and Health Administration.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **TETRACHLOROETHYLENE**
DOT Number: **UN 1897**
NAERG Code: **160**
CAS Number: **127-18-4**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	0
REACTIVITY	-	0
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* Extinguish fire using an agent suitable for type of surrounding fire. **Tetrachloroethylene** itself does not burn.
* POISONOUS GASES ARE PRODUCED IN FIRE, including *Hydrogen Chloride* and *Phosgene*.
* CONTAINERS MAY EXPLODE IN FIRE.
* Use water spray to keep fire-exposed containers cool.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Tetrachloroethylene** is spilled or leaked, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
* Ventilate and wash area after clean-up is complete.
* It may be necessary to contain and dispose of **Tetrachloroethylene** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

HANDLING AND STORAGE

* Prior to working with **Tetrachloroethylene** you should be trained on its proper handling and storage.
* **Tetrachloroethylene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); CHEMICALLY ACTIVE METALS (such as POTASSIUM, SODIUM, MAGNESIUM and ZINC); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); LITHIUM; BERYLLIUM; and BARIUM.
* Store in tightly closed containers in a cool, well-ventilated area away from HEAT.

FIRST AID

For POISON INFORMATION call 1-800-222-1222

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention.

Breathing

* Remove the person from exposure.
* Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.
* Medical observation is recommended for 24 to 48 hours after breathing overexposure, as pulmonary edema may be delayed.

PHYSICAL DATA

Vapor Pressure: 14 mm Hg at 68°F (20°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Ethene, Tetrachloro-
Other Names:
Perchloroethylene; PERC; Ethylene Tetrachloride

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NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **TRICHLOROETHYLENE**

CAS Number: 79-01-6
DOT Number: UN 1710

RTK Substance number: 1890
Date: April 1994 Revision: January 2000

HAZARD SUMMARY

* **Trichloroethylene** can affect you when breathed in.
* **Trichloroethylene** may cause mutations. Handle with extreme caution.
* Contact can irritate and burn the skin and eyes with possible eye damage.
* Exposure can cause lightheadedness, dizziness, unconsciousness, visual disturbances, nausea and vomiting. Very high levels can cause irregular heartbeat which can be fatal.
* **Trichloroethylene** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
* Repeated exposure can cause memory loss, headache, and depression.
* **Trichloroethylene** may damage the liver and kidneys.

IDENTIFICATION

Trichloroethylene is a colorless liquid with a sweet odor. It is used as a solvent for degreasing and dry cleaning, and in printing inks, paints, lacquers, varnishes, and adhesives.

REASON FOR CITATION

* **Trichloroethylene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, DEP, HHAG, NFPA and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a **MUTAGEN**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
* **ODOR THRESHOLD = 82 to 110 ppm.**
* The range of accepted odor threshold values is quite broad. Caution should be used in relying on odor alone as a warning of potentially hazardous exposures.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **100 ppm** averaged over an 8-hour workshift, **200 ppm** not to be exceeded during any 15 minute work period, and **300 ppm** for 5 minutes in any 2-hour work period.

NIOSH: The recommended airborne exposure limit is **25 ppm** averaged over a 10-hour workshift.

ACGIH: The recommended airborne exposure limit is **50 ppm** averaged over an 8-hour workshift and **100 ppm** as a STEL (short term exposure limit).

* **Trichloroethylene** may cause mutations. All contact with this chemical should be reduced to the lowest possible level.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Trichloroethylene** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Trichloroethylene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Trichloroethylene**:

* Contact can irritate and burn the skin and eyes with possible eye damage.
* Exposure can cause lightheadedness, dizziness, unconsciousness, visual disturbances, nausea and vomiting. Very high levels can cause irregular heartbeat which can be fatal.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Trichloroethylene** and can last for months or years:

Cancer Hazard

* There is limited evidence that **Trichloroethylene** causes cancer in animals. It may cause lung and liver cancer.
* **Trichloroethylene** may cause mutations (genetic changes).
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* There is no evidence that **Trichloroethylene** affects reproduction. This is based on test results presently available to the New Jersey Department of Health and Senior Services from published studies.

Other Long-Term Effects

* **Trichloroethylene** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
* Repeated exposure can cause memory loss, headache, intolerance of alcohol, depression, and weakness in the arms and legs.
* **Trichloroethylene** may damage the liver and kidneys.
* Repeated contact can cause irritation, blistering, roughening, and cracking of the exposed skin.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following are recommended before beginning work and at regular times after that:

* Liver and kidney function tests.

If symptoms develop or overexposure is suspected, the following are recommended:

* Exam of the nervous system. Consider nerve conduction tests.
* Urinary *Trichloracetic Acid* level (for repeated exposures) or blood **Trichloroethylene** levels (for acute exposure).
* Evaluation by a qualified allergist, including careful exposure history and special testing, may help diagnose skin allergy.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

* Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by **Trichloroethylene**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

* Where possible, automatically pump liquid **Trichloroethylene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Trichloroethylene** should change into clean clothing promptly.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Trichloroethylene**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Trichloroethylene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Trichloroethylene**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Trichloroethylene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
* Do not smoke in the work area. Even a little vapor inhaled through a burning cigarette, cigar, or pipe will be converted into more highly toxic substances.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Trichloroethylene**. Wear solvent-resistant gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* ACGIH recommends *Viton, Polyvinyl Alcohol, Teflon* and *Silver Shield* as protective materials.

Eye Protection

* Wear indirect-vent, impact and splash resistant goggles when working with liquids.
* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
* Contact lenses should not be worn when working with this substance.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposure over **25 ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **1,000 ppm** is immediately dangerous to life and health. If the possibility of exposure above **1,000** exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

* Prior to working with **Trichloroethylene** you should be trained on its proper handling and storage.
* **Trichloroethylene** must be handled and stored away from operations which generate HIGH TEMPERATURES such as ARC WELDING or CUTTING, UNSHIELDED RESISTANCE HEATING, OPEN FLAMES, and HIGH INTENSITY LIGHT, as poisonous gases are produced.
* **Trichloroethylene** must be stored to avoid contact with CHEMICALLY ACTIVE METALS (such as ALUMINUM, POTASSIUM, SODIUM, MAGNESIUM and ZINC); NITRIC ACID; and REDUCING AGENTS since violent reactions occur.
* **Trichloroethylene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
* **Trichloroethylene** in contact with STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE) results in the evolution of spontaneously flammable and explosive *Dichloroacetylene*.
* Store in tightly closed containers in a cool, well-ventilated area away from SUNLIGHT and MOISTURE.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: What are the likely health problems from chemicals which cause mutations?
A: There are two primary health concerns associated with mutagens: (1) cancers can result from changes induced in cells and, (2) adverse reproductive and developmental outcomes can result from damage to the egg and sperm cells.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information
Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation
If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations
Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources
The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

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The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

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mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

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PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>>EMERGENCY INFORMATION<<<<<<<<<<<<<<<<<<

Common Name: **TRICHLOROETHYLENE**
DOT Number: **UN 1710**
NAERG Code: **160**
CAS Number: **79-01-6**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	1
REACTIVITY	-	0
POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* Extinguish fire using an agent suitable for type of surrounding fire. **Trichloroethylene** itself does not burn.
* POISONOUS GASES ARE PRODUCED IN FIRE, including *Phosgene* and *Hydrogen Chloride.*
* CONTAINERS MAY EXPLODE IN FIRE.
* Use water spray to keep fire-exposed containers cool.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Trichloroethylene** is spilled or leaked, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete.
* Absorb liquids in vermiculite, dry sand, earth, or a similar material and deposit in sealed containers.
* Ventilate and wash area after clean-up is complete.
* It may be necessary to contain and dispose of **Trichloroethylene** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

HANDLING AND STORAGE (See page 3)

FIRST AID

In N.J. for POISON INFORMATION call 1-800-764-7661

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash area with large amounts of soap and water. Seek medical attention immediately.

Breathing

* Remove the person from exposure.
* Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 58 mm Hg at 68°F (20°C)
Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
Trichloroethene
Other Names:
1,2,2-Trichloroethylene; Tri; TCE; Trilene

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **VINYL CHLORIDE**

CAS Number: 75-01-4
DOT Number: UN 1086

RTK Substance number: 2001
Date: December 1994 Revision: June 2001

HAZARD SUMMARY

* **Vinyl Chloride** can affect you when breathed in.
* **Vinyl Chloride** is a CARCINOGEN–HANDLE WITH EXTREME CAUTION.
* **Vinyl Chloride** can cause reproductive damage. Handle with extreme caution.
* Contact can severely irritate and burn the eyes with possible eye damage.
* Exposure to **Vinyl Chloride** can irritate and burn the skin. Contact with the liquid or gas can cause frostbite.
* Breathing **Vinyl Chloride** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
* **Vinyl Chloride** can cause headache, nausea, vomiting, dizziness, fatigue, weakness and confusion. Higher levels can cause you to feel lightheaded and to pass out.
* **Vinyl Chloride** can damage the liver, nervous system and lungs.
* Repeated exposure can damage the skin (scleroderma), bones (acro-osteolysis) and blood vessels in the hands (Raynaud's Syndrome).
* **Vinyl Chloride** is a HIGHLY FLAMMABLE and REACTIVE chemical and a DANGEROUS FIRE and EXPLOSION HAZARD.

IDENTIFICATION

Vinyl Chloride is a colorless gas which is usually shipped as a liquid. It has a faintly sweet odor and is used to make plastics, adhesives and other chemicals.

REASON FOR CITATION

* **Vinyl Chloride** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, NTP, DEP, IARC, NFPA and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN** and **MUTAGEN** and is **FLAMMABLE** and **REACTIVE**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

OSHA: The legal airborne permissible exposure limit (PEL) is **1 ppm** averaged over an 8-hour workshift and **5 ppm**, not to be exceeded during any 15 minute work period.

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: The recommended airborne exposure limit is **5 ppm** averaged over an 8-hour workshift.

* **Vinyl Chloride** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

WAYS OF REDUCING EXPOSURE

* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* A regulated, marked area should be established where **Vinyl Chloride** is handled, used, or stored as required by the OSHA Standard: 29 CFR 1910.1017.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Vinyl Chloride** and at the end of the workshift.
* On skin contact with liquid **Vinyl Chloride**, immediately submerse the affected body part in warm water.

* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Vinyl Chloride** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Vinyl Chloride**:

* Contact can severely irritate and burn the eyes with possible eye damage.
* Exposure to **Vinyl Chloride** can irritate and burn the skin. Contact with the liquid or gas can cause frostbite.
* Breathing **Vinyl Chloride** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.
* **Vinyl Chloride** can cause headache, nausea, vomiting, dizziness, fatigue, weakness and confusion. Higher levels can cause you to feel lightheaded and to pass out.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Vinyl Chloride** and can last for months or years:

Cancer Hazard

* **Vinyl Chloride** is a CARCINOGEN in humans. It has been shown to cause liver, brain and lung cancer.
* Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard

* **Vinyl Chloride** may damage the developing fetus. There is limited evidence that **Vinyl Chloride** is a teratogen in animals.
* An excess of spontaneous abortions has been reported among spouses of workers who had been exposed to **Vinyl Chloride**.

Other Long-Term Effects

* **Vinyl Chloride** can damage the liver, nervous system and lungs.
* Repeated exposure can cause a disease called "scleroderma." This causes the skin to become very smooth, tight and shiny. It causes the bones of the fingers to erode (acro-osteolysis), and damages the blood vessels in the hands (Raynaud's syndrome). This causes the hands (or feet) to turn numb, pale or blue with even mild cold exposure.

MEDICAL

Medical Testing

For those with frequent or potentially high exposure (half the TLV or greater, or significant skin contact), the following are recommended before beginning work and at regular times after that:

* Liver function tests.
* Exam of the skin and nervous system.
* Chest x-ray and lung function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

* Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by **Vinyl Chloride**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically transfer **Vinyl Chloride** or pump liquid **Vinyl Chloride** from cylinders or other storage containers to process containers.
* Before entering a confined space where **Vinyl Chloride** may be present, check to make sure that an explosive concentration does not exist.
* A Class I, Type B, biological safety hood should be used when mixing, handling, or preparing **Vinyl Chloride**.
* Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA Standard: 29 CFR 1910.1017.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Vinyl Chloride** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Vinyl Chloride**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Vinyl Chloride**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Vinyl Chloride**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Vinyl Chloride** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Vinyl Chloride**. Wear protective gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* Where exposure to cold equipment, vapors, or liquid may occur, employees should be provided with special clothing designed to prevent the freezing of body tissues.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.
* Safety equipment manufacturers recommend *Silvershield* gloves as a protective material.

Eye Protection

* Wear non-vented, impact resistant goggles when working with fumes, gases, or vapors.
* Wear indirect-vent, impact and splash resistant goggles when working with liquids.
* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.
* Contact lenses should not be worn when working with this substance.

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IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposure over 1 **ppm**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

HANDLING AND STORAGE

* Prior to working with **Vinyl Chloride** you should be trained on its proper handling and storage.
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* **Vinyl Chloride** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); COPPER; ALUMINUM; IRON; STEEL; NITROGEN OXIDES; and ACETYLIDE FORMING METALS.
* Store in tightly closed containers in a cool, well-ventilated area away from HEAT, AIR and SUNLIGHT as hazardous polymerization may occur.
* Sources of ignition, such as smoking and open flames, are prohibited where **Vinyl Chloride** is used, handled, or stored.
* Metal containers involving the transfer of **Vinyl Chloride** should be grounded and bonded.
* Use only non-sparking tools and equipment, especially when opening and closing containers of **Vinyl Chloride**.
* Wherever **Vinyl Chloride** is used, handled, manufactured, or stored, use explosion-proof electrical equipment and fittings.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?

A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?

A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?

A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

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Q: Don't all chemicals cause cancer?

A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Can men as well as women be affected by chemicals that cause reproductive system damage?

A: Yes. Some chemicals reduce potency or fertility in both men and women. Some damage sperm and eggs, possibly leading to birth defects.

Q: Who is at the greatest risk from reproductive hazards?

A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

Q: Should I be concerned if a chemical is a teratogen in animals?

A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

Q: What are the likely health problems from chemicals which cause mutations?

A: There are two primary health concerns associated with mutagens: (1) cancers can result from changes induced in cells and, (2) adverse reproductive and developmental outcomes can result from damage to the egg and sperm cells.

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A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<<

Common Name: **VINYL CHLORIDE**
DOT Number: **UN 1086**
NAERG Code: **116**
CAS Number: **75-01-4**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	-	4
REACTIVITY	-	2
CARCINOGEN FLAMMABLE AND REACTIVE POISONOUS GASES ARE PRODUCED IN FIRE CONTAINERS MAY EXPLODE IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Vinyl Chloride** is a FLAMMABLE GAS.
* Shut off gas, if possible, and use dry chemical, foam or CO_2 extinguishers.
* POISONOUS GASES ARE PRODUCED IN FIRE, including *Phosgene* and *Hydrogen Chloride*.
* CONTAINERS MAY EXPLODE IN FIRE.
* Use water spray to keep fire-exposed containers cool.
* Vapors form explosive mixtures in air.
* Vapors may travel to a source of ignition and flash back.
* Vapor is heavier than air and may travel a distance to cause a fire or explosion far from the source.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If **Vinyl Chloride** is leaked, take the following steps:

* Evacuate persons not wearing protective equipment from area of leak until clean-up is complete.
* Remove all ignition sources.
* Ventilate area of leak to disperse the gas.
* Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.
* Keep **Vinyl Chloride** out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the build-up of explosive concentrations.
* It may be necessary to contain and dispose of **Vinyl Chloride** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: 1-877-WARN-DEP

HANDLING AND STORAGE (See page 3)

FIRST AID

In NJ for POISON INFORMATION call 1-800-764-7661

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately.

Skin Contact

* Immerse affected part in warm water. Seek medical attention.

Breathing

* Remove the person from exposure.
* Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 2,660 mm Hg at 68°F (20°C)
Flash Point: -108°F (-78°C)
Water Solubility: Very slightly soluble

OTHER COMMONLY USED NAMES

Chemical Name:
Ethene, Chloro-
Other Names:
Chloroethylene; VC; VCM; Vinyl Chloride Monomer; Chloroethene

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NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

APPENDIX B
BAKER HEALTH AND SAFETY FORMS

GUIDELINES IN CONDUCTING AN ACCIDENT INVESTIGATION

It is the supervisor's responsibility to immediately interview any injured employees or eyewitnesses in order to identify the cause of the accident. All interviews must be properly documented in written form and signed by interviewer and witness.

Every accident has a cause and one involving only a slight injury may reveal just as much about inadequate safety measures as one that results in serious injury. Therefore, each accident investigation should attempt to answer the following three questions:

1. How was the injury or the damage incurred--exactly what happened and where?
2. Under what accompanying or special circumstances did the accident occur?
3. What should be done to eliminate or control the hazard(s) that caused the accident?

Interview the injured employee and any bystanders who may have witnessed the accident. Be accurate and specific.

- **If the employee does not need immediate medical treatment and is physically able to talk about the accident, ask them what happened.**
- **Stress the fact that you want to discover the facts--not find fault or place the blame on anyone.**
- **Interview any participants in or witnesses to the accident. Allow them to speak freely, without interruption. If there is a disagreement that can't be resolved, make a note of it for further investigation.**

Write down the key facts.

- **What was the nature of the injury?**
- **What part of the body was injured or affected by the accident?**
- **What was the source of the injury--the object, substance or bodily motion that produced it?**
- **What type of accident was it, or in what manner was the person injured?**
- **What was the hazardous condition or circumstance involved?**
- **What was the cause of the accident--the object, substance, or part of the premises in which the hazardous condition existed? (Be specific.)**
- **What was the unsafe act that permitted the accident to occur?**

Analyze the accident and take steps to ensure that it doesn't happen again.

- **Correct the hazard--immediately, if possible.**
- **Provide employees with additional safety training.**
- **Review accident statistics to find out if the incident is part of a pattern of accident occurrence within the department. Check the employee's past record and what (if any) safety training they received.**
- **Study the possibility of changing methods, procedures, equipment, layout, etc. to reduce the hazard.**

Return completed form to:

Human Resources Department-Engineering Group
AOP, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108

9/92

SUPERVISOR'S ACCIDENT REPORT FORM

Baker

Name of Injured employee: _____

Job Title: _____ Dept.: _____

Date of Injury: _____ Exact Location: _____

Date of Birth: _____ Date of Hire: _____

Where did the accident or injury occur? _____

At what time did it occur? _____ a.m. p.m

Describe the injury in detail: _____

_____

_____

Will the injury cause loss of time? YES NO

When is the employee expected to return to work? _____

Any pre-existing physical disabilities? _____

Please indicate the injured area, the nature of the injury and the action taken:

☐ Head	☐ Hands	☐ Wounds	☐ Amputation	☐ 1st Aid Only	☐ Injured Sent:
☐ Eyes	☐ Fingers	☐ Strain & Sprain	☐ Burns	☐ Medical Only	☐ Home
☐ Trunk	☐ Legs	☐ Contusion	☐ Foreign Body	☐ Lost Time	☐ Dr. _____
☐ Arms	☐ Feet	☐ Fracture	☐ Skin (Occupational)	☐ Alleged	☐ Hosp. _____

Please indicate (x) all those that apply:

BASIC CAUSE:

- ☐ Operating Equipment Without Authority
- ☐ Environmental conditions (terrain,weather,etc.)
- ☐ Unsafe Equipment/Using Equipment Unsafely
- ☐ Unsafely Loading, Placing, Clearing brush
- ☐ Working on Moving or Dangerous Equipment
- ☐ Distraction, Teasing, Horse Play
- ☐ Failure to Use Personal Protective Devices
- ☐ Other (Explain)

CONTRIBUTING CAUSE, IF ANY

- ☐ Unguarded or Equipment Guards Absent
- ☐ Defective Tools, Equipment or Substance
- ☐ Unsafe Design or Construction of equipment
- ☐ Hazardous Conditions
- ☐ Unsafe Illumination
- ☐ Unsafe Ventilation
- ☐ Unsafe Clothing
- ☐ Other (Explain)

Describe accident in detail (use separate sheet of paper and include comments by eyewitnesses, injured employees, etc.) _____

_____

SUPERVISOR'S GUIDE TO CORRECTIVE ACTION:

UNSAFE ACT	UNSAFE CONDITION
Stop future incidents	Remove
Study the Job	Post Warning Signs
Provide Safety/Equipment Training	Advise Supervisor
Follow - up/Enforce	Advise Others (maintenance, Project Manager)

Describe the corrective action you will be taking: _____

_____

Supervisor's Signature: _____

Job Title: _____ Date: _____

QAPP ADDENDUM

FINAL

QAPP ADDENDUM
FOR SWMUS 303/318 and 336

RCRA PROGRAM
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0091

FEBRUARY 2005

Prepared for:

DEPARTMENT OF THE NAVY
MID-ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

Under the:

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(NOTE: Italicized print indicates that information in that section is presented in the Master Site QAPP and not in this QAPP Addendum.)

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LIST OF ACRONYMS AND ABBREVIATIONS

DQOs	Data Quality Objectives
MCB	Marine Corps Base
QAPP	Quality Assurance Project Plan
RCRA	Resource, Conservation, and Recovery Act
RFIs	RCRA Facility Investigations
SWMUs	Solid Waste Management Units
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) Addendum provides site-specific quality assurance information for the Resource, Conservation and Recovery Act (RCRA) Facility Investigations (RFIs) at Marine Corps Base (MCB) Camp Lejeune, North Carolina. General information that is required for the QAPP is presented in the Master Site QAPP, which is contained in the Master Project Plans for Camp Lejeune (Baker, 2003). This QAPP Addendum is designed to be used in conjunction with the Master Site QAPP. Site personnel are required to review the information presented in both the Master Site QAPP and this QAPP Addendum prior to conducting the field activities.

2.0 PROJECT DESCRIPTION AND ORGANIZATION

RFIs will be conducted at Solid Waste Management Units (SWMUs) 303/318 and 336. The primary objectives of the RFIs are to determine the nature and extent of contamination and evaluate potential impacts to human health and the environment.

The field activities will include the collection and analyses of soil and groundwater samples from soil borings, surface soil samples, groundwater grab samples, and monitoring wells at both SWMUs. Detailed sampling procedures and sample handling and analyses requirements are presented in the Site Specific Work Plan. Tables 4-1 and 4-2 contained in the Site Specific Work Plan present a summary of the sampling and analytical program proposed at each specific SWMU. The sample locations are shown on Figures 4-1 through 4-4 of the Site Specific Work Plan.

Data quality and sampling objectives and the United States Environmental Protection Agency (USEPA) seven-step data quality objectives (DQOs) process, as presented in the USEPA Guidance for the Data Quality Objectives Process (USEPA, 2000a), and USEPA Data Quality Objectives Process for Hazardous Waste Site Investigations (USEPA, 2000b) are presented in Section 3.0 of the Site Specific Work Plan.

Key personnel responsible for quality assurance of the project are presented in Section 5.0 of the Site Specific Work Plan. Baker's primary participants are as follows:

- Mr. Richard Bonelli – Activity Coordinator
- Mr. James Culp – Project Manager
- Mr. Scott Moffett – Project Manager
- Mr. Robert Sok – Site Manager

Mr. Culp and Mr. Moffett will have the overall responsibility for conducting the field activities and completing the report associated with this project. They will be supported by geologists, engineers, scientists, biologists, and clerical personnel, as needed. The primary subcontractors required for this project include a drilling contractor, utility locator, mobile laboratory, analytical laboratory, and independent data validator. Miscellaneous subcontractors may also be procured for various support services. Specific subcontractors have not yet been selected. Figure 5-1

contained in the Site Specific Work Plan presents the project organization, responsibilities, and support staff.