

**PLAN OF ACTION (POA)  
FOR A REMEDIAL INVESTIGATION AT  
THE NAVY EXCHANGE  
SERVICE STATION OF THE BRUNSWICK  
NAVAL AIR STATION  
BRUNSWICK, MAINE**

**Prepared for:**

**DEPARTMENT OF THE NAVY, NORTHERN DIVISION  
Naval Facilities Engineering Command, Code 023  
Building 77L, U.S. Naval Base  
Philadelphia, Pennsylvania 19112**

**Prepared by:**

**ERM-NEW ENGLAND, INC.  
205 Portland Street  
Boston, Massachusetts 02114**

**July 1991**

## TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES .....	i
LIST OF FIGURES .....	i
1.0 INTRODUCTION.....	1-1
1.1 Background.....	1-1
1.2 Purpose and Scope.....	1-2
1.3 Site Description.....	1-2
1.4 History of USTs at the Site.....	1-4
1.5 History of Environmental Activity at the Site.....	1-5
1.6 Regulatory Requirements.....	1-6
2.0 PLAN OF ACTION/SCOPE OF WORK .....	2-1
2.1 Task 1 - Conduct Soil Gas Survey .....	2-1
2.2 Task 2 - Install Borings/Monitoring Wells .....	2-2
2.3 Task 3 - Sample and Analyze Soil and Ground Water.....	2-5
2.4 Task 4 - Compile and Analyze Data.....	2-6
2.5 Task 5 - Prepare Report .....	2-7
2.6 Task 6 - Project Management and Meetings .....	2-7
3.0 PROJECT PERSONNEL .....	3-1
4.0 PROJECT SCHEDULE .....	4-1
5.0 SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR BRUNSWICK NAS .....	5-1
5.1 Site Name and Address .....	5-1
5.2 Site Personnel with Assigned Responsibilities .....	5-1
5.3 Site Description.....	5-1
5.4 Planned Activities .....	5-1
5.5 Potential Hazards .....	5-2
5.6 Emergency Contacts and Directions to Nearest Hospital ...	5-4
5.7 Disposal of Contaminated Health and Safety Equipment...	5-4

TABLE OF CONTENTS (Con't)

	<u>Page</u>
6.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN.....	6-1
6.1 Purpose .....	6-1
6.2 Soil Gas Sampling .....	6-2
6.3 Drilling Activities .....	6-2
6.4 Pre-Monitoring Well Sampling Activities .....	6-5
6.5 Monitoring Well Evacuation and Sampling.....	6-6
6.6 Quality Assurance/Quality Control Samples .....	6-7
6.7 Other QA/QC Protocols .....	6-8

TABLES

FIGURES

APPENDIX A MAINE DEP ANALYTICAL METHODS

## LIST OF TABLES

- Table 1    Sampling Plan  
Table 2    Analytical Parameters

## LIST OF FIGURES

- Figure 1    Brunswick Naval Air Station Brunswick, Maine  
Figure 2    Proposed Soil Gas Survey and Monitoring Well Location Map  
Figure 3    Project Staffing  
Figure 4    Estimated Project Schedule

## SECTION 1.0

### INTRODUCTION

#### 1.1 Background

Brunswick Naval Air Station (NAS) is located in the town of Brunswick, Maine (see Figure 1), approximately 27 miles north of Portland, Maine. The Naval Exchange (NEX) service station located on the base presently operates three 10,000-gallon underground storage tanks (USTs) for storing and dispensing gasoline.

In 1981, gasoline odors were detected in the area around the service station and a ground water recovery system was installed and operated for a period of time. This recovery system appeared to temporarily correct the problem. Gasoline fumes were then detected at the Family Service Center building located south of the NEX. A passive vapor venting system was then installed in the soil along the northern side of the Family Services Center across the street from the service station.

At the present time, the only known source of the gasoline release is a faulty fitting between the pump island and underground storage tanks (see Figure 2), which was discovered and repaired in 1981. The investigation of this suspected source is further described in Section 1.5.

The tank systems passed tightness testing in 1989. However, gasoline odors were again detected in 1989 in sewer manholes south of the Family Service Center. As a result, ERM-New England, inc. (ERM) has been contracted by Northern Division, Naval Facilities Engineering Command (under Contract No. N62472-89-D-1448) to prepare this Plan of Action (POA) for conducting a remedial investigation (RI) to identify the source of the gasoline odors and delineate any associated soil and ground water contamination at the site.

## 1.2 Purpose and Scope

The purpose of the POA is to preliminarily define the extent of soil and ground water contamination from the UST systems (tanks and piping) located at the NEX service station, Brunswick NAS, and make recommendations for any further investigation or remedial actions. For this purpose, ERM will complete the following major tasks during the RI:

- Task 1      Conduct Soil Gas Survey
- Task 2      Install Borings and Monitoring Wells
- Task 3      Sample and Analyze Soil and Ground Water
- Task 4      Analyze Data
- Task 5      Prepare Report
- Task 6      Project Management and Meetings

The above scope meets the objectives of the POA. The order and specific details of each task are based on ERM's experience with this type of assessment and our current level of knowledge about the site.

This scope does not include identification and evaluation of remedial alternatives, engineering design work, or preparation of plans and specification documents. Remedial investigations are frequently conducted in phases and it is possible that additional site work may be required to fully characterize the horizontal and vertical extent of contamination. An assessment of the necessity for additional work will be made in the RI Report.

## 1.3 Site Description

The site is located within the NAS at the intersection of Second Street and Burbank Avenue (see Figure 2). The site, with an area of approximately one acre, consists of the NEX service station (Building 538) including two pump islands, a paved parking area, and the grassy area to the east of the service station where the three 10,000-gallon underground gasoline tanks are located.

The service station building has an area of approximately 5,300 square feet which includes two service bays, an office, and a small store with a beverage container redemption center. The original building (the western side of the existing building) was constructed in 1957. Several additions to the original building have been made since that time.

To the north of the site is Building 295 (a water pump house), to the east is Building 11 (the Navy Exchange Complex), to the south is Building 27 (the Family Service Center), and to the west is the public works vehicle compound. The topography of the site and surrounding area is relatively flat with a slight slope to the south. Much of the site is paved except for a small portion of the eastern side where the USTs are located, the area between Burbank Avenue and the Family Services Center, and the grassy island at the corner of Burbank and Second Street.

Buried utilities at the site include a storm sewer pipe and a sanitary sewer pipe; both of which exit the south side of the service station and pass under Burbank Avenue. There are two catchment basins on the site which feed the storm sewer; one located next to the sanitary sewer manhole and the other located just outside the service bays.

### *Site Geology*

Geology of the area is characterized by unconsolidated glacial and marine deposits of silt, clay, and sand overlying bedrock.

The results of a soil boring, conducted at the NEX in 1974 to provide geotechnical information for construction of a building addition, revealed an on-site stratigraphy consisting of fine yellow to gray sand from one to 22.5 feet, and a soft blue clay to 93.5 feet which is underlain by two feet of sand and gravel. Bedrock was intersected at 95.5 feet.

### *Site Hydrogeology*

Based on the findings of a RI conducted at the NAS NPL site (Site 9) located approximately 2,000 feet south of the NEX, ground water is found at water

table conditions with a general south-southeast flow direction. Based on information from the previously mentioned geotechnical soil boring in the vicinity of the NEX, the depth to ground water is approximately five feet below the ground surface.

#### 1.4 History of USTs at the Site

In an effort to determine possible sources of the gasoline release, the history of the USTs at the site was investigated.

According to an April 4, 1990 listing of all USTs at Brunswick NAS, there are currently four USTs at the NEX service station. These include three 10,000-gallon single walled-steel gasoline tanks located in the grassy area to the east of the service station, and one 1,000-gallon steel fuel oil tank located on the north side of the service station. The three gasoline tanks were installed in 1974 and the fuel oil tank was installed in 1975. Maine Department of Environmental Protection (DEP) registration numbers for these tanks are 14682-1, 14682-2, 14682-3, and 10045-63, respectively.

USTs that have been removed from the site include two 5,000-gallon gasoline tanks (removed in 1974 prior to building expansion) and a 550-gallon waste oil tank (removed in November of 1989). The two 5,000-gallon tanks were located under the current east side of the service station and were removed to permit expansion of the service station. The waste oil tank was located on the west side of the service station. No records were found at the NAS or at DEP documenting these tank removals.

It is reported that a leaking fitting between the pump island and the tanks installed in 1974 was discovered and repaired in 1981. This is presently the only known source of contamination.

The three existing 10,000-gallon UST systems passed an integrity test conducted by Tankpro of Scarborough, Maine, in July of 1989.

## 1.5 History of Environmental Activity at the Site

ERM reviewed Maine DEP files to determine if any spill incidents or releases had been reported for the site (complete files were only available for the period since 1984). A gasoline spill had been reported to DEP in 1989. According to Mr. Brad Hahn of DEP's Portland office, who prepared a report for the incident, the incident involved a minor amount of contaminated soil that was discovered while performing a tank tightness test. Approximately one cubic yard of soil was removed and disposed of off-site. According to the contractor who performed the tightness test (Tankpro of Scarborough, Maine), the spill did not appear to be related to the tightness test. Based on the contractor's description of the incident, Mr. Hahn decided that the amount of contamination was minor and no follow-up was necessary. Additional information regarding past environmental activity at the site, obtained by interviewing NAS personnel, is discussed below.

The ground water recovery system located at the site is comprised of three wells connected to a central manifold and pump system. The system is located in the grassy island at the corner of Second Street and Burbank Avenue. According to Mr. Neil Campbell, an NAS maintenance worker, the recovery system was installed in 1981. At that time, gasoline vapors were detected in the street next to the service station. To determine the source of the vapors, surficial soils in a 60 to 70 square foot area around the UST systems were removed, and a faulty connection in one of the pipes was found and repaired. The excavated soils were analyzed by DEP personnel, and the contaminated soils were disposed of off-site.

The recovery wells were installed and ground water was pumped into a temporary above ground holding tank for approximately one week and analyzed by DEP. Subsequently, for approximately one year, DEP permitted ground water from these wells to be pumped into the nearby storm sewer line. Ground water pumping was terminated when the water no longer appeared to be contaminated. The date of termination of pumping is unknown. There are no records in DEP's files to document any of these activities. The only documentation in NAS files concerning these

activities is a work authorization for installation of the wells dated July 22, 1981.

During a site visit, ERM observed a vent pipe that had been installed on the north side of the Family Services Center. According to NAS personnel, this vent pipe is the exhaust stack for a passive vapor collection system installed along the north side of this building. The system was installed to collect and exhaust gasoline vapors that had been detected inside the building. No records or documentation were found to indicate the exact design of the system or when it was installed. However, since the Family Services Center was constructed in 1982, the system must have been installed sometime after that date.

#### 1.6 Regulatory Requirements

The Maine law requiring reporting and cleanup of discharges of hazardous matter into the environment is set forth in 38 MSRA 1317 and in DEP regulations, Chapters 800 and 801. This law requires submittal of a written report to DEP within 30 days of the discharge of hazardous matter. There are no formal requirements governing how remedial investigations and actions should be performed, and there are no state cleanup levels for soil or ground water. Generally, these requirements are determined on a site-specific basis.

The Maine law governing the design and operation of petroleum USTs is set forth in Chapter 691 of Maine's code of regulations. Amendments to these regulations were signed into law in April of 1990. These regulations require that all existing UST systems located in sensitive geologic areas (significant ground water aquifers, primary sand and gravel recharge areas, within 1,000 feet of a public or 300 feet of a private drinking water supply) be upgraded to conform with current design standards (cathodically protected steel, double-wall fiberglass or other equally non-corrosive material) by October of 1989. Existing USTs will also have to be upgraded to include leak detection systems (ground water or vapor monitoring, monthly inventory, or automatic tank gauging) by December of 1991. The NAS, which is located in a sensitive geologic area, has applied

for and obtained a waiver from DEP delaying the upgrade of these USTs until October of 1991.

## SECTION 2.0

### PLAN OF ACTION/SCOPE OF WORK

To characterize the potential contamination at the site, ERM is proposing several tasks, including the installation and sampling of five ground water monitoring wells. The locations of the monitoring wells will be determined by establishing a survey grid and conducting a reconnaissance level soil gas survey. The details of this field program are discussed in the following sub-sections.

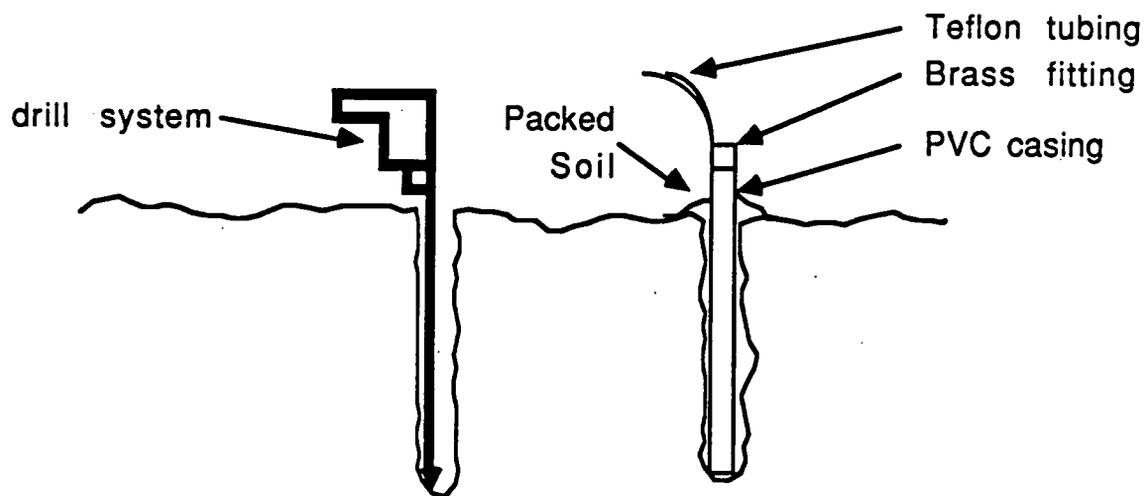
#### 2.1 Task 1 - Conduct Soil Gas Survey

The purpose of conducting a soil gas survey is to provide a rapid and cost-effective definition of the horizontal extent of gasoline vapors in the soil. The location of gasoline vapors will indicate areas of the subsurface impacted from a release and migration of gasoline product. The results of the survey will be used to select optimal locations for the proposed monitoring wells from which soil and ground water quality information will be obtained. Soil gas surveys have proven to be successful at similar sites where gasoline was present in a shallow water table aquifer.

ERM's proposed soil gas sampling locations are shown on Figure 2. The locations were selected to provide extensive geographic coverage of the site and document soil gas conditions in the assumed down gradient direction. The sampling grid may be revised based on field conditions and location of utilities.

Soil gas measurements will be collected as follows: A Black and Decker Macho II Rotary Hammer with a nominal one-inch diameter, three-foot long, carbide screw bit will be used to advance a small boring at each sample location. Nominal one-inch diameter, four-foot long, open-ended, PVC casing with perforations along the bottom foot will then be inserted approximately three feet into the boring. The PVC casing is fitted with a brass opening-reduction fitting on the above-ground end. Teflon tubing is

attached to the end and acts as the sampling port for an OVM total organic photo-ionization detector (PID). Both peak and stable readings will be recorded. The PVC casings will be dedicated to a particular sampling location until they are decontaminated by washing with a soap (alconox) and water solution followed by a tap water and distilled water rinse. Any casing moved to a new location will first be decontaminated as described above. After readings are taken, the PVC will be removed and the small hole will be backfilled with soil from the boring and, if additional material is required, surface soil from the area around the boring. A diagram of the equipment is shown below.



## 2.2 Task 2 - Install Borings/Monitoring Wells

The purpose of installing borings and monitoring wells is to further characterize the geologic and hydrogeologic setting of the site and to obtain information on the horizontal and vertical extent of soil and ground water contamination. These wells may also be used to document changes in ground water quality through time. ERM proposes to install a total of five monitoring wells during Task 2 at the locations shown in Figure 2. The proposed well locations may be changed based on the results of the soil gas survey.

Prior to boring and well installation, utility clearances will be checked by Brunswick NAS digging permit procedures, by calling Dig Safe System, Inc.

(1-800-322-4844), by review of available site plans and blue prints, by consultation with knowledgeable site personnel, and by checking proposed location clearances with a metal detector.

The rationale for the proposed well locations is as follows:

Monitoring Well MW - 1

Monitoring Well MW - 1 will be located northeast of the NEX building in the assumed upgradient direction from the location of the suspected gasoline release to provide information on background water quality and to provide greater control for ground water gradient mapping (flow direction).

Monitoring Well MW - 2

Monitoring Well MW - 2 will be located downgradient of the USTs to the north of the Family Service Center where gasoline fumes were previously detected. This well is intended to indicate whether gasoline contaminated ground water is migrating to the Family Services Center from the NEX.

Monitoring Well MW - 3

Monitoring Well MW - 3 will be located downgradient of the former UST location to detect any contamination to the west of the Family Service Center.

Monitoring Well MW - 4

Monitoring Well MW - 4 will be located in the area of the highest soil gas readings. Based on the location of the pump islands and the UST piping, it is likely that this well will be installed near the location shown on Figure 2.

### Monitoring Well MW - 5

Monitoring Well MW - 5 is located downgradient of the NEX south of the Family Service Center. This well will be used to determine if the contamination has migrated beyond the Family Service Center. If not, the well may be monitored to determine if contamination is migrating in this direction through time.

#### *Well Construction*

Wells will be constructed with four-inch inside diameter schedule 40 PVC because the potential usefulness of the larger diameter wells during subsequent remedial phases is much greater than with two-inch wells. Also, the incremental cost for the four-inch shallow wells required at Brunswick NAS is small.

A ten foot section of well screen (0.010 inch slot width) will be installed such that approximately three feet of screen is located above the water table. This configuration will permit detection of floating hydrocarbons and allow for seasonal fluctuations of the water table. All completed wells will be finished with flush mounted protective road boxes.

Drilling equipment will be decontaminated between borings by steam cleaning with potable water. Potable water will be obtained from the base water supply system for this purpose.

During the installation of each well, ERM will collect soil samples at five foot intervals or changes in strata (in accordance with ASTM protocols) to further characterize subsurface conditions. All split spoon samples will be field monitored using an Organic Vapor Monitor (OVM). Drilling logs will be kept to document geologic and other characteristics of the subsurface materials. A detailed description of well installation procedures is presented in Section 6.3.

### *Survey and Measure Water Levels*

A surveyor, registered in the State of Maine, will locate the new monitoring wells horizontally and vertically and tie them in to the Maine State Grid and Mean Sea Level (MSL). If no suitable horizontal and vertical control can be found at the site, monitoring wells at site 9 will be used for location survey control. Vertical locations are needed for water table contouring and horizontal locations will be used to accurately locate the wells on the site plan. ERM will measure ground water levels in all of the wells and relate the water levels to MSL datum. Based on these elevations, ERM will evaluate the ground water gradient and the direction of ground water flow.

### *Test Soil Permeability*

ERM will conduct permeability tests in selected wells on site to obtain additional hydrogeologic data. The purpose of the tests is to determine the permeability of the soil in the vicinity of the screened interval in each well. The permeability values can then be used to calculate the approximate rates of ground water and contaminant migration.

Permeability testing will be conducted using rising (variable) head techniques. A solid slug will be used to displace water up the well and the subsequent recovery (falling head) of the water to the original level will be timed with a computerized data logger and transducer system. The slug will then be removed, displacing the water down the well, and the recovery (rising head) will be timed. The data will be analyzed using the Bouwer & Rice method to determine formation permeabilities at each well. The permeability testing will be conducted in accordance with ERM's Standard Operating Procedures (SOPs). *Appendix B*

### 2.3 Task 3- Sample and Analyze Soil and Ground Water

ERM will collect soil and ground water samples from the five proposed borings/wells. A soil sample will be collected from each soil boring at the location closest to the water table. Ground water samples will be collected

from each of the five monitoring wells. All samples will be analyzed following the methods for compounds associated with petroleum product releases:

- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) including methyl tert-butyl ether (MTBE) by EPA Method 8020;
- Total Lead by EPA Method 7421;
- Gasoline by Maine DEP Methods 4.2.1 (water) and 4.2.3 (soil);
- Fuel Oil by Maine DEP Methods 4.1.1 (water) and 4.1.2 (soil); and,
- Total Petroleum Hydrocarbons (TPH) by IR - EPA Method 418.1.

MTBE is an additive to unleaded gasoline. The relatively high mobility of this compound, combined with its association with unleaded gasoline, can be useful for tracking and identifying subsurface plumes.

ERM will collect all samples in accordance with DEP and U.S. Environmental Protection Agency (EPA) SOPs and ERM protocols. All samples will be submitted to Alpha Analytical Laboratories in Westborough, Massachusetts (State of Maine certified lab) for analyses.

#### 2.4 Task 4 - Compile and Analyze Data

ERM will analyze and document all project data for inclusion into a comprehensive Phase I report. Laboratory results will be analyzed with respect to current EPA Maximum Contaminant Levels (MCLs) for the appropriate compounds and, if more stringent, Maine DEP standards or guidelines. Data will be summarized in tables and figures, as appropriate. ERM will analyze project data using accepted industry standards for remedial investigations. Data analyses will be thoroughly documented and subject to senior technical review in accordance with ERM's quality control policies.

## 2.5 Task 5 - Prepare Report

ERM will prepare three copies each of a draft and final report. The final report will consider and incorporate the Navy's comments on the draft and will be in a format which is acceptable for submittal to DEP. The report will be illustrated with clear, concise figures and maps, where appropriate. The report will include:

- Conclusions and Recommendations;
- Introduction;
- Background;
- Scope of Work;
- Data Interpretation;
- Boring and Well Logs;
- Ground Water Flow Map;
- Site Map Showing All Sampling Locations;
- Contaminant Distribution Map;
- Tabulated Analytical Results;
- List of ARARs Used in Evaluating the Data;
- Slug Test Data;
- Survey Data (if available);
- Water Level Measurement Records;
- Soil Gas Survey Data Sheets;
- Chain-of-Custody Forms; and
- Laboratory Analysis and QA/QC Data.

## 2.6 Task 6 - Project Management and Meetings

The purpose of this task is to ensure completion of the project on-time and on-budget, provide oversight of project personnel, and ensure regular interaction with Navy personnel. This task includes general communication and coordination, financial management, personnel and project scheduling, etc. In addition to an initial project planning meeting, the ERM project team will be available for public or private meetings to present and discuss results and recommendations.

## SECTION 3.0

### PROJECT PERSONNEL

ERM has assembled a project team comprised of personnel who have completed similar assignments on projects equivalent to the project outlined in the POA. ERM's project team offers the Navy several important benefits:

- The project team has conducted numerous Phase I remedial investigations related to gasoline releases in both unconsolidated and fractured bedrock terrain.
- The senior professionals assigned to the project have worked with the DEP and are familiar with the regulatory process in Maine.
- The key personnel assigned to the RI are familiar with the project site and were involved in the development of the POA.

The proposed project organization is illustrated in Figure 3. John Drobinski, Project Manager, will be responsible for project control, technical review, and client interaction. The work on-site will be directed by Dorothy Vesper, Project Geologist.

The key project personnel, selected for the project team based on their availability for the assignment, experience with petroleum site assessments, and managerial skills are presented below.

#### PERSON

#### FUNCTION

Byron Nickerson	Project Director
Benjamin Frothingham	Project Manager
Dorothy Vesper	Project Geologist/On-Site Manager
Robert Deist	Health and Safety Officer
Denise Erb	Site Health and Safety Officer
David Blye	Chemical Data Review

SECTION 4.0

PROJECT SCHEDULE

ERM's proposed project schedule is shown in Figure 4. It is anticipated that the project will take approximately nine weeks to complete.

## SECTION 5.0

### SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR BRUNSWICK NAS

#### 5.1 Site Name and Address

NAS Brunswick Navy Exchange (NEX)  
Naval Air Station  
Brunswick, Maine

#### 5.2 Site Personnel with Assigned Responsibilities

Program Manager - Byron Nickerson  
Project Manager - Benjamin Frothingham  
Site Manager/Project Geologist - Dorothy Vesper  
Health & Safety Officer - Robert Deist  
Site Health & Safety Officer - Denise Erb

#### 5.3 Site Description

The site is the NAS Brunswick Navy Exchange (NEX) service station located in Brunswick, Maine. A Remedial Investigation will be conducted.

#### 5.4 Planned Activities

Project activities include services necessary to develop a Plan of Action (POA) for the investigation of potential soil and ground water contamination from the underground storage tanks, completion of the work specified in the approved POA, and preparation of the construction contract documents necessary to clean up the site.

## 5.5 Potential Hazards

### Chemical (Fuel Oil)

There is no specified acceptable exposure limit for fuel oils. Acceptable exposure limits for gasoline and its constituents have been used to provide the action level guidelines specified below. These guidelines can be applied to activities involving gasoline and/or fuel oil contamination.

### Gasoline

Gasoline has a maximum acceptable exposure level or Threshold Limit Value (TLV) expressed as a Time Weighted Average (TWA) (8 hours per day) of 300 ppm and a Short Term Exposure Limit (STEL) of 500 ppm over a period of 15 minutes according to the American Conference of Governmental Industrial Hygienists. Benzene is found in gasoline in varying concentrations ranging from 1-10%. Other significant components of gasoline include toluene, xylene and ethylbenzene. The permissible exposure limit (PEL) for benzene is 1 ppm due largely to the carcinogenic nature of the compound. A PEL of 100 ppm has been established for xylene, toluene and ethylbenzene.

Benzene concentrations must be monitored within the workers' breathing space throughout intrusive activities involving contaminated or potentially contaminated media (soils, ground water, etc.). Benzene monitoring will be conducted any time organic vapors reach or exceed 10 ppm in the breathing space as measured by an OVM. Benzene can be monitored using colorimetric indicator tubes (e.g., Draeger Pump Kit).

If OVM readings reach or exceed 10 ppm in the breathing space during excavations/drilling operations, benzene monitoring will be conducted at each 3 foot interval of excavation/boring advancement. If OVM readings reach or exceed 10 ppm in the breathing space during ground water sampling activities, benzene monitoring will be conducted at least once during well purging and prior to sampling. Benzene monitoring will not be required once an excavation/borehole is completed and monitoring results

indicate that no benzene is present within the detected airborne gas/vapor mixture.

If benzene is not found within the workers' breathing space, and Volatile Organic Compound (VOC) concentrations are between 0 and 100 ppm as measured with the OVM, Level D Personal Protective Equipment (PPE) will be worn. The 100 ppm action level has been set based on the PEL of toluene, xylene and ethylbenzene. Level D is regular work clothing. Outer gloves and boots will also be worn since there is potential for direct contact with contaminated soils. If the VOC concentrations are 100 to 500 ppm, or benzene concentrations are greater than 1 ppm, Level C PPE (half face respirator with organic cartridges) will be worn. A full-face air purifying respirator will be required for VOC concentrations between 500-900 ppm or benzene concentrations greater than 10 ppm in the breathing space. If the VOC levels exceed 900 ppm or benzene concentrations greater than 50 ppm in the breathing space, the area will be evacuated and the ERM Health and Safety Coordinator and appropriate plant personnel will be contacted. If the VOC levels exceed 900 ppm or benzene exceeds 50 ppm in the breathing space, Level B (supplied air) PPE must be worn or the area must not be re-entered until the vapors dissipate.

Fuel oils/gasoline vapors are dangerous fire hazards when exposed to heat, flame, or oxidizers. To fight fire, foam, CO<sub>2</sub>, or dry chemicals will be used. When heated to decomposition gasoline emits an acrid smoke and irritating fumes. Gasoline has a flash point of -45 °F.

The ERM Site Health and Safety Officer will continuously monitor the air with an explosimeter in addition to an OVM. If combustible gas levels exceed 20% LEL, the work area will be evacuated until it is positively ventilated. If the level is between 10 and 20% LEL only intrinsically safe instruments should be used.

Physical (Utilities)

Planned activities require excavation. All utility companies and local authorities will be notified of planned excavation activities and all underground utilities will be appropriately marked.

5.6 Emergency Contacts and Directions to Nearest Hospital

Ben Frothingham - ERM Project Manager----- (617) 742-8228  
Police----- 911  
Fire----- 911  
Ambulance----- 911  
Hospital - Parkview Memorial----- (207) 729-1641  
Occupational Health Co. - Health Resources----- (617) 426-3586

Parkview Memorial Hospital is located on Maine Street in Brunswick. To get to the hospital from the NAS entrance, one would take a left turn from the base on Old Bath Road. After proceeding approximately two miles west on Old Bath Road, turn left on Maine Street. The hospital is located on the left approximately 1 mile south of the intersection of the Old Bath Road and Maine Street.

5.7 Disposal of Contaminated Health and Safety Equipment

Contaminated health and safety equipment, including clothing and personal protective devices, will be disposed of in a 55-gallon drum, labelled and picked up by a certified hazardous waste disposal contractor.

**SECTION 5.0 ATTACHMENTS**

**SITE PERSONNEL DATA LIST**

ERM AND SUBCONTRACTOR SITE PERSONNEL  
REMEDIAL INVESTIGATION AT THE NAVY EXCHANGE SERVICE STATION  
NAVAL AIR STATION  
BRUNSWICK, MAINE 04011-5000

PROJECT DIRECTOR - BYRON NICKERSON

PROJECT MANAGER - BEN FROTHINGHAM

SITE MANAGER/GEOLOGIST - DOROTHY VESPER

SITE HEALTH AND SAFETY OFFICER - DENISE ERB

DRILLING FOREMAN - TOM PAQUETTE

DRILLING HELPER - JOHN GALVIN

**Health and Safety Equipment List**

## Health and Safety Equipment List

Water Level Probe - Keck Electric  
Tyvex Coveralls - White  
Respirator - Full Face  
Respirator - Half Face  
PH Meter - Orion  
OVM Meter (PID), HNU, Photovac  
Optical Interface Probe  
Gloves - Latex  
Gloves - Neoprene  
Gloves - PVC  
Filter Cartridge - Dust/Mist  
Filter Cartridge - Organic  
LEL/O2 Meter  
Decon Supplies  
 Draeger Unit

**Material Safety Data Sheets (MSDSs)**

# MATERIAL SAFETY DATA SHEET

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



No. 467

AUTOMOTIVE  
GASOLINE, LEAD-FREE

Date October 1981

SECTION I. MATERIAL IDENTIFICATION					
<b>MATERIAL NAME:</b> AUTOMOTIVE GASOLINE, LEAD-FREE <b>DESCRIPTION:</b> A volatile blend of hydrocarbons for automotive fuel <b>OTHER DESIGNATIONS:</b> Petrol, CAS #008 006 619, ASTM D439 <b>MANUFACTURER:</b> Available from several suppliers.					
SECTION II. INGREDIENTS AND HAZARDS			%	HAZARD DATA	
<b>Gasoline</b> A hydrocarbon blend that can include normal and branched chain alkanes, cycloalkanes, alkenes, aromatics and other additives.** (Lead max 0.013 g/L, phosphorus max 0.0013 g/L, sulfur max 0.10 wt%. May contain benzene, <5%; see ASTM D3606). *ACGIH 1981 TLV (Intended Changes List). See also Am. Ind. Hyg. A. 39 110-117 (1978) **The composition of fuel is varied with altitude and seasonal requirements for a locality. The blend must meet antiknock requirements. (Antiknock Index min 85, ASTM D439.)			100	8-hr TWA 300 ppm r 900 mg/m <sup>3</sup> *  Man Eye: 500 ppm/1H Moderate irritation  Inhalation: TCLo 900 ppm/1H TFX:CNS	
SECTION III. PHYSICAL DATA					
Distillation at 1 atm, Initial, deg C >39		Specific gravity, 60/60 F - 0.72-0.76			
50% distilled - 77-121		Melting point, deg C ----- -90.5-95.4			
End point ----- <240		Evaporation rate ----- N/A			
Vapor density (Air=1) ----- 3.0-4.0					
Solubility in water ----- Insoluble					
<b>Appearance and Odor:</b> A clear, mobile liquid with a characteristic odor which can be recognized at about 10 ppm in air. (Gasoline may be colored with dye.)					
SECTION IV. FIRE AND EXPLOSION DATA				LOWER	UPPER
Flash Point and Method	Autoignition Temp.	Flammability Limits in Air			
-45 F	536-853 F	% by volume		1.4	7.6
<b>Extinguishing Media:</b> Dry chemical, carbon dioxide, alcohol foam. Use of water may be ineffective to extinguish fire, but use water spray for cooling fire-exposed drums and tanks to prevent pressure rupture. It is a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow along surfaces, reach distant ignition sources and flash back. Can react violently with oxidizing agents. <b>Firefighters should wear self-contained breathing apparatus and full protective clothing.</b>					
SECTION V. REACTIVITY DATA					
This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This is an OSHA Class IA flammable liquid. A mixture of gasoline vapors and air can be explosive. It is incompatible with oxidizing agents. Thermal-oxidative degradation can yield carbon monoxide and partially oxidized hydrocarbons.					

**SECTION VI. HEALTH HAZARD INFORMATION**

TLV 300 ppm (See Sect. II)

Inhalation causes intense burning of the mucous membranes, throat and respiratory tract; overexposure to vapors can lead to bronchopneumonia. Inhalation of high conc. can cause fatal pulmonary edema. Repeated or prolonged skin exposure causes dermatitis. Can cause blistering of skin due to its defatting properties. Exposure to eyes can cause hyperemia of the conjunctiva.

Ingestion or excessive vapors can cause inebriation, drowsiness, blurred vision, vertigo, confusion, vomiting and cyanosis (2000 ppm produces mild anesthesia in 30 min, higher conc. are intoxicating in less time.) Aspiration after ingestion causes bronchitis, pneumonia, or edema which can be fatal.

**FIRST AID:**

**Eye Contact:** Flush thoroughly with running water for 15 min. including under eyelids.

**Skin Contact:** Remove contaminated clothing. Wash affected area with soap and water.

**Inhalation:** Remove to fresh air. Restore breathing and administer oxygen if needed.

**Ingestion:** Do not induce vomiting. Aspiration hazard. Contact physician.

Seek prompt medical assistance for further treatment, observation and support.

**SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES**

Notify safety personnel of leaks or spills. Remove sources of heat or ignition. Provide adequate ventilation. Clean-up personnel require protection against liquid contact and vapor inhalation. If a leak or spill has not ignited, use water spray to disperse vapors and to protect men attempting to stop the leakage. Contain spill. Do not allow to enter sewer or surface water. Add absorbent solid to small spills or residues and pick up for disposal.

**DISPOSAL:** Burn scrap material in an approved incinerator. Burn contaminated liquid by spraying into an incinerator. Follow Federal, State, and Local regulations.

**SECTION VIII. SPECIAL PROTECTION INFORMATION**

Use general and local exhaust ventilation (explosion-proof) to keep vapors below the TLV requirements in the workplace. Respirators should be available for nonroutine or emergency use above the TLV.

Avoid eye contact by use of chemical safety goggles and/or full faceshield where splashing is possible. Wear protective clothing appropriate for the work situation to minimize skin contact such as rubber gloves and boots. Clothing to be changed daily and laundered.

Eyewash fountains, showers and washing facilities should be readily accessible. Provide suitable training to those handling and working with this material.

**SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS**

Store in closed containers in a cool, dry, well-ventilated area away from sources of heat, ignition and strong oxidizing agents. Protect containers from physical damage.

Avoid direct sunlight. Storage must meet requirements of OSHA Class IA liquid. Outdoor or detached storage preferred. No smoking in areas of use. Prevent static electric sparks and use explosion-proof electrical services. (Must meet code.) Avoid skin and eye contact. Avoid inhalation of vapors. Wear clean work clothing daily. Indoor use of this material requires exhaust ventilation to remove vapors.

ICC Flammable Liquid, Red Label. LABEL: Flammable Liquid DOT I.D. No. UN 1203.

DOT Classification: **FLAMMABLE LIQUID**

DATA SOURCE(S) CODE: 2.4-9.34.37

Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.

APPROVALS: MIS  
CRD

Industrial Hygiene  
and Safety

MEDICAL REVIEW: 10-24-81  
14 November 1981

**GENIUM PUBLISHING**

**MATERIAL SAFETY DATA SHEET**

Unocal Corporation  
 1201 West 5th Street, P.O. Box 7600  
 Los Angeles, California 90051

Product Name: METHANOL  
 Product Code No: 15030

Issue Date: 12/01/89 Pag 1

**MANUFACTURER**

UNOCAL CHEMICALS DIVISION - PETROCHEM. GROUP  
 UNION OIL COMPANY OF CALIFORNIA  
 1345 NORTH MEACHAM ROAD  
 SCHAUMBURG, ILLINOIS 60196

CONTACT FOR FURTHER INFORMATION:  
 YOUR LOCAL SALES OFFICE (LAST PAGE)

**Transportation Emergencies:**

CHEMTREC  
 (800) 424-9300 Cont. U.S.  
 (202) 483-7616 (Collect)  
 from Alaska & Hawaii  
**Health Emergencies:**  
 Call LOS ANGELES POISON  
 INFORMATION CENTER (24 hrs)  
 1-(800)-356-3129

**PRODUCT IDENTIFICATION**

**PRODUCT NAME:** METHANOL  
**SYNONYMS:** AMSCO SOLV 5030  
 CARBINOL  
 COLONIAL SPIRIT  
 COLUMBIAN SPIRIT  
 METHYL ALCOHOL  
 METHYL HYDROXIDE  
 MONOHYDROXYMETHANE  
 PCN UCD 15030  
 PCN UCD 5030  
 PROXYLIC SPIRIT  
 UCD 810  
 WOOD ALCOHOL  
 WOOD NAPHTHA  
 WOOD SPIRIT  
**GENERIC NAME:** VOLATILE SOLVENT  
**CHEMICAL FAMILY:** OXYGENATED HYDROCARBON  
**DOT PROPER SHIPPING NAME:** METHYL ALCOHOL  
**ID NUMBER:** UN1230  
**DOT HAZARD CLASSIFICATION:** FLAMMABLE LIQUID

SECTION I - COMPONENTS	PERCENT	EXPOSURE LIMIT	UNITS	AGENCY	TYPE
------------------------	---------	----------------	-------	--------	------

**HAZARDOUS COMPONENTS**

METHANOL					
CAS #: 67-56-1					
	200.000		ppm	ACGIH	TWA-SKIN
	250.000		ppm	ACGIH	STEL-SKIN
	200.000		ppm	MSHA	TWA
	200.000		ppm	OSHA	TWA-SKIN
	250.000		ppm	OSHA	STEL-SKIN
	1000.000		ppm	CAL OSHA	CEIL
	600.000		ppm	CAL OSHA	EXCUR
	200.000		ppm	CAL OSHA	TWA-SKIN

Product Name : METHANOL  
Product Code No: 15030

Page 2  
Issue Date: 12/01/89

SECTION I - COMPONENTS	PERCENT	EXPOSURE LIMIT	UNITS	AGENCY	TYPE
------------------------	---------	----------------	-------	--------	------

**OTHER COMPONENTS**

--NONE--

THIS PRODUCT CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 313 AND 40 CFR 372:

	CAS NUMBER	WEIGHT %
METHANOL	67-56-1	99-100

SECTION II - EMERGENCY AND FIRST AID PROCEDURES **\*\*\*EMERGENCY\*\*\***  
Have physician call LOS ANGELES POISON INFORMATION CENTER (24 hrs) (800) 356-3129

**EYE CONTACT:**

IF IRRITATION OR REDNESS DEVELOPS, MOVE VICTIM AWAY FROM EXPOSURE AND INTO FRESH AIR. FLUSH EYES WITH CLEAN WATER. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION.

**SKIN CONTACT:**

REMOVE CONTAMINATED SHOES AND CLOTHING AND CLEANSE AFFECTED AREA(S) THOROUGHLY BY WASHING WITH MILD SOAP AND WATER. IF IRRITATION OR REDNESS DEVELOPS AND PERSISTS, SEEK MEDICAL ATTENTION.

**INHALATION (BREATHING):**

IF RESPIRATORY SYMPTOMS DEVELOP, MOVE VICTIM AWAY FROM SOURCE OF EXPOSURE AND INTO FRESH AIR. IF SYMPTOMS PERSIST, SEEK MEDICAL ATTENTION. IF VICTIM IS NOT BREATHING, IMMEDIATELY BEGIN ARTIFICIAL RESPIRATION. IF BREATHING DIFFICULTIES DEVELOP, OXYGEN SHOULD BE ADMINISTERED BY QUALIFIED PERSONNEL. SEEK IMMEDIATE MEDICAL ATTENTION.

**INGESTION (SWALLOWING):**

IF SWALLOWED, SEEK EMERGENCY MEDICAL ATTENTION. IF VICTIM IS DROWSY OR UNCONSCIOUS, PLACE ON THE LEFT SIDE WITH THE HEAD DOWN AND DO NOT GIVE ANYTHING BY MOUTH. IF VICTIM IS CONSCIOUS AND ALERT, VOMITING SHOULD BE INDUCED PREFERABLY WITH SYRUP OF IPECAC UNDER DIRECTION FROM A PHYSICIAN OR POISON CENTER. IF SYRUP OF IPECAC IS NOT AVAILABLE, VOMITING CAN BE INDUCED BY GENTLY PLACING TWO FINGERS IN THE BACK OF THE THROAT. IF POSSIBLE, DO NOT LEAVE VICTIM UNATTENDED.

**COMMENTS:**

NOTE TO PHYSICIANS: THIS PRODUCT CONTAINS METHANOL. METHANOL IS METABOLIZED TO FORMALDEHYDE AND FORMIC ACID. THIS IN TURN MAY CAUSE METABOLIC ACIDOSIS, VISUAL DISTURBANCES AND BLINDNESS. BECAUSE METABOLISM MUST OCCUR BEFORE THE TOXIC EFFECTS, THE ONSET OF TOXIC SYMPTOMS MAY BE DELAYED FROM 6 TO 30 HOURS FOLLOWING INGESTION. ETHANOL COMPETES FOR THE SAME METABOLIC PATHWAY AND HAS BEEN USED AS AN ANTIDOTE. METHANOL IS EFFECTIVELY REMOVED BY HEMODIALYSIS.

SECTION III - HEALTH HAZARDS/ROUTES OF ENTRY

**EYE CONTACT:**

THIS MATERIAL MAY CAUSE MILD EYE IRRITATION. DIRECT CONTACT WITH THE LIQUID OR EXPOSURE TO VAPORS OR MISTS MAY CAUSE STINGING, TEARING AND REDNESS.

**SKIN CONTACT:**

THIS MATERIAL MAY CAUSE MILD SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY CAUSE REDNESS, BURNING, AND DRYING AND CRACKING OF THE SKIN. CONTACT MAY RESULT IN SKIN ABSORPTION BUT SYMPTOMS OF TOXICITY ARE NOT ANTICIPATED BY THIS ROUTE ALONE UNDER NORMAL CONDITIONS OF USE. PERSONS WITH PRE-EXISTING SKIN DISORDERS MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF THIS MATERIAL.

Product Name: METHANOL  
Product Code No: 15030

Page 3  
Issue Dat : 12/01/89

**SECTION III - HEALTH HAZARDS/ROUTES OF ENTRY****INHALATION (BREATHING):**

WHILE THIS MATERIAL HAS A LOW DEGREE OF TOXICITY, BREATHING HIGH CONCENTRATIONS OF VAPORS OR MISTS MAY CAUSE IRRITATION OF THE NOSE AND THROAT AND SIGNS OF NERVOUS SYSTEM DEPRESSION (E.G., HEADACHE, DROWSINESS, DIZZINESS, LOSS OF COORDINATION, AND FATIGUE). RESPIRATORY SYMPTOMS ASSOCIATED WITH PRE-EXISTING LUNG DISORDERS (E.G., ASTHMA-LIKE CONDITIONS) MAY BE AGGRAVATED BY EXPOSURE TO THIS MATERIAL.

**INGESTION (SWALLOWING):**

THIS MATERIAL IS TOXIC AND MAY BE HARMFUL IF SWALLOWED. EFFECTS OF OVEREXPOSURE MAY INCLUDE IRRITATION OF THE DIGESTIVE TRACT, SIGNS OF NERVOUS SYSTEM DEPRESSION (E.G., HEADACHE, DROWSINESS, DIZZINESS, LOSS OF COORDINATION, AND FATIGUE), VISUAL DISTURBANCES (INCLUDING BLINDNESS), CONVULSIONS, COMA AND DEATH.

**COMMENTS:**

THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN BY NTP, IARC OR OSHA. METHANOL CAUSES HARM TO THE FETUS IN LABORATORY ANIMAL STUDIES. THE RELEVANCE OF THESE FINDINGS TO HUMANS IS UNCERTAIN. REPORTS HAVE ASSOCIATED REPEATED AND PROLONGED OCCUPATIONAL OVEREXPOSURE TO SOLVENTS WITH PERMANENT BRAIN AND NERVOUS SYSTEM DAMAGE (SOMETIMES REFERRED TO AS SOLVENT OR PAINTERS' SYNDROME). INTENTIONAL MISUSE BY DELIBERATELY CONCENTRATING AND INHALING THIS PRODUCT MAY BE HARMFUL OR FATAL.

**SECTION IV - SPECIAL PROTECTION INFORMATION****VENTILATION:**

IF CURRENT VENTILATION PRACTICES ARE NOT ADEQUATE TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE ESTABLISHED EXPOSURE LIMITS (SEE SECTION I), ADDITIONAL VENTILATION OR EXHAUST SYSTEMS MAY BE REQUIRED. WHERE EXPLOSIVE MIXTURES MAY BE PRESENT, ELECTRICAL SYSTEMS SAFE FOR SUCH LOCATIONS MUST BE USED.

**RESPIRATORY PROTECTION:**

IF AIRBORNE CONCENTRATIONS EXCEED ESTABLISHED EXPOSURE LIMITS (SEE SECTION I), USE A SUPPLIED AIR RESPIRATOR. DO NOT USE A CHEMICAL CARTRIDGE RESPIRATOR.

**PROTECTIVE GLOVES:**

THE USE OF GLOVES IMPERMEABLE TO THE SPECIFIC MATERIAL HANDLED IS ADVISED TO PREVENT SKIN CONTACT, POSSIBLE IRRITATION AND ABSORPTION.

**EYE PROTECTION:**

APPROVED EYE PROTECTION TO SAFEGUARD AGAINST POTENTIAL EYE CONTACT, IRRITATION OR INJURY IS RECOMMENDED.

**OTHER PROTECTIVE EQUIPMENT:**

IT IS SUGGESTED THAT A SOURCE OF CLEAN WATER BE AVAILABLE IN THE WORK AREA FOR FLUSHING EYES AND SKIN. IMPERVIOUS CLOTHING SHOULD BE WORN AS NEEDED.

**SECTION V - REACTIVITY DATA****STABILITY:**

STABLE UNDER NORMAL CONDITIONS OF STORAGE AND HANDLING.

**CONDITIONS TO AVOID (STABILITY):**

AVOID ALL POSSIBLE SOURCES OF IGNITION (SEE SECTIONS VII AND VIII).

Product Name : METHANOL  
Product Code N : 15030

Issue Date: 12/01/89

### SECTION V - REACTIVITY DATA

#### INCOMPATIBILITY MATERIALS TO AVOID:

AVOID CONTACT WITH STRONG OXIDIZERS AND STRONG ACIDS AND BASES.

#### HAZARDOUS DECOMPOSITION PRODUCTS:

COMBUSTION MAY YIELD CARBON MONOXIDE AND/OR CARBON DIOXIDE. DO NOT BREATHE SMOKE OR FUMES. WEAR APPROPRIATE PROTECTIVE EQUIPMENT.

#### HAZARDOUS POLYMERIZATION:

WILL NOT OCCUR

#### POLYMERIZATION CONDITIONS TO AVOID:

NONE KNOWN

### SECTION VI - SPILL AND LEAK PROCEDURES

\*\*\*HIGHWAY OR RAILWAY SPILLS\*\*\*

Call CHEMTREC (800) 424-9300 Cont. U.S.

(Collect) (202) 483-7616 from Alaska & Hawaii

#### PRECAUTIONS IN CASE OF RELEASE OR SPILL:

FLAMMABLE. KEEP ALL SOURCES OF IGNITION AND HOT METAL SURFACES AWAY FROM SPILL/RELEASE. STAY UPWIND AND AWAY FROM SPILL/RELEASE. ISOLATE HAZARD AREA AND LIMIT ENTRY TO EMERGENCY CREW. STOP SPILL/RELEASE IF IT CAN BE DONE WITHOUT RISK. WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION IV). PREVENT SPILLED MATERIAL FROM ENTERING SEWERS, STORM DRAINS, OTHER UNAUTHORIZED TREATMENT DRAINAGE SYSTEMS AND NATURAL WATERWAYS. DIKE FAR AHEAD OF SPILL FOR LATER RECOVERY OR DISPOSAL. SPILLED MATERIAL MAY BE ABSORBED INTO AN APPROPRIATE ABSORBENT MATERIAL. NOTIFY FIRE AUTHORITIES AND APPROPRIATE FEDERAL, STATE AND LOCAL AGENCIES. IMMEDIATE CLEANUP OF ANY SPILL IS RECOMMENDED. IF SPILL IN EXCESS OF EPA REPORTABLE QUANTITY IS MADE INTO THE ENVIRONMENT, IMMEDIATELY NOTIFY THE NATIONAL RESPONSE CENTER (PHONE NUMBER 800-424-8802).

#### EPA REPORTABLE QUANTITY:

METHANOL 5,000 lbs., EQUIVALENT TO 5,000 lbs. OF THIS PRODUCT.

#### WASTE DISPOSAL METHOD:

DISPOSE OF PRODUCT IN ACCORDANCE WITH LOCAL, COUNTY, STATE, AND FEDERAL REGULATIONS.

### SECTION VII - STORAGE AND SPECIAL PRECAUTIONS

#### HANDLING AND STORAGE PRECAUTIONS:

KEEP CONTAINER(S) TIGHTLY CLOSED. USE AND STORE THIS MATERIAL IN COOL, DRY, WELL VENTILATED AREAS AWAY FROM HEAT, DIRECT SUNLIGHT, HOT METAL SURFACES AND ALL SOURCES OF IGNITION. POST AREA "NO SMOKING OR OPEN FLAME." BOND AND GROUND ALL EQUIPMENT WHEN TRANSFERRING FROM ONE VESSEL TO ANOTHER. STORE ONLY IN APPROVED CONTAINERS. KEEP AWAY FROM INCOMPATIBLE MATERIALS (SEE SECTION V). PROTECT CONTAINER(S) AGAINST PHYSICAL DAMAGE. THE USE OF EXPLOSION-PROOF EQUIPMENT IS RECOMMENDED AND MAY BE REQUIRED (SEE APPROPRIATE FIRE CODES). DO NOT ENTER CONFINED SPACES SUCH AS TANKS OR PITS WITHOUT FOLLOWING PROPER ENTRY PROCEDURES SUCH AS ASTM D-4276. OUTDOOR OR DETACHED STORAGE IS PREFERRED. INDOOR STORAGE SHOULD MEET OSHA STANDARDS AND APPROPRIATE FIRE CODES. THE USE OF RESPIRATORY PROTECTION IS ADVISED WHEN CONCENTRATIONS EXCEED THE ESTABLISHED EXPOSURE LIMITS (SEE SECTIONS I AND IV). WASH THOROUGHLY AFTER HANDLING. DO NOT WEAR CONTAMINATED CLOTHING OR SHOES. USE GOOD PERSONAL HYGIENE PRACTICE. "EMPTY" CONTAINERS RETAIN RESIDUE (LIQUID AND/OR VAPOR) AND CAN BE DANGEROUS. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. "EMPTY" DRUMS SHOULD BE COMPLETELY DRAINED, PROPERLY BUNGED AND PROMPTLY SHIPPED TO THE SUPPLIER OR A DRUM RECONDITIONER. ALL OTHER

Product Name: METHANOL  
 Product Code N: 15030

Page 5  
 Issue Date: 12/01/89

**SECTION VII - STORAGE AND SPECIAL PRECAUTIONS**

CONTAINERS SHOULD BE DISPOSED OF IN AN ENVIRONMENTALLY SAFE MANNER AND IN ACCORDANCE WITH GOVERNMENTAL REGULATIONS. BEFORE WORKING ON OR IN TANKS WHICH CONTAIN OR HAVE CONTAINED THIS PRODUCT, REFER TO OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS, ANSI Z49.1, AND OTHER GOVERNMENTAL AND INDUSTRIAL REFERENCES PERTAINING TO CLEANING, REPAIRING, WELDING, OR OTHER CONTEMPLATED OPERATIONS.

**SECTION VIII - FIRE AND EXPLOSION HAZARD DATA**

NFPA HAZARD CLASS	HEALTH HAZARD:	1	HAZARD RANKING 0 - LEAST 1 - SLIGHT 2 - MODERATE 3 - HIGH 4 - EXTREME * - CHRONIC HEALTH EFFECTS	FLASH POINT  52 F (TCC)
	FLAMMABILITY:	3		
	REACTIVITY:	0		
	OTHER:			
HMIS HAZARD CLASS	HEALTH HAZARD:	2*		
	FLAMMABILITY:	3		
	REACTIVITY:	0		
	PPE:			

LOWER EXPLOSIVE LIMIT (% VOL.)UPPER EXPLOSIVE LIMIT (% VOL.)

7.3

36.0

**EXTINGUISHING MEDIA:**

DRY CHEMICAL, CARBON DIOXIDE, HALON, POLAR OR ALCOHOL FOAM, OR WATER SPRAY IS RECOMMENDED. WATER MAY BE INEFFECTIVE.

**UNUSUAL FIRE & EXPLOSION HAZARDS:**

THIS MATERIAL IS FLAMMABLE AND MAY BE IGNITED BY HEAT, SPARKS, FLAME OR OTHER SOURCES OF IGNITION (e.g. STATIC ELECTRICITY, PILOT LIGHTS, MECHANICAL/ELECTRICAL EQUIPMENT). VAPORS MAY TRAVEL CONSIDERABLE DISTANCES TO A SOURCE OF IGNITION WHERE THEY MAY IGNITE, FLASHBACK OR EXPLODE. VAPOR/AIR EXPLOSION HAZARD INDOORS/OUTDOORS OR IN SEWERS. VAPORS ARE HEAVIER THAN AIR AND MAY ACCUMULATE IN LOW AREAS. IF CONTAINER IS NOT PROPERLY COOLED, IT MAY EXPLODE IN THE HEAT OF A FIRE.

**SPECIAL FIRE FIGHTING PROCEDURES:**

WEAR APPROPRIATE PROTECTIVE EQUIPMENT INCLUDING RESPIRATORY PROTECTION AS CONDITIONS WARRANT (SEE SECTION IV). STOP SPILL/RELEASE IF IT CAN BE DONE WITHOUT RISK. MOVE UNDAMAGED CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. WATER SPRAY MAY BE USEFUL IN MINIMIZING OR DISPERSING VAPORS AND COOLING EQUIPMENT EXPOSED TO HEAT AND FLAME. AVOID SPREADING BURNING LIQUID WITH WATER USED FOR COOLING PURPOSES.

**SECTION IX - PHYSICAL DATA**

\*\*\*UNLESS OTHERWISE NOTED, VALUES ARE AT  
 20 C/68 F AND 760 mm Hg/1 atm.

<u>APPROX BOILING POINT</u>	(AIR - 1) <u>VAPOR DENSITY</u>	(N-BUTYL ACETATE - 1) <u>EVAPORATION RATE</u>	<u>% VOLATILE</u>
148 F	1.1	3.50	100
<u>% SOLUBILITY IN WATER</u>	<u>VAPOR PRESSURE (mm Hg)</u>		
100	96		
<u>SPECIFIC GRAVITY</u>	<u>APPROX. BULK DENSITY (lb/gal)</u>		
0.792 (60 F/60 F)	6.6 (60 F)		

Product Name: METHANOL  
Product Code N : 15030

Issue Date: 12/01/89

**SECTION IX - PHYSICAL DATA****APPEARANCE**

CLEAR, LITTLE IF ANY COLOR, LIQUID

**ODOR**

CHARACTERISTIC

**SECTION X - PRECAUTIONARY WARNING**

WARNING! FLAMMABLE. HARMFUL IF SWALLOWED. MAY CAUSE BLINDNESS IF SWALLOWED. CANNOT BE MADE NONPOISONOUS. KEEP AWAY FROM HEAT, SPARKS, FLAMES OR OTHER SOURCES OF IGNITION (E.G., STATIC ELECTRICITY, PILOT LIGHTS OR MECHANICAL/ELECTRICAL EQUIPMENT). DO NOT TASTE OR SWALLOW. WASH THOROUGHLY AFTER HANDLING. \*\*POISON\*\* CALL A PHYSICIAN. FIRST AID: IF SWALLOWED, AND VICTIM IS CONSCIOUS AND ALERT, INDUCE VOMITING, PREFERABLY BY GIVING SYRUP OF IPECAC, OR BY GENTLY PLACING TWO FINGERS IN THE BACK OF THE THROAT. IF VICTIM IS UNCONSCIOUS, DO NOT GIVE ANYTHING BY MOUTH. CALL A PHYSICIAN. IN CASE OF CONTACT, FLUSH EYES OR SKIN WITH PLENTY OF WATER. \*\* SKULL AND CROSSBONES

**SECTION XI - DOCUMENTARY INFORMATION**

ISSUE DATE: 12/01/89    PRODUCT CODE NO. 15030  
PREV. DATE: 03/21/89    PREV. PROD. CODE NO. 5030  
MSDS NO: 6276            PREV. MSDS NO: 810

**DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES**

The information in this document is believed to be correct as of the date issued. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THIS INFORMATION, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. This information and product are furnished on the condition that the person receiving them shall make his own determination as to the suitability of the product for his particular purpose and on the condition that he assume the risk of his use thereof.

Product Name: METHANOL  
Product Code No: 15030

Issu Date: 12/01/89

FOR FURTHER INFORMATION, CONTACT YOUR LOCAL SALES OFFICE

ATLANTA	(404) 934-0343 (800) 633-2362	LOS ANGELES	(714) 228-4700
BALTIMORE (Outside MD)	(301) 355-2737 (800) 638-7676	MIAMI (FL Only) (FL Only)	(305) 634-2411 (800) 621-3841 (800) 282-0537
BIRMINGHAM (Outside AL) (Inside AL)	(205) 995-9776 (800) 328-1611 (800) 328-1610	NASHVILLE (TN Only)	(615) 320-5474 (800) 325-7685
CHARLOTTE (NC Only) (SC, GA, VA)	(704) 588-2633 (800) 532-6103 (800) 438-2968	NY/NJ (NY Only)	(201) 574-9890 (800) 526-4376
CHICAGO	(312) 257-9300	PHILADELPHIA CONSHOHOCKEN	(215) 753-1903 (215) 828-1010
CINCINNATI	(513) 422-0176	NEW ENGLAND	(401) 438-7240 (800) 523-0725
CLEVELAND	(216) 425-4600	SAN FRANCISCO/ OAKLAND AREA	(415) 562-1976
DALLAS/FT. WRTH	(214) 298-8233	TWIN CITIES	(612) 227-8020
DETROIT	(313) 772-0870	WICHITA	(316) 838-3335
HOUSTON	(713) 643-3517		
KANSAS CITY	(816) 231-7600		

\*\*\*\*\* THIS IS THE LAST PAGE \*\*\*\*\*

\*\*\*\*\* THIS IS THE LAST PAGE \*\*\*\*\*

\*\*\*\*\* THIS IS THE LAST PAGE \*\*\*\*\*

## SECTION 6.0

### QUALITY ASSURANCE/QUALITY CONTROL PLAN

#### 6.1 Purpose

The purpose of this Quality Assurance/Quality Control Plan (QA/QC) is to define standard field practices for the Brunswick NAS-NEX Remedial Investigation POA so that reliable data collection and analyses are ensured. The enclosed sampling program is based upon currently accepted EPA standards for assessing potential ground water and soil contamination problems.

The following EPA Guidance Documents were consulted:

1. Superfund Data Quality Objectives for Remedial Response Activities; Development Process, March 1987 (VOL I).
2. RCRA Ground Water Monitoring Technical Enforcement Guidance Document, September, 1986.

The tasks defined under this Standard Operating Procedures Plan (SOP) include:

- soil gas survey;
- drilling activities;
- pre-monitoring well sampling activities;
- monitoring well evacuation and sampling activities;
- QA/QC samples; and,
- other QA/QC protocols.

The primary use for the data collected during this investigation will be site characterization. The existing concentrations of any contaminants found will be compared to selected Federal and State Applicable or Relevant and Appropriate Requirements (ARARs).

## 6.2 Soil Gas Sampling

A Black and Decker Macho II Rotary Hammer with a nominal one-inch diameter, three-foot long, carbide screw bit will be used to advance a small boring. Nominal one-inch diameter, four-foot long, open-ended, PVC casing with perforations in the bottom foot will be inserted into the boring. The PVC casing is fitted with a brass opening-reduction fitting on the above-ground end. Teflon tubing is attached to the end and acts as the sampling port for a total organics photo-ionization detector (PID). Both peak and stable readings will be recorded. The PVC casings are dedicated to a particular sampling location until they are decontaminated.

## 6.3 Drilling Activities

### Drilling And Well Construction

ERM will supervise the installation of all borings and monitoring wells and ensure that all wells are constructed in compliance with EPA protocols. Borings will generally consist of 6-8 inch holes in which 1 3/8 inch inner diameter split-spoon samples will be taken. Wells will be drilled primarily using the auger and/or drive and wash techniques. The drilling contractor, at his option and with ERM approval, may employ drilling methods involving uncased wall-supported holes or use of hollow stem augers or any combination of these methods, provided he can also perform split tube sampling as required. No unsupported hole methods will be used. Field boring logs will be used to record all data obtained during drilling.

During well installation, detailed logs will be maintained by an experienced geologist and documented in the field log books. The borehole and all soil samples will be field screened with an OVM photoionization detector (PID) to measure for volatile organic compounds (VOCs). Representative samples from all split spoons will be placed in capped and aluminum foil sealed jars for head space analyses at a later date. See the following section for details on split spoon sampling and headspace analysis.

Upon completion of each boring to the desired depth, a 4 inch inner diameter PVC well will be installed in the boring. The well will include 10-15 feet of machine slotted PVC well screen conforming to ASTM schedule 40; the remainder will be solid PVC riser. All PVC and slotted casing will be clean, flush joint and have threaded couplings. For all water table monitoring wells, the well screens will be placed so that the screens intersect the water table, thereby allowing for seasonal fluctuations in the water table and for detection of any floating contaminants.

A clean, silica sand pack will be set around the screen extending from the base of the boring (at least one foot below the well screen) to a level two feet above the top of the screened section. A minimum three-foot thick layer of bentonite pellets will then be set. A bentonite/portland cement grout will be placed above the bentonite well seal up to a level two feet below ground level.

#### Protective Cover

The wells will be finished with a three foot concrete surface seal and a flush mounted road box such that the concrete collar extends from the road box in all directions. The cap of the road box will be secured by a brass bolt and the PVC casing with a locking cap. All well construction details will be included in the drilling logs (an example is attached).

Wells will be developed by pumping until the discharge is free of sediment, and the pH and conductivity measurements of the discharge have stabilized. Soils from drilling, and water removed from the wells will be collected into 55-gallon drums for interim storage pending analytical results. Based on those results, the materials will be disposed of properly.

The well locations, ground elevations, and top of PVC casing will be surveyed by a registered surveying firm and located on a base map. Horizontal well locations will be surveyed to an accuracy of +/- 1.0 foot and referenced to the Maine State Grid. Top of casing elevations will be surveyed to an accuracy of +/- 0.01 foot and referenced to MSL. The well number will be stamped on the lip of the road box, visible with the cap on.

The top of casing measuring point will be clearly marked on the inner lip of the road box. Ground-water level data from all wells will be used to prepare water table contour maps and determine hydraulic gradients and ground-water flow directions.

### Split Spoon Sampling And Decontamination

Split spoon soil samples will be collected according to ASTM techniques using a 1 3/8 inch inner diameter split tube sampler. Two-foot long samples will be collected continuously to the water table and then at lithology changes, five foot intervals, or at the discretion of the on-site geologist. The sampler will be driven into the ground using a 140 pound hammer dropped from a height of 30 inches until either 24 inches have been penetrated or 100 blows have been applied in any six inch section. The number of blow counts for each six inch interval will be recorded on the well log.

Upon extraction of the sampler from the borehole, the sampler will be broken open and screened with a PID. A visual inspection and classification will be performed on the sample and a geological description will be recorded on the well log. The length of the recovered sample will be recorded before portions of the soil are used to fill laboratory containers for later analysis. Soil samples for TPH analysis will be collected in wide mouth pre-cleaned glass jars supplied by the laboratory, cooled to 4 degrees celsius, and analyzed within 28 days. The portion of the sample which is not held for laboratory analysis will be collected in glass jars, covered with aluminum foil, and capped. The jar will be labeled with the:

- job number;
- boring number;
- sampling interval;
- blow counts; and
- date.

The jar sample will be allowed to equilibrate to room temperature for at least ten minutes. The sample will be vigorously shaken for 15 seconds both at the beginning and end of the headspace development period and then opened while leaving the foil cover on top. The end of a PID meter will be forced through the foil to collect a headspace reading. Both stable and peak readings will be recorded.

The sample from each boring which is closest to the water table will be sent to the laboratory for analysis of total petroleum hydrocarbons (TPH) by infrared methods (IR) EPA Method 5520.

The split spoon samplers will be decontaminated using a system consisting of:

- an initialalconox and water wash;
- a secondary fresh water wash;
- a tertiary methanol rinse; and
- a final distilled water rinse.

#### 6.4 Pre-Monitoring Well Sampling Activities

##### Well Maintenance Check

Prior to each sampling event, ERM personnel will routinely inspect the condition of each monitoring well to ensure that the protective casing, lock, cover and surface seal remain intact. Observations regarding these inspections will be recorded in the site field data book. This record will include well number, condition, date, and time of observation.

##### Health And Safety Air Monitoring

An air purifying respirator (half-face) will be required if benzene concentrations reach or exceed 1 ppm in the breathing space. A full-face air purifying respirator will be required if benzene concentrations reach or exceed 10 ppm in the breathing space. Air supplied respirators will be required if benzene concentrations exceed 50 ppm in the worker breathing

zone. A PID probe will be held over the well casing after the initial uncapping to make this determination. All readings, including non-detectable, will be recorded in the field data book. All field activities will be conducted under appropriate OSHA regulations and guidelines and the site-specific health and safety plan (see Section 5.0).

### Water Level Measurements

ERM will gauge each well with an optical interface probe to determine depth to water in each well and the presence or absence of floating chemicals. The measuring device will be lowered into the well until water has been reached. The probe will be raised and then lowered a second time to check the accuracy of the first measurement. The cable will be held against the side of the inner protective well casing at the designated measuring point, and the depth measurement recorded to the nearest 0.01 feet. Any water level corrections due to floating product will be made.

The measuring device will then be raised out of the well and decontaminated by rinsing first with distilled water, then with methanol, and again with distilled water.

Water levels will be measured from the top of the PVC casing at the designated measuring point and recorded on a Monitoring Well Data Sheet, along with the date and time of reading and observers initials.

### 6.5 Monitoring Well Evacuation And Sampling

Each well will be purged by pumping until at least three well volumes have been removed. All purging, field monitoring and sampling activities will be conducted so that the entire purging area is protected from contamination. All necessary purging and sampling apparatus will be contained so that the potential for cross contamination of samples is mitigated. Field personnel will wear dedicated latex or vinyl gloves when handling sampling equipment and sample containers.

During the purging activity, the specific electrical conductance will be measured using a YSI Field Meter and analysis of pH and temperature will also be conducted using an Orion Research Model SA 250 Meter. Instrument probes will be decontaminated by wiping and rinsing with methanol followed by tap and distilled water rinses. Liquids generated by sampling and decontamination will be held in properly labelled drums and disposed of by a licensed, certified hazardous water contractor. The pH instrumentation will be standardized before and after the sampling event and will be decontaminated as above.

After the well has been purged, samples will be collected by lowering the PVC bailer until it intersects the water table. The sample will then be raised and a volume of water will be poured sufficient to fill two 40 ml glass VOA vials and one 1-liter amber glass bottle. VOA vials will be slowly filled with a minimum of turbulence and allowed to overflow before capping to eliminate all headspace and reduce potential loss of VOCs. One ground-water sample from each well will be sent to the laboratory for analysis of VOCs by EPA Method 602 and TPH by IR.

The well will not be purged and no water samples will be collected if petroleum product (non-aqueous phase liquid) is detected at the water table. The thickness of petroleum in the well will be recorded in the site field data book.

Once each well has been sampled, all well-specific materials will be disposed of in a large plastic garbage bag and placed in the field vehicle for disposal at the end of the day. These include the plastic protective flooring, nylon line, gloves, spent respirator cartridges if applicable, rags and other refuse materials.

## 6.6 Quality Assurance/Quality Control Samples

### Duplicates

One duplicate ground-water sample will be collected. This "blind" duplicate sample will be labeled so that the laboratory will not be able to

distinguish between it and any other samples. The duplicate will be split evenly from the same bailer load to the extent possible. Duplicate sample data will be recorded in the field data book along with all of the other samples.

In addition, the laboratory will split one soil sample collected for TPH and perform one duplicate analysis.

#### Equipment Blank

This sample will consist of deionized water that has contacted all instrument probes which have been previously decontaminated as described above. This water will then be placed into a set of laboratory prepared sample containers and analyzed for VOCs and TPH. The equipment blank will serve as a check on both the effectiveness of the instrument probe decontamination procedures and on potential contaminants associated with the sample containers. It should be noted that an additional "field blank" is not required since dedicated sampling equipment will be used.

#### Trip Blank

One trip blank will be prepared by the laboratory, and it will accompany the field personnel from the office, to the site, to each sampling point and then back to the laboratory. The trip blank will be analyzed to determine if contamination may have occurred during sample handling, transportation, storage and/or shipping procedures.

### 6.7 Other QA/OC Protocols

#### Sample Handling

All samples will be sealed, stored in a cooler on ice and sent by overnight delivery to the laboratory so they will be received within 24 hours of the sampling event.

The contract laboratory will provide all bottles in a "ready to use" state. There will be no field preservation occurring throughout this sampling event.

### Sample Labels

Sample labels will be placed on all samples just prior to sampling, and will include the following information:

- date and time of collection;
- sample location;
- sample number;
- analysis requested;
- name of sampler;
- preservative; and,
- number of containers (i.e., 1 of 2).

### Documentation

The field log book and field data sheets used during the sampling procedure will include the following minimum information:

- sampling location;
- air monitoring readings;
- monitoring well maintenance information;
- total well depth;
- pH and conductivity readings;
- depth to water;
- well volume calculation;
- well evacuation procedure;
- sample identification (location, number);
- date and time;
- preservative; and,
- general field information (weather, unanticipated events such as breakage).

### Chain Of Custody

A chain-of-custody form (attached) will be completed after the sample collection and field log entries have been completed. The chain-of-custody form will be relinquished by the field staff at an overnight delivery office. At the time of delivery, the contract laboratory will sign in the samples by signing the chain-of-custody and telephone ERM to confirm their arrival. The chain-of-custody forms will include the following information:

- sample number;
- sample identification;
- date and time of collection;
- sample type (ground water, soil);
- sample location;
- number of containers;
- parameters requested for analysis;
- dates of possession; and,
- signature of all individuals involved in chain of possession.

### Analytical Parameters

Maximum permissible holding times and detection limits for the Maine DEP analytical methods to be used will be forwarded when they are received from the Maine DEP. Data for EPA methods is included in the attached table. Protocol qualification limits are a function of sample specific matrix characteristics. The types of sample matrices anticipated at the site should not adversely effect qualification limits.

### Data Validation

Data validation will be conducted by project staff (list attached) experienced in chemical data review. Data will be evaluated with regard to holding times, required detection limits, precision, accuracy, reproducibility, comparability, and completeness. Any data not meeting required criteria will be qualified.

QA/QC Personnel

ERM Project Director

ERM Project Manager

ERM QA/QC Manager

\*Laboratory Project Manager

Laboratory QA/QC Manager

Byron Nickerson

Benjamin Frothingham

David Blye

Jim Roth

Scott McLean

\*Alpha Analytical Laboratory

8 Walkup Drive

Westborough, MA 01581

Contact: Scott McLean - Laboratory Director

**SECTION 6.0 ATTACHMENTS**

**Maine Certification Information**

Eight Walkup Drive  
Westborough, MA 01581-1019  
(508) 898-9220 FAX: (508) 898-9193



April 3, 1991

APR 5 1991

Mr. Charles Barker  
ERM - New England, Inc.  
205 Portland Street  
Boston, MA 02114

Dear Mr. Barker:

Per your request, below is an outline of the requirements Alpha met to successfully become certified in the State of Maine.

1. Applied for certification via Maines' application form.
2. Submitted State of Massachusetts certification.
3. Paid fee of \$50.00.
4. Submitted copy of Massachusetts on-site evaluation report.
5. Submitted the past two years of EPA WS performance evaluation reports.

Certification in the State of Maine is by reciprocity. If you have any further questions please call.

Sincerely,

A handwritten signature in cursive script, appearing to read "Scott McLean", is written over a horizontal line.

Scott McLean  
Laboratory Director

SM/mar

**Sample Boring Log**



**Sample Chain-of-Custody Form**

ERM- NEW ENGLAND, INC  
 205 Portland Street, Boston MA 02114  
 (617)742-8228 FAX (617)720-5742

**SAMPLE CHAIN OF CUSTODY**

Project #			Project Name			Number of Containers					Airbill #
Sampler			ERM Contact								Remarks
ERM Traffic Report	Date	Time	Comp or Grab (C or G)	Sample Matrix	Station Location						
Sample Relinquished by			Sample Received by			Date	Time	Reason for Transfer			

**TABLE 1  
SAMPLING PLAN  
BRUNSWICK NEX**

<u>Sample #</u>	<u>Matrix</u>	<u>Location</u>
98-65-01	Soil	Water Table MW-1
98-65-02	Soil	Water Table MW-2
98-65-03	Soil	Water Table MW-3
98-65-04	Soil	Water Table MW-4
98-65-05	Soil	Water Table MW-5
98-65-06	Water	Source Water
98-65-07	Water	MW-1
98-65-08	Water	MW-2
98-65-09	Water	MW-3
98-65-10	Water	MW-4
98-65-11	Water	MW-5
98-65-12	Water	Duplicate
98-65-13	Water	Equipment Blank
98-65-14	Water	Trip Blank
98-65-15	Water	Trip Blank
98-65-16	Water	Trip Blank

1. All water samples will be analyzed for the following compounds:  
 BTEX and MTBE by EPA Method 8020  
 Total Lead by EPA Method 7421  
 Gasoline by ME DEP Method 4.2.1  
 Fuel oil by ME DEP Method 4.1.1  
 TPH by EPA Method 418.1
2. All soil samples will be analyzed for the following compounds:  
 BTEX and MTBE by EPA Method 8020  
 Total Lead by EPA Method 7421  
 Gasoline by ME DEP Method 4.2.3  
 Fuel oil by ME DEP Method 4.1.2  
 TPH by EPA Method 418.1

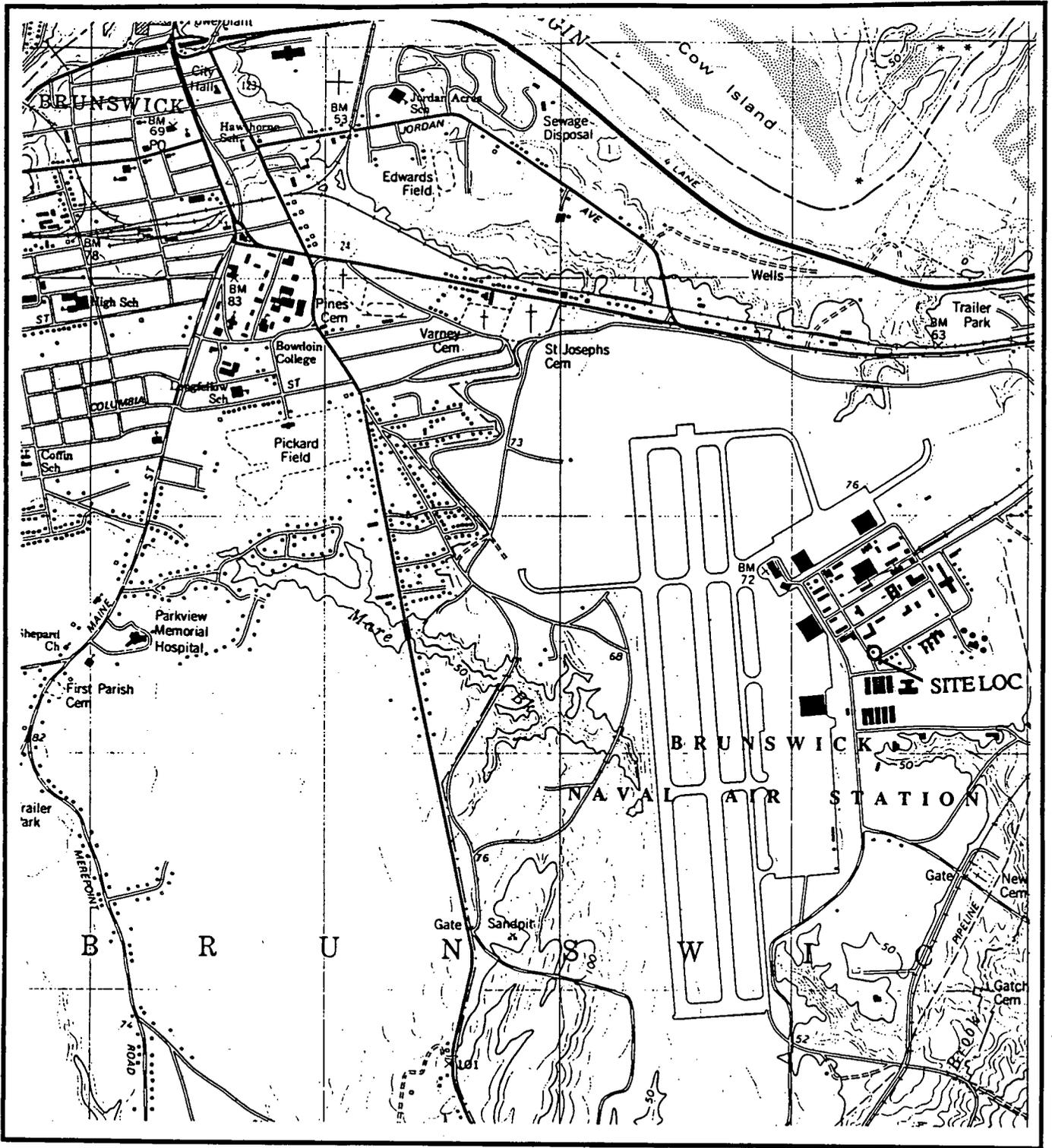
Note: Sample preparation will be completed by the laboratory using the appropriate preparation method for each analytical method.

TABLE 2

Analytical Parameters

<u>EPA Method No.</u>	<u>Max Holding Time</u>	<u>IDL</u>	<u>MDL(ppm)*</u>
8020	14 days	5 ng absolute	0.0002 - 0.0004
418.1	28 days	0.1 mg/l	1.0
7421	6 mos.	NA	H2O = 0.002 Soil = 0.4
4.2.1	14 days	NA	0.05
4.2.3	14 days	NA	0.05
4.1.1	7 days	NA	0.1
4.1.2	7 days	NA	5

\* Practical Quantification Limits (PQL) vary with sample-specific matrix characteristics.



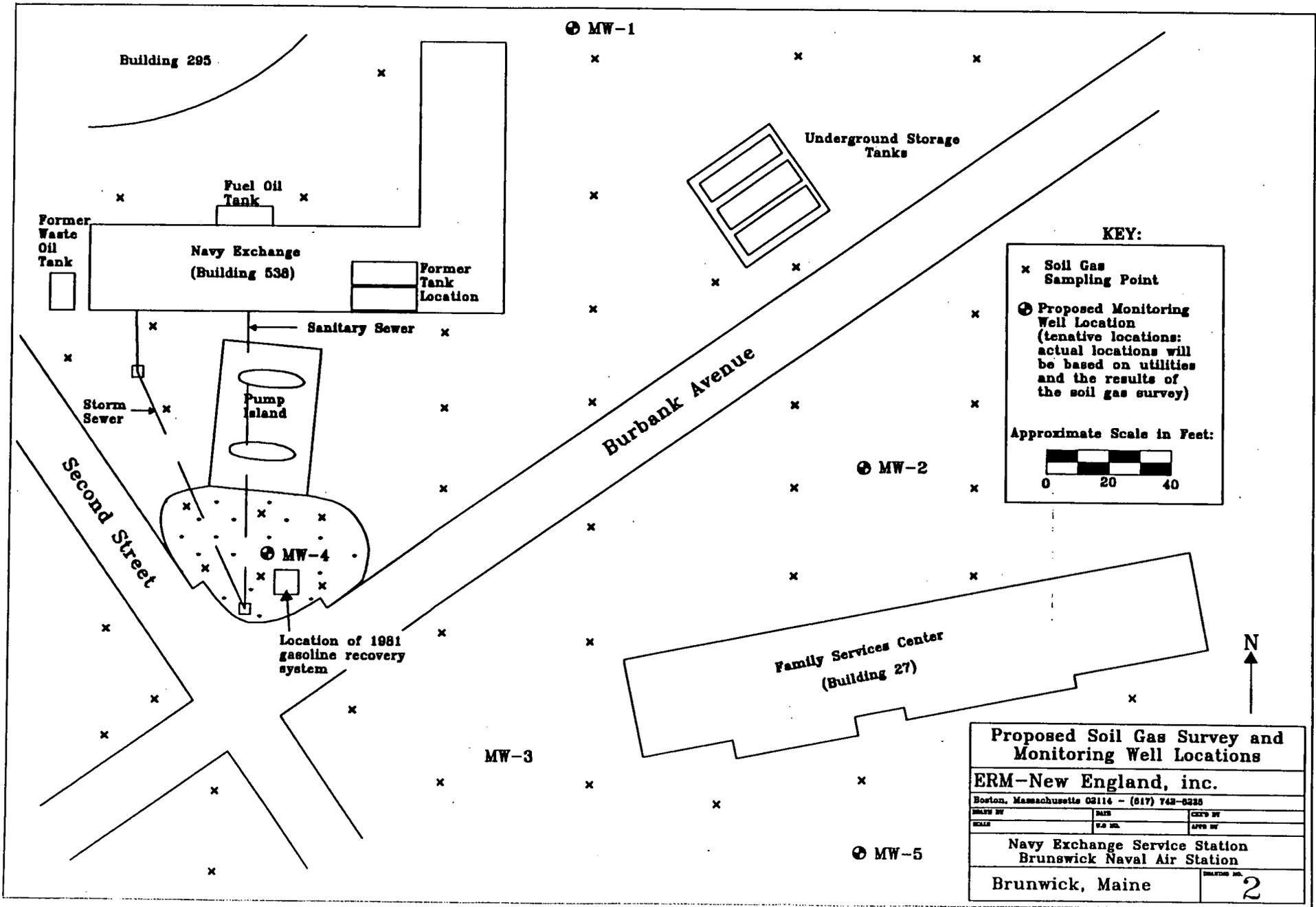
Source: USGS Topographic Map,  
Brunswick, ME, 1980

Scale 1:24,000



<b>ERM</b>	<b>Topographic Location Map</b>
New England	
<b>Brunswick Naval Air Station Brunswick, Maine</b>	
Figure 1	Feb. 1991

44 pts



**KEY:**

- x Soil Gas Sampling Point
- ⊕ Proposed Monitoring Well Location (tentative locations: actual locations will be based on utilities and the results of the soil gas survey)

Approximate Scale in Feet:

<b>Proposed Soil Gas Survey and Monitoring Well Locations</b>		
<b>ERM-New England, inc.</b>		
Boston, Massachusetts 02114 - (617) 743-8235		
DATE BY	DATE	CHECK BY
SCALE	S.D. NO.	APPRO BY
Navy Exchange Service Station Brunswick Naval Air Station		
Brunswick, Maine		DRAWING NO. <b>2</b>

**FIGURE 3**  
**PROJECT STAFFING**

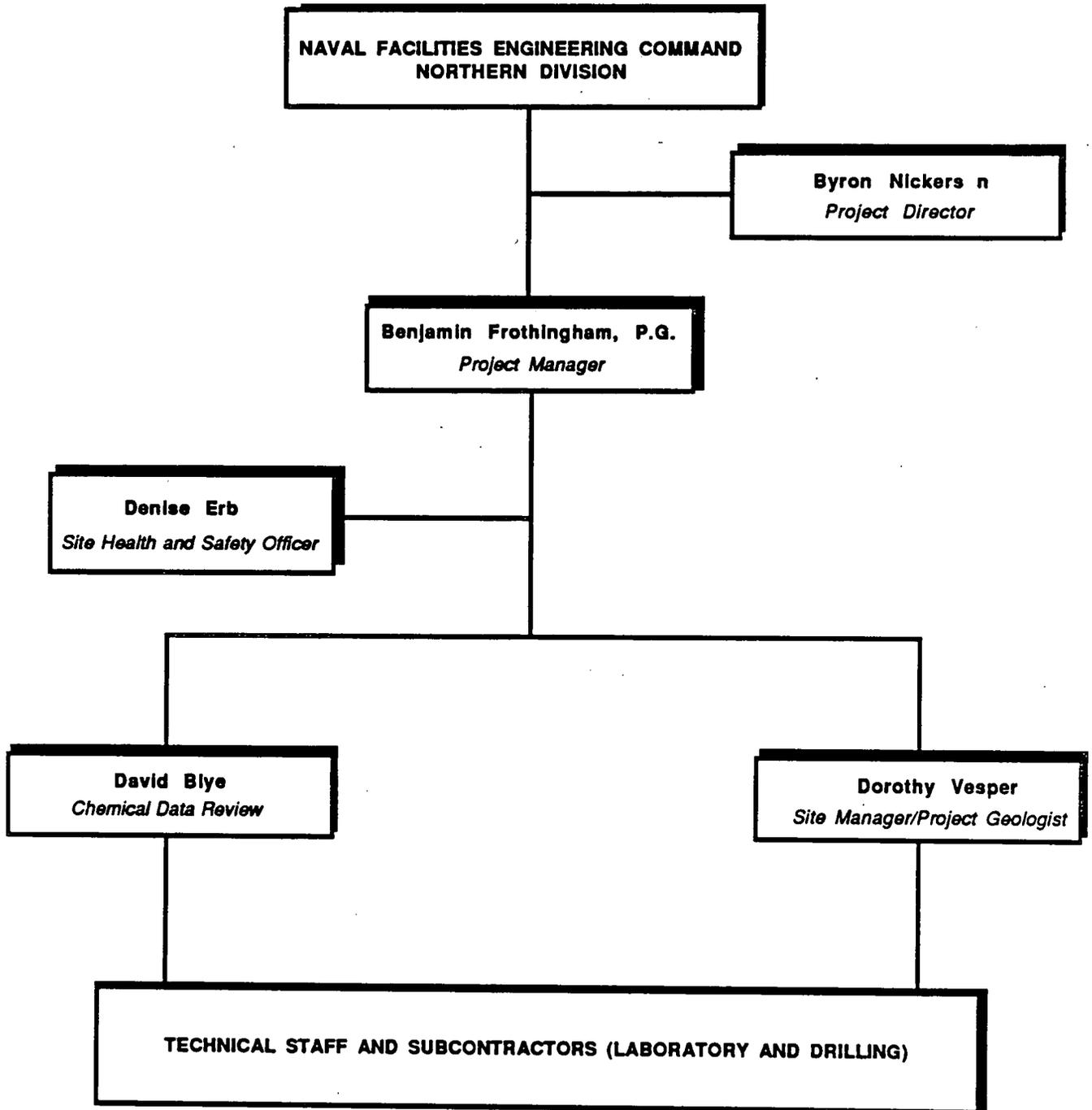
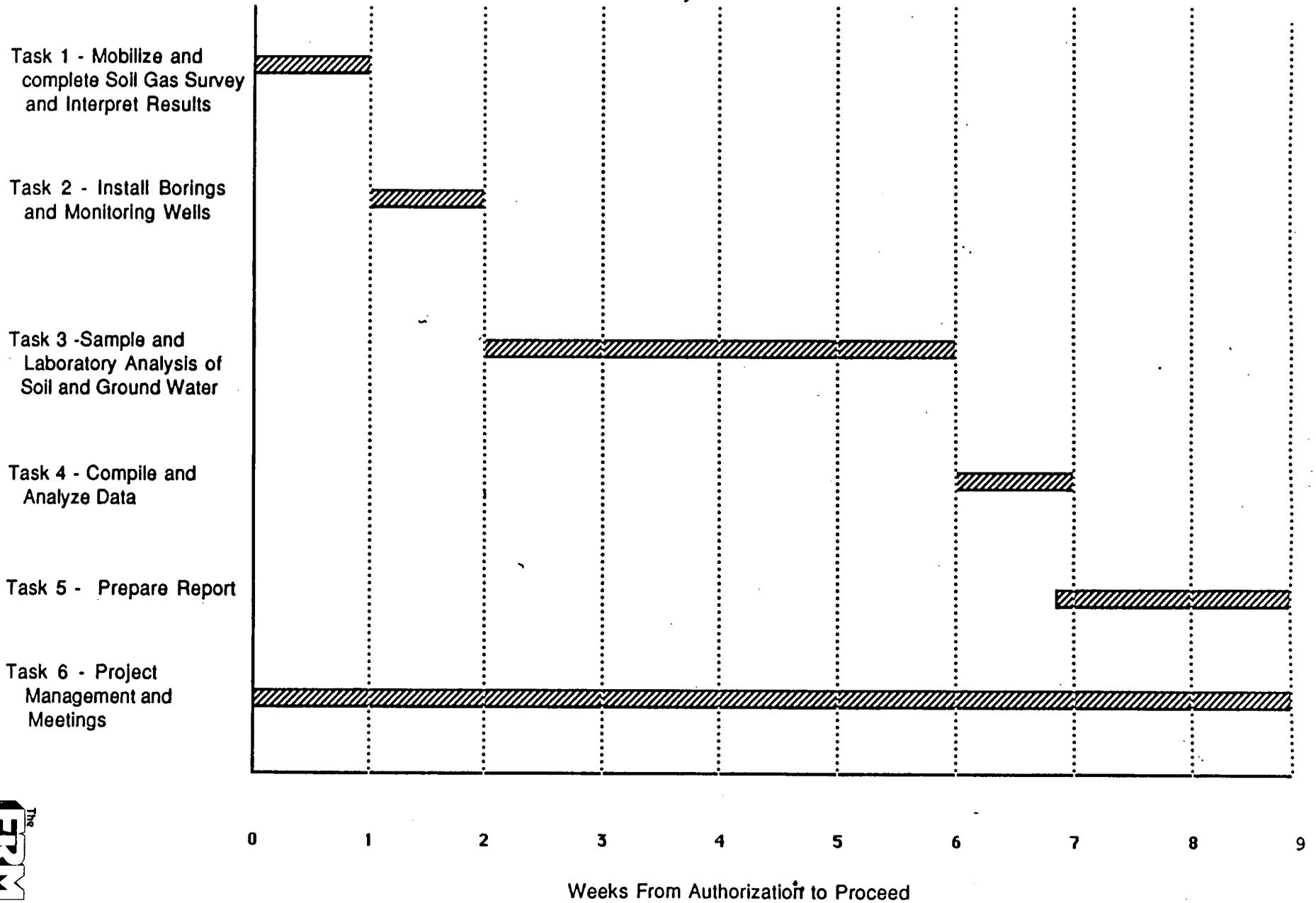


FIGURE 4  
Estimated Project Schedule



**APPENDIX A**

**MAINE DEP ANALYSIS METHODOLOGIES**

# DRAFT

Quality Assurance File

Larry Boston

Analysis of soil for residues of fuel oil (DEP-LOP # )

ME DEP # 4.1.2

- I. Scope and Application:
- II. Summary of Method:
- III. Summary of Collection:
- IV. Apparatus:
- V. Reagents:
- VI. Procedure:
  1. Weigh 10g of soil into a 250 ml beaker using muffled metal spatula. Add 50 ml methylene chloride.
  2. Add 50g sodium sulfate (muffled at 550° C overnight) in 4 steps, breaking up clumps and mixing well after each addition. Let sample stand (to absorb water) 10 minutes between additions and 30 minutes after the last addition. Use a second spatula, if necessary, to remove soil from first spatula.
  3. Prepare a blank using 50g of Na<sub>2</sub>SO<sub>4</sub>.
  4. Mix the sample well and transfer the soil plus Na<sub>2</sub>SO<sub>4</sub> to a soxhlet extraction thimble held in a 400ml beaker.
  5. Place the extraction thimble in the soxhlet apparatus and connect it to a clean, muffled 500ml rotovap flask.
  6. Rinse the beakers and spatula(s) 3 times (125ml, 125ml, 100ml) with MeCl<sub>2</sub> into the soxhlet tube (transfer from 250ml beaker to 400ml beaker to soxhlet). Transfer the MeCl<sub>2</sub> to the soxhlet in small aliquots, never allowing the MeCl<sub>2</sub> to spill out over the top of the extraction thimble.
  7. Cover the soxhlet with its condenser.
  8. Turn on the cold water at a medium speed.
  9. Turn on the heat and adjust so that the soxhlet drains every 5 minutes.

1/3/91

Quality Assurance File

Larry Boston

Analysis of soil for residues of fuel oil (DEP-LOP #

)

VI. Procedure:

10. Extract for at least 16 hours.
11. Turn off the heat and allow the samples to cool to room temp. (approximately 1 hour).
12. Remove condensers from the soxhlets.
13. Siphon the remaining  $\text{MeCl}_2$  in the soxhlet to the rotovap flask. Let stand 10-15 minutes. Pour the remaining  $\text{MeCl}_2$  into the rotovap flask.
14. Concentrate the solvent at  $50^\circ \text{C}$  to approximately 5-8ml using a rotary evaporator.
15. Transfer it to a calibrated centrifuge tube with teflon lined screw cap..
16. Rinse flask 3 times with approximately 1.5ml of  $\text{MeCl}_2$  each rinse.
17. Transfer these 3 rinses to the same calibrated centrifuge tube and reduce the volume to 1ml under a stream of nitrogen.
18. Inject a 5 microliter aliquot of the concentrate into the gas chromatograph.

Analysis of water for residues of fuel oil (DEP-LOP #3.3.1.2, p 33)  
ME DEP # 4.1.1

I. Scope and Application:

1. This method includes the measurement of hydrocarbons extractable from water with methylene chloride. It is applicable to the determination of relatively non-volatile hydrocarbons, such as those found in fuel oils and higher boiling point petroleum distillates.
2. Light petroleum products with boiling points below 150° are completely or partially lost in the solvent removal operation.
3. The presence of coextracted material such as plant and animal fats and waxes, and phthalate ester plasticizers can interfere in the analysis. A blank must be analyzed with each set of samples.

II. Summary of Method:

1. The water sample is sequentially extracted with <sup>two</sup> ~~three~~ sixty mL aliquots of methylene chloride. The solvent is concentrated to 1 mL and then analyzed by capillary column gas chromatography with flame ionization detection. The total detector response of the sample is compared to that of a reference sample of fuel oil.

III: Summary of Collection:

1. Samples must be collected in one liter amber glass bottles which have been precleaned by washing in soap and water and then baked for at least one hour at 400°C. The bottle cap will have a precleaned teflon liner.
2. Samples must be stored at 4°C and extracted within one week of collection. Sample extracts must be analyzed within four weeks of preparation.

IV. Apparatus:

1. Boiling flasks; 300 mL flat bottom borosilicate glass.
2. Separatory funnels; 2 liter with teflon stopcock and plug.
3. Rotary evaporator of Kuderna-Danish concentrator apparatus.
4. Gas Chromatograph:
  - a. Temperature programmed oven in the range of 40°-250°C.
  - b. Electronic integrator to record detector output.
  - c. Flame ionization detector.
  - d. Capillary chromatography column, Hewlett-Packard Ultra #1 (methyl silicone) bonded phase or equivalent, 25 m, .50 micron film, .33 mm I.D. Helium carrier gas, 5 mL/min.
5. Syringes; 10 microliter Hamilton or equivalent.

V. Reagents:

1. Methylene chloride, pesticide residue analysis grade or equivalent.

VI. Procedure:

1. Mark the water meniscus on the side of the sample bottle for later determination of the sample volume.
2. Transfer the entire water sample to a 2 liter separatory funnel.
3. Rinse the sample bottle with 60 mL methylene chloride and transfer to the separatory funnel.
4. Shake the funnel vigorously for two minutes, periodically releasing the pressure.
5. Return the funnel to the ring stand and allow the phases to separate for approximately ten minutes.
6. Drain the methylene chloride into a boiling flask, being careful not to include any of the water.
7. Repeat 3, 4, 5, 6, twice, using a total of 180 mL of solvent.
8. Concentrate the solvent to approximately 2-3 mL using a rotary evaporator.
9. Transfer to a calibrated centrifuge tube, rinse flask with three 2 mL portions of methylene chloride, and add to the centrifuge tube, reduce the volume in the tube to 1 mL under a stream of nitrogen.
10. Determine the original sample volume by refilling the sample bottle to the mark with water and transferring to a 1000 mL graduated cylinder. Record the sample volume to the nearest 5 mL.
11. Inject a 5.0 microliter aliquot of the concentrate into the GC.
12. Calculate the concentration in the sample as follows:

C(st) = concentration of the standard in ug/L (1000 mg/L=10<sup>6</sup>ug/L)

A(s) = total area of the sample from 2.5 minutes to end of run

A(b) = total area of sample blank from 2.5 minutes to end of run

A(B) = total area of solvent blank from 2.5 minutes to end of run

A(st) = total area of standard from 2.5 minutes to end of run

U(st) = volume of standard injected in microliters

U(s) = volume of sample injected in microliters

V(s) = volume of original sample in mL

V(c) = volume of concentrated sample in mL

C(s) = concentration of sample in ug/L

$$C(s) = \frac{A(s) - A(b)}{A(st) - A(B)} \times \frac{U(st)}{U(s)} \times \frac{V(c)}{V(s)} \times C(st)$$

VII: Gas Chromatograph instructions using HP 5880-A, capillary column GC/FID:

1. List the instrument conditions.
2. Check the tank pressures of the gases used in the analysis; carrier is He, H<sub>2</sub> and air zero are required for the flame ionization detector, N<sub>2</sub> is the detector make-up gas.
3. Increase the He flow at the bench-top regulator.
4. Light the detector; plot signal B, zero the baseline, list the zero, it should be around 5. Turn the air flow and the hydrogen flow control valves counterclockwise until they are fully opened. Depress the FID ignitor switch to ignite the flame; Then zero the baseline, and list the zero. If ignition was successful, the zero should be around 25.
5. Program the oven as follows;
  - a. oven temp initial value 40°C
  - b. oven temp initial time 2 min
  - c. oven temp program rate 8 degrees/min
  - d. oven temp final value 250°C
  - e. oven temp final time 10 min
6. Other instrument setpoints include attenuation 6, threshold 4. valve 5 is on, and valve 6 is on.
7. Run table includes the valve controls for the sample splitter;  
Run time 0.01 integrator off  
0.50 valve 5 and valve 6 off  
2.50 integrator on  
10.00 valve 5 and valve 6 on

Quality Assurance File

**DRAFT**

DEP

Larry Boston

DEP

Determination of gasoline in soils by static headspace analysis.  
DEP-LOP (3.3.1.1, p32)

*ME DEP # 4.2.3*

### I. Scope and Application

1. Gasoline is a complex mixture of aliphatic and aromatic hydrocarbons with boiling points ranging from 32°C to 210°C. This method measures these volatile constituents in soil and similar solid samples by analysis of the vapor phase which is in equilibrium with the soil sample to be analyzed.
2. Other volatile organic compounds may be present in the soil sample, therefore great care should be used when interpreting results.

### II. Summary of Method

1. A known weight of soil sample is introduced into a gas-tight septum vial in which a known headspace volume has been left over the soil. The vial is heated thereby concentrating the gasoline into the headspace where it can be sampled with a gas-tight syringe and injected onto a gas chromatographic column. The gas chromatograph is then temperature programmed for separation of the individual components of gasoline which are detected with a flame ionization detector. The total detector response of the soil sample is compared to that of an aqueous reference sample of gasoline.

### III. Sample Collection and Storage

1. Samples must be collected in 40 ml glass screw cap teflon-lined septum vials which have been pre-cleaned by washing in soap and water then rinsing three times with deionized water. The screw caps and septa are then baked for one hour at 105°C. The vials are baked for at least one hour at 400°C.
2. Samples must be stored at 4°C and analyzed within 14 days of collection.

#### IV. Aparatus Continued

5. Gas chromatographic column: 6 ft. by 2 mm I.D. borosilicate glass packed with 60/80 Carbopack B/1% SP 1000 (Supelco, Inc.)
6. Electronic integrator: Hewlett-Packard 5880 series GC terminal.
7. Tekmar Liquid Sample Concentrator Model LSC-2.
8. Tekmar Model ALS Automatic Laboratory Sampler (optional).
9. 5 ml Frit Sparge Sampler(s) for Model LSC-2/Model ALS.

#### V. Operating Conditions

1. For the Gas Chromatograph:
  - a. 6 ft. x 2 mm I.D. glass column
  - b. Packing - 60/80 Carbopack B/1% SP1000 (Supelco Inc.)
  - c. Carrier Gas - N<sub>2</sub>
  - d. Gas flow - 40 ml/min
  - e. Injection port temperature - 250°C
  - f. Detector temperature - 250°C
  - g. Oven temperature program - 75°C to 200°C at a rate of 8 degrees per minute with a 2.00 minute hold at 75°C and a 20.00 minute hold at 200°C.
2. For the Tekmar LSC-2:
  - a. Purge Time: 11 minutes
  - b. Purge Flow Rate: 30 ml/min
  - c. Purge Ready - (SP 1): 35°C
  - d. Desorb Ready - (SP 2): 50°C
  - e. Desorb Preheat - (SP 3): 140°C
  - f. Desorb Temp : (SP 4): 180°C
  - g. Desorb Time: 0.8 min.
  - h. Bake Temp (SP 5): 225° C
  - i. Bake Time: 20 min.
  - j. Purge Pressure: 20 psi
  - k. Trap: 0.010" wall thickness, 12" x 1/8"
  - l. Trap Material: Carbotrap 300 (Supelco)

#### VI. Reagents

1. Gasoline Reference Material
2. Organic free water for the blank. It is convenient to identify a source of untreated ground water for use as reagent water in the analysis. Municipal water supplies as a result of chlorination typically contain halomethanes which will interfere in the analysis. The use of groundwater which has been determined to contain no compounds chromatographing in the volatile range is recommended.

#### IV. Apparatus

1. Vials: 40 ml, borosilicate glass, equipped with open-top screw caps, Pierce #13075 or equivalent.
2. Septa: teflon-lined silicone discs, Pierce #12722 or equivalent.
3. Syringe: 5.00 ml gas-tight, Hamilton #1005 or equivalent.
4. Constant temperature bath: Blue M Model MW-1120A-1 with temperature range to 100°C and thermal stability of +1/5°C, 120V, 50/60HZ, or equivalent.
5. Gas chromatograph: Hewlett-Packard 5880A, equipped with a flame ionization detector.
6. Gas chromatographic column: 6 ft. x 2 mm. I.D. borosilicate glass packed with 60/80 Carbo-pack B/1Z SP 1000 (Supelco, Inc.).
7. Electronic integrator: Hewlett-Packard 5880A series GC terminal.
8. Balance: capable of weighing to +0.01 grams.

#### V. Operating Conditions

1. Nitrogen carrier gas flow of 40 ml/min.
2. Injection port temperature of 250°C.
3. Detector temperature of 250°C.
4. Oven temperature programming from 75°C. to 200°C at a rate of 8 degrees per minute with a 2.00 minute hold at 75°C. and a 20.00 minute hold at 200°C.

#### VI. Reagents

1. Gasoline (reference material): regular leaded, neat material must be obtained from a major supplier, store at room temperature in a 40 ml amber screw cap septum vial.  
(Vials - Pierce #13090 or equivalent)  
(Septa - Pierce #12722 or equivalent)  
Note: Sunlight and low temperatures result in the formation of a precipitate which should be avoided.

VII. Preparation of Gasoline Reference Sample

1. a. 1 ppt solution - Weigh 25 mg. or syringe 34 ul of gasoline into 20 ml methanol in a 25 ml volumetric flask, dilute to volume with methanol, invert 4 times to mix.
- b. 10 ppm solution - Pipet 1.00 ml of 1 ppt solution into 99 ml reagent water in a 100 ml volumetric flask. Invert 4 times to mix.
- c. 100 ppb solution - Pipet 1.00 ml of 10 ppm solution into 99 ml reagent water in a 100 ml volumetric flask. Invert 4 times to mix.
2. Transfer 30 ml of 100 ppb solution into a 40 ml screw cap septum vial. Seal cap tightly and place in a pre-heated constant temperature bath at 70<sup>0</sup> for 30 minutes.
3. Shake the gasoline reference sample 10 minutes and 20 minutes after placing in the hot water bath.

VIII. Preparation of Blanks

1. Transfer 30 ml of reagent water into a 40 ml screw cap septum vial. Seal tightly and place in a pre-heated constant temperature bath at 70<sup>0</sup>C for 30 minutes.
2. Shake the blank 10 minutes and 20 minutes after placing in the hot water bath.

IX. Preparation of Soil Samples

1. Previously collected soil samples have been refrigerated at 4<sup>0</sup>C.
2. Transfer 10g of sample to a new vial and weigh to .01g.
3. Allow samples to equilibrate to room temperature.
4. Place sample in a pre-heated constant temperature bath at 70<sup>0</sup>C. for 60 minutes.
5. Do not shake soil sample.

X. Analysis

1. Remove vial containing the gasoline reference sample from waterbath.
2. Immediately remove 5.00 ml of the vapor from the headspace using a gas-tight syringe and inject into the gas chromatograph.
3. A fingerprint trace of the individual peaks along with a numerical output of the peak areas is obtained. Integrate peak areas from 1.00 minute to 30.00 minutes.
4. Repeat this procedure for the blank and then for each sample prepared.
5. Measure volume of headspace in soils after GC analysis by adding water to fill vial & recording the volume.

XI. Quality Control

1. Due to the complex nature of gasoline, (in excess of 240 different compounds can be indentified in typical gasoline) spiking all samples with surrogate standard spiking solutions to monitor laboratory performance is not possible, therefore, an alternative quality assurance method has been applied to this particular analysis.
2. Daily records of the total detector response to a 100 ppb gasoline reference sample must be maintained. The mean total response for a 100 ppb gasoline reference sample is determined from 10 replicate samples. The daily response of the reference sample must fall within two standard deviations from the mean to be considered within acceptable control limits.
3. A blank must be run after each gasoline reference sample and after each highly contaminated sample.
4. One sample in 20 must be run in duplicate.
5. A gasoline reference sample must be run at the beginning and the end of the day. If either of these values fall outside the limits posted on the machine, no values are to be reported until the standards are back in control.
6. The method detection limit for gasoline in a soil matrix has not yet been established but has been approximated from the detection limit of the water matrix. The limit is different for the HP 5880 and the P & E 900.

estimated limit for HP 5880 = 20 ug/kg

estimated limit for PE 900 = 10 ug/kg

## XI. Quality Control

7. Precision and accuracy statements for the recovery of gasoline from a soil matrix have not yet been established.

## XII. Calculations:

AST) = Total integrated area of standard from 1 to 30 min.

A(B) = Total integrated area of blank from 1 to 30 min.

A(S) = Total integrated area of sample from 1 to 30 min.

U(ST) = ml standard injected.

U(S) = ml sample injected.

C(ST) = Concentration of standard in ug/l.

V(ST) = Volume standard in l.

V(HSST) = Volume of headspace above standard in ml.

V(HSS) = Volume of headspace above standard in ml.

W(S) = Weight sample in Kg.

C<sub>S</sub> = Concentration of sample in mg/kg.

$$C_S = \frac{A(S) - A(B)}{A(ST) - A(B)} \times \frac{U(ST)}{U(S)} \times \frac{C(ST)}{V(HSST)} \times \frac{V(ST)}{W(S)} \times \frac{V(HSS)}{W(S)}$$

ANALYSIS OF GASOLINE IN WATER DEP-L0P (3.1.1.2.6)  
ME DEP # 4.2.1

**DRAFT**

GASOLINE ANALYSIS IN WATER USING THE PURGE AND TRAP METHOD

I. Scope and Application

1. Gasoline is a complex mixture of hydrocarbons. In excess of 240 different compounds can be identified in typical gasolines. They include both aliphatic and aromatic constituents with boiling points ranging from 32°C to 210°C.

II. Summary of Method

1. Residue analysis of gasoline in water can be accomplished using a purge and trap method. In this technique a water sample is introduced into a gas tight sparge tube on a Tekmar LSC-2. Purge gas transfers the volatile compounds to a trap, from which they are subsequently released and transferred to the gas chromatograph.

2. The gas chromatograph is temperature programmed for separation of the individual components of gasoline, which are detected with a flame ionization detector.

3. The relative concentration of gasoline in the water is determined by comparison of the total detector response for the sample to the detector response for an aqueous gasoline reference sample..

III. Sample Collection and Storage

1. Samples must be collected in pre-cleaned 40 ml glass screw cap teflon-lined septum vials.

2. Samples must be stored at 4°C and analyzed within 14 days of collection.

IV. Apparatus

1. Vials: 40 ml, borosilicate glass, equipped with open-top screw caps, (Pierce #13075, I CHEM S236-0040 or equivalent).

2. Septa: teflon-lined silicone discs, (Pierce #12722 or equivalent).

3. Syringe: 5.00 ml gas-tight, (Hamilton #1005 or equivalent).

4. Gas Chromatograph: (Hewlett Packard 5880A, equipped with a flame ionization detector).

## VII. Preparation of Gasoline Reference Sample

1. a). 1 ppt solution - Weigh 25 mg or syringe 34 ul of gasoline into 20 ml methanol in a 25 ml volumetric flask, dilute to volume with methanol, invert 4 times to mix.

b). 10 ppm solution - Pipet 1.00 ml of 1 ppt solution into 99 ml reagent water in a 100 ml volumetric flask. Invert 4 times to mix.

c). 100 ppb solution - Pipet 1.00 ml of 10 ppm solution into 99 ml reagent water in a 100 ml volumetric flask. Invert 4 times to mix.

2. Transfer 40 ml of 100 ppb solution into a 40 ml screw cap septum vial. Seal cap tightly. This may be stored at 4°C for up to 5 days before use.

3. Allow standard to come to ambient temperature before analyzing.

## VIII. Preparation of Blank

1. Transfer 40 ml of reagent water into a 40 ml screw cap septum vial. Seal cap tightly. This may be stored at 4°C for up to 5 days before use.

2. Allow blank to come to ambient temperature before analyzing.

## IX. Analysis

1. To load samples, remove plunger from the syringe barrel. Carefully pour the sample into the barrel until it overflows. Allow it to drain out, then refill with the same sample. Insert the plunger and adjust to the desired volume (5.0 ml). Take care to vent any residual air while adjusting the volume. Transfer to the Frit Sparge Sampler.

2. Standards and blanks are loaded in exactly the same manner as the samples.

## X. Quality Control

1. Due to the complex nature of gasoline, (in excess of 240 different compounds can be identified in typical gasoline) spiking all samples with surrogate standard spiking solutions to monitor laboratory performance is not possible, therefore, an alternative quality assurance method has been applied to this particular analysis.

2. Daily records of the total detector response to a 100 ppb gasoline reference sample must be maintained. The mean total response for a 100 ppb gasoline reference sample is determined from 10 replicate samples. The daily response of the reference sample must fall within two standard deviations from the mean to be considered within acceptable control limits.

3. A blank must be run after each gasoline reference sample and after each highly contaminated sample.

IX. Analysis Continued

4. One sample in 20 must be run in duplicate.

5. A gasoline reference sample must be run at the beginning and end of the day. If either of these values fall outside the limits posted on the machine, no values are to be reported until the standards are back in control.

6. The detection limit for gasoline in a water matrix has been established for the HP 5880 as follows:

estimated limit for the HP 5880 = 20 ug/L

XI. Calculations

$$\frac{\text{Total peak area of sample} - \text{Total peak area of blank}}{\text{Total peak area of standard} - \text{Total peak area of blank}} \times$$

$$\frac{\text{Volume of standard}}{\text{Volume of sample}} \times \text{concentration of standard (ug/L)} =$$

Concentration of gasoline present in sample (ug/L) .

## Appendix B

### Permeability Testing

The equipment needed to conduct a slug test includes:

- A solid slug to displace the water.
- A Keck electronic water level probe;
- In-Situ Hermit SE1000B Data Logging transducer system.
- Decontamination solutions/water. These will be used for decontaminating all equipment that comes into contact with the ground water.

The procedure for conducting slug tests follows.

1. Measure the depth to water and record the level in the field notebook.
2. Lower the transducer into the well. The transducer should be placed so that slug removal does not cause the water level to fall below the transducer.
3. Secure the transducer level by taping or tying the cord to the well.
4. Prepare the Hermit by specifying:
  - test number (0 through 9);
  - reference equal to zero;
  - readings taken on a log scale.
5. Check the level on the transducer and record in field notebook.
6. Begin the falling head test by lowering the slug into the well and starting the Hermit at the same time.
7. Allow Hermit to record data until the water level stabilizes.
8. STOP the test, and increment the test number.
9. Begin the rising head test by removing the slug from the well and starting the new test at the same time.
10. STOP the test when the water level stabilizes.
11. The data can be printed on the In-Situ printer or can be directly transferred to an IBM or compatible personal computer through an RS232 port.