FINAL

ANNUAL GROUNDWATER MONITORING REPORT 2006

MICHAEL ROAD FUEL FARM

NCDENR Incident Number: 32214
Marine Corps Base
Camp Lejeune, North Carolina

June 19, 2006

Prepared for:

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Contract Number: N62470-04-D-0205
Task Order: 0008

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LIST OF ACRONYMS

2000 Guidelines	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater
2001 Guidelines	Guidelines for Assessment and Corrective Action, North Carolina Underground Storage Tank Section (Effective July 1, 2001)
2L GWQS	NCAC T15A:02L Groundwater Quality Standards
AS	Air Sparge
AST	Aboveground Storage Tank
BDL	Below Detection Limit
BN	Base/Neutral (extractables)
BNA	Base/Neutral/Acid (extractables)
BQL	Below Quantitation Limit
BLS	Below Land Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAP	Corrective Action Plan
CFR	Code of Federal Regulations
Cr	Chromium
CSA	Comprehensive Site Assessment
DIPE	Di-isopropyl Ether
DO	Dissolved Oxygen
DOD	Department of Defense
DPT	Direct Push Technology
DWQ	Division of Water Quality
DWM	Division of Waste Management
DTW	Depth to Water
EDB	Ethylene di-bromide
EMD	Environmental Management Division
EPA	Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
EQB	Environmental Quality Branch
Fe	Iron
FID	Flame Ionization Detector
FT	Feet
GCL	Gross Contaminant Level
GIS	Geographic Information System
GPS	Global Positioning System
Guidelines Vol. II	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks (January 2, 1998)
HDPE	High Density Polyethylene
I/C	Industrial/Commercial
ID	Identification
I&E	Installations and Environment Department
IGWQS	Interim Groundwater Quality Standards
IPE	Isopropyl Ether
LSA	Limited Site Assessment
LUST	Leaking Underground Storage Tank
m	Meter
MADEP	Massachusetts Department of Environmental Protection
MCAS	Marine Corps Air Station
MCB	Marine Corps Base

MDL	Method Detection Limit
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MSCC	Maximum Soil Contaminant Concentration
MSL	Mean Sea Level
MTBE	Methyl tertiary butyl ether
µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
NA	Not Analyzed
N/A	Not Applicable
NAVFAC	Naval Facilities Engineering Command Atlantic
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NE	None Established
NM	Not Measured
NMT	No Measurable Thickness
NS	Not Sampled
OVA	Organic Vapor Analyzer
PAH	Polynuclear Aromatic Hydrocarbons
Pb	Lead
PPB	Parts Per Billion
PPM	Parts Per Million
PID	Photo Ionization Detector
PQL	Practical Quantitation Limit
PVC	Polyvinyl chloride
RBCA	Risk-Based Corrective Action
RCRA	Resource Conservation and Recovery Act
Res	Residential
SOW	Scope of Work
STGW	Soil-to-Groundwater
SVE	Soil Vapor Extraction
SVOC	Semi Volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Tentatively Identified Compound
TOC	Top of Casing
TPH	Total Petroleum Hydrocarbons
US	United States
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
VPH	Volatile Petroleum Hydrocarbons
WiRO	NCDENR Wilmington Regional Office

EXECUTIVE SUMMARY

The Michael Road Fuel Farm (MRFF) project site is located in the Hadnot Point Industrial Area of Marine Corps Base (MCB), Camp Lejeune, North Carolina. The facility is located off Michael Road and encompasses one of the main fuels operations for the Base. The former leaking underground storage tank system was a 2,500 gallon double wall fiberglass UST with approximately 900 feet of associated underground piping. The UST was part of a gravity fed system that was used to collect excess fuel during loading and off-loading of bulk fuel trucks. There are seven loading racks and each had a pressure relief valve connected to underground piping that gravity drained excess fuel into the subject UST. Base personnel began to notice recurring groundwater intrusion into the tank and, therefore, scheduled the tank for removal.

Shaw Environmental and Infrastructure, Inc. (Shaw) removed the tank and piping in September 2004. Approximately 425 tons of TPH impacted soils were removed from the subsurface. They took soil samples from each sidewall of the UST excavation and 54 samples from along the former fuel line. MADEP constituents and diesel range organics were detected above applicable soil action limits. A groundwater sample from a temporary well, which was installed in the tank basin, also exhibited elevated levels of groundwater contaminants.

As a result, CATLIN Engineers and Scientists, Inc. (CATLIN) conducted a Phase I Limited Site Assessment (LSA) for the site in March 2005. CATLIN collected a total of ten additional soil samples from the hot spots identified during tank closure. They also installed and sampled two monitoring wells, UST1070-MW01 and UST1070-MW02. Soil contaminant results were below residential maximum soil contaminant concentrations (MSCCs). One groundwater contaminant, C_9-C_{22} aromatics, was detected at a concentration of <230 µg/L. The standard is 210 µg/L, so CATLIN recommended that MCB Camp Lejeune resample the well in one year to assess attenuation of the contamination.

Sovereign Consulting Inc. (Sovereign) conducted an annual sampling event at the project site on January 12, 2006. The intent of the sampling event was to assess the current groundwater quality and determine if the C_9-C_{22} aromatic concentration in UST1070-MW02 attenuated to below the 2L GWQS of 210 µg/L. The sample was sent under chain of custody for analysis to SGS/Paradigm Analytical Laboratories, Inc. (SGS) in Wilmington, North Carolina (NC Certification Number 481). The lab tested the groundwater sample for volatile and extractable petroleum hydrocarbons with the MADEP methods. All compounds were below quantitation limits. No groundwater contamination was detected in the sample obtained from monitoring well UST1070-MW02.

Based on the findings of this investigation and previous reports, soils at MRFF do not contain contaminants above residential MSCCs. Two samples – one obtained during tank removal and the other during the Phase I LSA – contained contaminants above the STGW MSCC, but below the residential MSCC. Sovereign also confirmed that the C_9-C_{22} aromatic concentration in UST1070-MW02 attenuated to below the applicable NCGWQS of 210 µg/L. All MADEP compounds were below quantitation limits as of the January 2006 groundwater sampling event. Since this site has been classified as low risk by NCDENR and contaminants have been remediated to the applicable MSCCs and 2L GWQSs, this site qualifies for No Further Action as outlined in 15A NCAC 2L .0407(d). Public notice, however, is required per 15A NCAC 2L .0409 since soil contaminants are present above the applicable STGW MSCC.

1.0 TITLE PAGE

DATE OF REPORT: June 19, 2006
Facility I.D.: N/A UST Incident Number: 32214
Site Name: Michael Road Fuel Farm
Site Location: Marine Corps Base Camp Lejeune, North Carolina
Nearest City/Town: Camp Lejeune County: Onslow
Risk Classification: Low Risk Land Use Classification: Residential

UST Owner: Commanding Officer – MCB Camp Lejeune
I&E/EMD/EQB
PSC Box 20004
Address: MCB Camp Lejeune, NC 28542-0004 Phone: (910) 451-5068

Property Owner: Same as above
Address: Same as above Phone: Same as above

Property Operator/Occupant: Base Fuel Operations – Mr. Harold Taylor
Address: Building 1070, Michael Road Phone: Same as above

Consultant/Contractor: Sovereign Consulting Inc.
Address: 405 Oakmears Crescent, Suite 1
Virginia Beach, VA 23462 Phone: (757) 456-5093

Release Information

Date Discovered: September 2004
Latitude: 34° 40' 22.56" N **Longitude:** 77° 19' 46.26" W
Estimated Quantity of Release: Unknown
Cause of Release: Unknown
Source of Release (Piping/UST): UST and piping
Sizes and contents of UST system(s) from which the release occurred: The former system was a 2,500 gallon double wall fiberglass UST and associated piping used to recover excess fuel from the facilities seven bulk fuel truck loading racks. The UST and associated piping handled various fuels, such as JP-8, kerosene, and MOGAS – gasoline.

*I, **Nicole L. Hall** a Professional Engineer for Sovereign Consulting Inc., do certify that the information contained in this report is correct and accurate to the best of my knowledge.*

2.0 INTRODUCTION

The purpose of this report is to summarize data from a recent groundwater sampling event at the Michael Road Fuel Farm aboard MCB Camp Lejeune, as well as perform an evaluation for site closure in accordance with the 2001 NCDENR DWM UST Guidelines.

The project's scope of work entailed gauging and sampling of one site monitoring well, UST1070-MW02, and analyzing the groundwater sample for petroleum constituents using the MADEP methods. Sampling was conducted based on the recommendations made in the site's Phase I LSA, dated March 28, 2005, performed by CATLIN Engineers and Scientists. Results of Sovereign's 2006 sampling event are presented in this report.

3.0 SITE HISTORY

The Michael Road Fuel Farm facility encompasses one of the main fuels operations for MCB Camp Lejeune. It is located off of Michael Road and includes Building 1070, a fuel dispenser island, and a separate bulk fuel truck loading rack area. The MRFF truck loading rack area included the former tank which is the subject of this investigation.

The former leaking underground storage tank system was a 2,500 gallon double wall fiberglass UST with associated piping. The UST was part of a gravity fed system that was used to collect excess fuel during loading and off-loading of bulk fuel trucks. There are seven loading racks and each had a pressure relief valve connected to underground piping that gravity drained excess fuel into the subject UST. The tank did not usually contain more than a couple hundred gallons of mixed fuel according to Base personnel. It was removed upon the documentation of recurring groundwater intrusion.

Shaw removed the tank and piping in September 2004. Approximately 425 tons of TPH impacted soils were removed from the subsurface. Two areas of concern were identified as a result of closure soil and groundwater sampling – the former UST basin and a location approximately 30 feet west of the former UST basin called location 052. Sample location 052 was along the former fuel line. As a result, CATLIN conducted a Phase I Limited Site Assessment for the site and used the information to determine the level of impact at the site.

In March 2005, CATLIN collected six soil samples along the former pipeline, three soil samples around location 052 to delineate the contaminated area, and one soil sample in the location of the Shaw temporary monitoring well, which was located within the excavation limits of the former UST. Two shallow monitoring wells were also installed at the site, UST1070-MW01 and UST1070-MW02. Monitoring well UST1070-MW01 was installed next to location 052, and monitoring well UST1070-MW02 replaced the (Shaw) temporary well. Soil and groundwater samples taken were analyzed using Risk Based laboratory analytical methods.

EPA Method 8260 and 8270 compound concentrations were either BQL or compliant with applicable I/C, Residential, and STGW MSCCs. One soil sample (UST1070-SB08, 4-6 feet BLS), however, exhibited C_9-C_{22} aromatics at a concentration of 171 µg/kg, which is below the I/C and residential MSCCs, but above the STGW MSCC. Groundwater samples taken from the two monitoring wells were also sent to the laboratory for analysis. EPA Methods 602 + Xylenes,

625 + 10 largest non-target peaks, MADEP VPH, and MADEP EPH were run. There were no 602 or 625 compounds detected in either sample; however, MADEP constituents were again detected in one well. UST1070-MW02 had a C_9-C_{22} aromatics concentration of <230 µg/L, which may or may not actually exceed the applicable 2L GWQS of 210 µg/L. The total concentration was obtained by adding the known C_9-C_{10} aromatic concentration of 130 µg/L and the C_{11}-C_{22} aromatic concentration of <100 µg/L. No free phase product was detected during the Phase I LSA.

Based on the information provided in the March 2005 Phase I LSA, NCDENR classified the site as low risk and residential. NCDENR also approved the report's recommendation to resample UST1070-MW02 in one year to assess the attenuation of the detected MADEP constituents. As a result, Sovereign was tasked by NAVFAC and MCB Camp Lejeune to resample UST1070-MW02. This report summarizes the details and findings associated with the 2006 sampling event.

4.0 SITE REMEDIATION

The former 2,500-gallon UST system was closed by removal in September 2004 by Shaw. Subsequently, NCDENR required Marine Corps Base, Camp Lejeune to perform a Phase I Limited Site Assessment (LSA) at the site since petroleum contamination was detected during the removal. This section presents an overview of the soil and groundwater assessments performed during tank closure and follow on assessment work.

4.1 SOIL

TANK REMOVAL

Following removal of the UST, a confirmation soil sample was collected from each side of the excavation within one foot of groundwater (approximately 6-feet bls). The samples were analyzed for VOCs using EPA Method 8260, MADEP VPH, and MADEP EPH. Following removal of the piping, a total of 54 confirmation soil samples were collected every 20 feet of piping and/or at joint locations. The samples were analyzed for TPH-GRO and TPH-DRO.

There were no VOCs or MADEP compounds detected in the former UST basin above residential or STGW MSCCs, with the exception of C_9-C_{22} aromatics. Only C_9-C_{22} aromatic concentrations were detected in sample TFF-UST-004 of the UST basin above only the STGW MSCC, but below the residential MSCC.

A total of 54 confirmation soil samples were collected from beneath the former pipeline and analyzed for TPH-GRO and TPH-DRO. A total of 20 out of the 54 samples exceeded the TPH-DRO action limit of 10 ppm. There were no TPH-GRO detections in excess of the laboratory reporting limit of 5.9 ppm. Applicable tank closure information is located in Appendix A.

PHASE I LIMITED SITE ASSESSMENT

CATLIN conducted soil sampling activities during the Phase I LSA which ws performed in March 2005. A total of ten soil samples were taken to supplement the data obtained during tank removal activities. Six soil samples were taken along the former fuel line. Three soil samples were taken around location 052 as previously discussed, and one soil sample was obtained from the location of the temporary well within the UST basin. EPA Methods 8260 and 8270 were run, as well as the MADEP methods. VOC and SVOC concentrations were either BQL or compliant with applicable I/C, Residential, and STGW MSCCs. One soil sample (UST1070-SB08, 4-6 feet BLS), however, exhibited C_9-C_{22} aromatics at a concentration of 171 µg/kg, which is below the I/C and residential MSCCs, but above the STGW MSCC. Phase I LSA data is also in Appendix A.

4.2 GROUNDWATER

TANK REMOVAL

Shaw encountered groundwater during UST excavation activities, and as a result, installed a temporary well in the excavation area. Sampling of the well was performed in October 2004, and laboratory analysis for VOCs, SVOCs and MADEP constituents was conducted.

Compounds were detected in excess of the North Carolina GWQSs. They included benzene, ethylbenzene, xylenes, methyl tert butyl ether, and naphthalene. The groundwater sample also exhibited C_5-C_8 aliphatic and C_9-C_{22} aromatic concentrations above the applicable standards.

PHASE I LIMTED SITE ASSESSMENT

Groundwater was again sampled during the Phase I LSA. CATLIN installed two monitoring wells, UST1070-MW01 and UST1070-MW02. Samples from these wells were obtained and sent for analysis per EPA Methods 602 + xylenes and 625 plus 10 largest no-target peaks, as well as MADEP VPH and EPH. The only contaminant detected was in UST1070-MW02. C_9-C_{22} aromatics were identified at a concentration of <230 µg/L. This concentration may or may not actually exceed the applicable 2L GWQS of 210 µg/L. The total concentration was obtained by adding the known C_9-C_{10} aromatic concentration of 130 µg/L and the C_{11}-C_{22} aromatic concentration of <100 µg/L. No free phase product was detected during the Phase I LSA.

5.0 ANNUAL SAMPLING

Upon submittal of the Phase I LSA to NCDENR in March 2005, they approved the report's recommendations and agreed to the resampling of UST1070-MW02 in one year for the presence of MADEP constituents. As a result, Sovereign conducted the follow on groundwater sampling event in January 2006. The intent of the sampling event was to assess the current groundwater quality.

Sovereign gauged and sampled the well on January 12, 2006. The static groundwater depth was 5.85 feet from top of casing, and no free product was detected in the well during the site visit. Sovereign purged and sampled the well, then sent the samples under chain of custody for analysis to SGS in Wilmington, NC (NC Certification Number 481). The lab tested the groundwater sample for volatile and extractable petroleum hydrocarbons with the MADEP methods. Laboratory reports and chain of custody documentation are included in Appendix B. All compounds were below quantitation limits. No groundwater contamination was detected in the sample obtained from monitoring well UST1070-MW02. Tables 1-2 summarize the data obtained during Sovereign's field activities.

6.0 RECEPTOR SURVEY

Sovereign reassessed site conditions and concluded that the receptor survey previously completed by CATLIN in the Phase I LSA report still applies. There have been no changes in receptor impact, and there have been no changes to land use of the site or the surrounding areas. The survey can be found within the Phase I LSA data in Appendix A.

7.0 CONCLUSIONS AND PETITION FOR SITE CLOSURE

Based on fieldwork and laboratory analytical data gathered during the tank removal, Phase I LSA, and January 2006 groundwater sampling event, the following conclusions are presented:

1. Two soil contaminants were detected in the UST basin during tank removal. MTBE was detected in soil sample TFF-UST-001; however, the concentration was below North Carolina's Industrial, Residential and Soil-to-Groundwater MSCC. C_9-C_{22} aromatics were also detected. The concentration was found in sample TFF-UST-004 and was present above the STGW MSCC, but below the residential MSCC.

2. Petroleum contamination was also confirmed along the former underground delivery lines during tank removal. Twenty of the 54 line samples did not comply with the TPH-DRO action limit of 10 ppm. No gasoline range organics exceeded the action limit.

3. CATLIN obtained ten soil samples during the March 2005 Phase I LSA from the tank excavation and along the former fuel line at the contaminated locations identified during tank closure. Samples were analyzed for VOCs, SVOCs, and MADEP constituents. VOC and SVOC concentrations were either BQL or compliant with applicable I/C, Residential, and STGW MSCCs. Soil sample UST1070-SB08 (4-6 feet BLS) exhibited C_9-C_{22} aromatics at a concentration of 171 µg/kg, which is below the I/C and residential MSCCs, but above the STGW MSCC.

4. CATLIN collected two groundwater samples from monitoring wells UST1070-MW01 and UST1070-MW02. The only contaminant detected was in UST1070-MW02. C_9-C_{22} aromatics were identified at a concentration of <230 µg/L.

5. Sovereign conducted additional groundwater sampling activities at the project site on January 12, 2006. The sample taken from well UST1070-MW02 did not exhibit any MADEP constituents above their 2L standards.

Based on the findings of this investigation and previous reports, soils at MRFF do not contain contaminants above residential MSCCs. Two samples – one obtained during tank removal and the other during the Phase I LSA – contained contaminants above the STGW MSCC, but below the residential MSCC. Since this site has been classified as low risk by NCDENR and soil contamination has been remediated to the residential MSCC, no further soil remediation is necessary per the requirements of 15A NCAC 2L .0408.

Sovereign also confirmed that the C_9-C_{22} aromatic concentration in UST1070-MW02 attenuated to below the applicable NCGWQS of 210 µg/L. All MADEP compounds were below quantitation limits as of the January 2006 sampling event. Since groundwater contaminants were not detected above 2L groundwater quality standards, this site qualifies for No Further Action as outlined in 15A NCAC 2L .0407(d).

8.0 PUBLIC NOTICE REQUIREMENTS

Low risk sites that meet the residential maximum soil contaminant concentrations are eligible for a No Further Action status per NCDENR Regulation 15A NCAC 2L .0407 and .0408. The soil contamination identified during tank closure and the Phase I LSA is present at levels below the residential maximum soil contaminant concentrations. Two samples exhibited MADEP compounds above the applicable soil-to-groundwater MSCC. As such, if NCDENR grants No Further Action status, 15A NCAC 2L .0409 requires that public notification be made to property owners and occupants within or contiguous to the area containing contamination within 30 days of the grant.

9.0 REFERENCES

AH Environmental Consultants, *Final Report, Wellhead Protection Plan – 2002 Update, Marine Corps Base, Camp Lejeune,* August 2002.

CATLIN Engineers and Scientists, *Leaking Underground Storage Tank (LUST) Phase I Limited Site Assessment Report for Michael Road Fuel Farm, Marine Corps Base Camp Lejeune, North Carolina,* March 28, 2005.

Shaw Environmental, Inc, *Final Michael Road Fuel Farm UST Closure Report, Marine Corps Base, Camp Lejeune, Onslow County, North Carolina,* February 2005.

North Carolina Department of Environment and Natural Resources, Division of Waste Management, Underground Storage Tank Section, *Guidelines for Assessment and Corrective Action*, April 2001.

TABLES

TABLE 1

SUMMARY OF GROUNDWATER SAMPLING RESULTS

Date: January 2006
Incident Number and Name: Michael Road Fuel Farm, 32214
Facility ID#: N/A

Analytical Method: MADEP Method VPH/EPH

Contaminant of Concern →			C_5-C_8 Aliphatics	C_9-C_{12} Aliphatics	C_9-C_{10} Aromatics	C_9-C_{18} Aliphatics	C_{19}-C_{36} Aliphatics	C_{11}-C_{22} Aromatics
Well ID	**Sample ID**	**Date Collected**						
UST1070-MW02	UST1070-MW02	1/12/2006	<100	<100	<100	<100	<100	<100

- All results reported in µg/l
- µg/L =micrograms per liter
- GCL = gross contamination level

TABLE 2
SUMMARY OF GROUNDWATER SAMPLING RESULTS

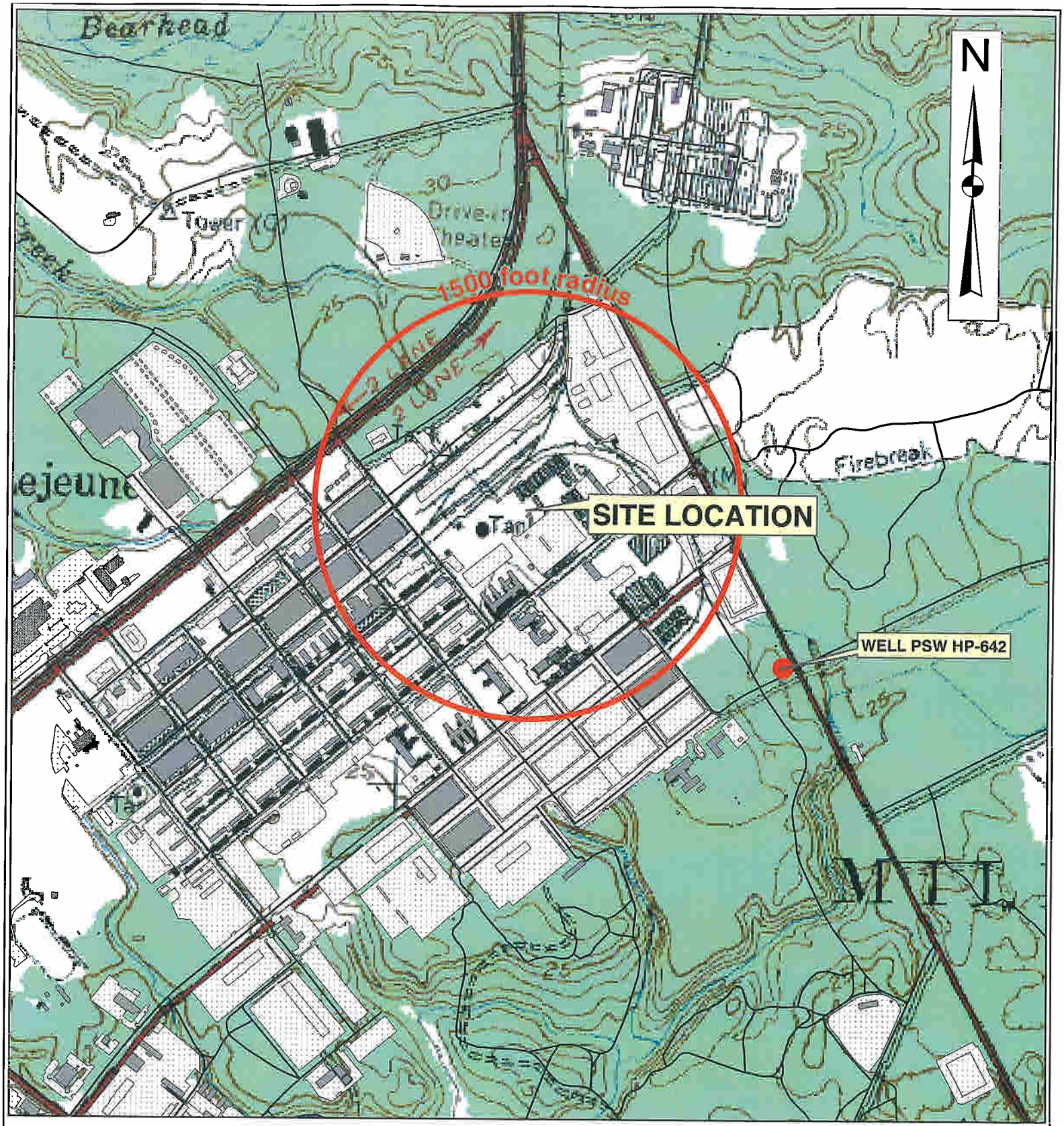
Date: January 2006
Incident Number and Name: Michael Road Fuel Farm, 32214
Facility ID#: N/A

Analytical Method: MADEP Method VPH/EPH as compared to NCDENR 2L Interim GWQS

Contaminant of Concern →			C_5-C_8 Aliphatics	C_9-C_{18} Aliphatics	C_9-C_{22} Aromatics	C_{19}-C_{36} Aliphatics
Well ID	**Sample ID**	**Date Collected**				
UST1070-MW02	UST1070-MW02	1/12/2006	<100	<200	<200	<100
2L Interim Standard (µg/l)			420	4,200	210	42,000
GCL (µg/l)			NE	NE	NE	NE

- All results reported in µg/l
- µg/L = micrograms per liter
- GCL = Gross Contaminant Level
- NE = Not Established

FIGURES



Data Sources: USGS Topographic Quadrangle Camp Lejeune (1952, Photorevised 1971). GIS data provided by Camp Lejeune GIS Department.

990 495 0 990 Feet

SCALE

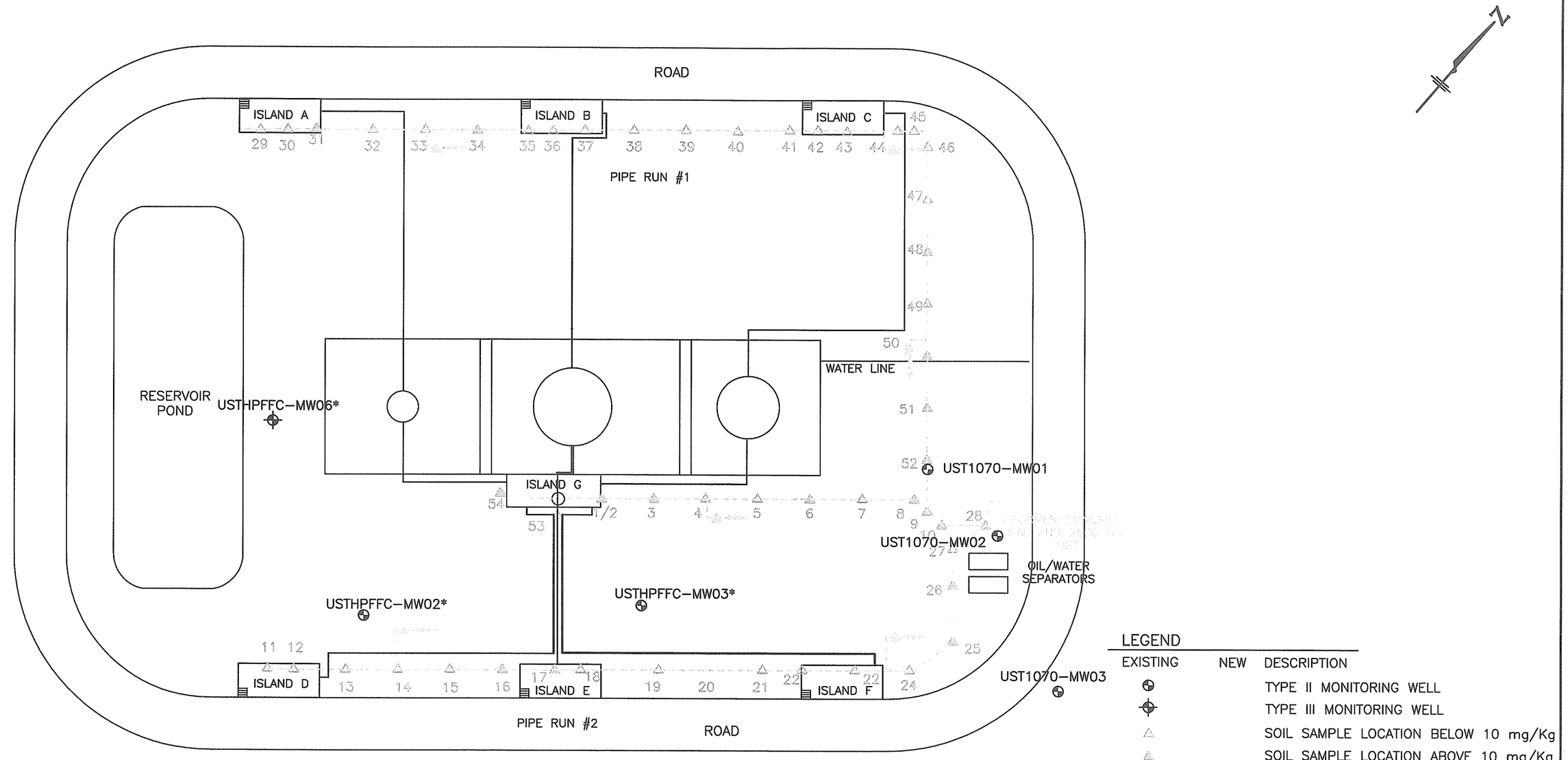
SOVEREIGN CONSULTING INC.
VIRGINIA BEACH, VIRGINIA

PROJECT
FINAL ANNUAL MONITORING REPORT
MICHAEL ROAD FUEL FARM
MCB CAMP LEJEUNE, NC

TITLE
GENERAL VICINITY TOPOGRAPHIC MAP

FIGURE
1

JOB NO.	DATE	SCALE	DRAWN BY	CHECKED BY
206-063	JUN 2006	AS SHOWN	THW	MEM



NOTE:
1. SITE MAP ADAPTED FROM SHAW ENVIRONMENTAL, INC.
2. *–MONITORING WELL IS FOR ASSESSMENT OF SEPARATE INCIDENT

SOVEREIGN CONSULTING INC.
VIRGINIA BEACH, VIRGINIA

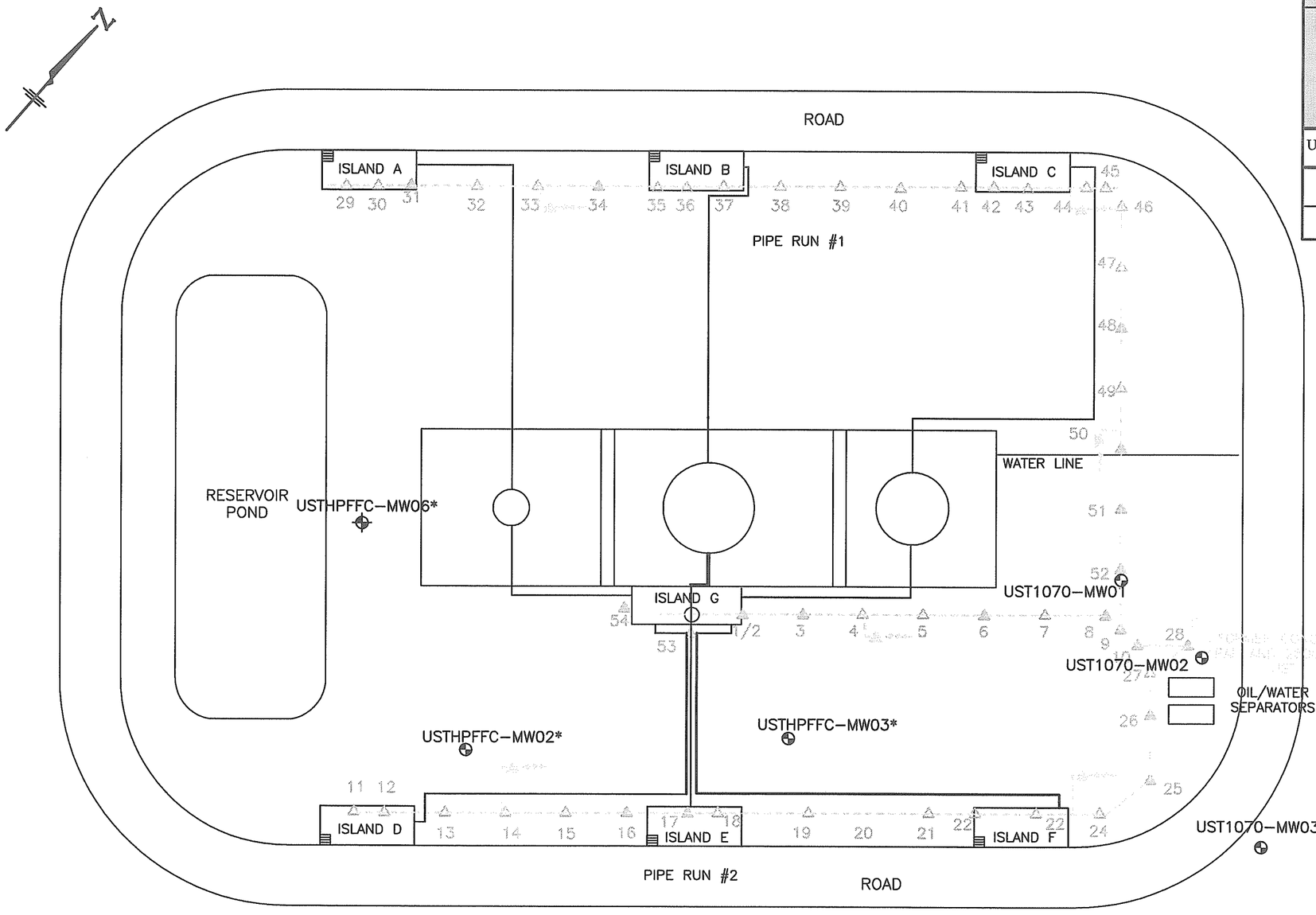
PROJECT: MICHAEL ROAD FUEL FARM
MCB
CAMP LEJEUNE, NC

TITLE: SITE MAP WITH MONITORING WELL LOCATION

FIGURE: 2

JOB NO. 206-063 | DATE: JUN 2006 | SCALE: 1"=40' | DRAWN BY: LCJ | CHECKED BY: MEM

206063-MICHEALROAD-02



Analytical Method: MADEP Method VPH/EPH as compared to NCDENR 2L GWQS

Contaminant of Concern →						
Well ID	Sample ID	Date Collected	C_5-C_8 Aliphatics	C_9-C_{18} Aliphatics	C_9-C_{22} Aromatics	C_{19}-C_{36} Aliphatics
UST1070-MW02	UST1070-MW02	1/12/2006	<100	<200	<200	<100
2L Interim Standard (µg/l)			420	4,200	210	42,000
GCL (µg/l)			NE	NE	NE	NE

- All results reported in µg/l
- µg/L = micrograms per liter
- GCL = Gross Contaminant Level
- NE = Not Established

LEGEND

EXISTING	NEW	DESCRIPTION
⊕		TYPE II MONITORING WELL
⊕		TYPE III MONITORING WELL
△		SOIL SAMPLE LOCATION BELOW 10 mg/Kg
△		SOIL SAMPLE LOCATION ABOVE 10 mg/Kg
———		EXISTING 4" PIPING
		FORMER FUEL LINE
		FORMER ANODE TEST STATION
▤		STORM DRAIN

40 20 0 40
SCALE IN FEET

NOTE:
1. SITE MAP ADAPTED FROM SHAW ENVIRONMENTAL, INC.
2. *–MONITORING WELL IS FOR ASSESSMENT OF SEPARATE INCIDENT

SOVEREIGN CONSULTING INC.
VIRGINIA BEACH, VIRGINIA

PROJECT: MICHAEL ROAD FUEL FARM
MCB
CAMP LEJEUNE, NC

TITLE: SITE MAP WITH GROUNDWATER
LABORATORY RESULTS – MADEP VPH/EPH
AS COMPARED TO NCDENR 2L GWQS

FIGURE 3

JOB NO. 206–063 | DATE: JUN 2006 | SCALE: 1"=40' | DRAWN BY: LCJ | CHECKED BY: MEM

206063–MICHEALROAD–03

APPENDIX A

HISTORICAL SOIL AND GROUNDWATER DATA AND FIGURES

UST CLOSURE REPORT
DATA AND FIGURES

FINAL

MICHAEL ROAD FUEL FARM UST CLOSURE REPORT

MARINE CORP BASE, CAMP LEJEUNE
ONSLOW COUNTY, NORTH CAROLINA

Prepared for:

Naval Facilities Engineering Command
1510 Gilbert Street
Norfolk, Virginia 24311-6287

Prepared by:

Shaw Environmental, Inc.

11560 Great Oaks Way, Suite 500
Alpharetta, Georgia 30022-2424

Ron Kenyon
Project Manager

Roland Moreau, P.E.
Program Manager

And by:

Robert S. Brown, L.G.
North Carolina License Number 1238
Senior Hydrogeologist

February 2005
Shaw Project No. 780790

EXECUTIVE SUMMARY

One UST and 900 feet of underground fuel line piping were removed at the Michael Road Fuel Farm in September 2004. The UST was used to receive excess fuel from the pressure overflow valves during loading and off-loading activities at the Michael Road Fuel Farm.

Beginning May 24, 2004 and ending the week of June 13, 2004 installation of the new aboveground piping, above ground storage tank (AST) and underground piping removal was completed. During the week of September 19, 2004 the underground storage tank (UST) was removed and a temporary piezometer was installed for collection of a groundwater sample. The following work was accomplished at the site:

- Excavation of approximately 48 tons of non-hazardous TPH impacted soil from the UST location at the Michael Road Fuel Farm.
- Excavation of approximately 260 tons of soil from the fuel pipe location at the Michael Road Fuel Farm.
- Removal of one 2,500 gallon double walled fiberglass UST from the location.
- Removal of approximately 900 feet of 3-inch diameter steel fuel piping associated with the UST.
- Collection of four confirmation soil samples from the UST excavation for MADEP-EPH, MADEP-VPH, and VOCs (Method 8260B) analyses.
- Collection of 54 confirmation soil samples from beneath the fuel piping for TPH-GRO and TPH-DRO analysis.
- Collection of one composite soil sample for Toxicity Characteristic Leaching Procedure analysis for disposal purposes.
- Restoration of the site by backfilling, compacting and grading.
- Installation of one temporary piezometer in the former UST excavation backfill for collection of one groundwater sample that was analyzed for MADEP EPH/VPH, VOCs Method 601/602 plus xylenes, and SVOCs Method 625 plus 10 largest peaks.
- Transportation to and disposal of soil at an in-State petroleum permitted disposal facility.
- Transportation and disposal of the former fiberglass UST at the local landfill.

During UST removal activities, minor staining and a slight petroleum hydrocarbon odor was observed in soil next to the UST. All of this soil was removed during UST removal activities and staged for disposal as TPH contaminated soil. Based on depths to groundwater measurements in

monitoring wells on site, groundwater occurs at a depth of 6-7 feet bls. The excavation removed soil to a total depth of 10 feet bls.

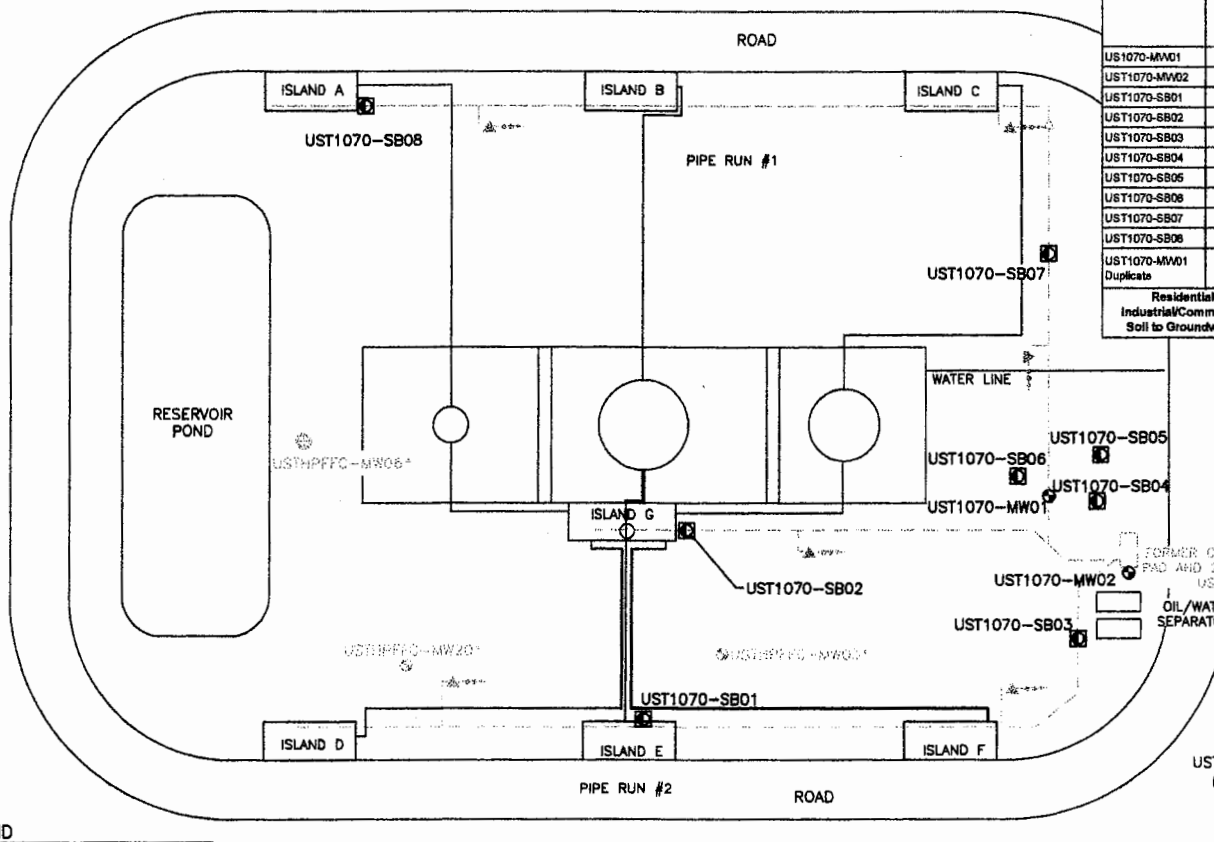
Soil samples from the UST excavation did not detect contaminants in excess of North Carolina's Industrial or Residential Maximum Soil Contaminant Concentrations (MSCCs) in soils for MADEP-EPH, MADEP-VPH, and VOCs. Soil samples from beneath the fuel lines did not detect TPH-GRO at concentrations above the laboratory reporting limit of 5.9 mg/kg. However, of the 54 samples collected, TPH-DRO was detected in 20 soil samples above the project guideline of 10 mg/kg at concentrations ranging from 10.9 mg/kg to a high of 1,480 mg/kg in one sample (TFF-052).

The groundwater sample from the temporary piezometer detected benzene (125 ug/l), ethylbenzene (248 ug/l), xylenes (816 ug/l), methyl tert butyl ether (531 ug/l) and naphthalene (44 ug/l) at concentrations in excess of the North Carolina Groundwater Quality Standards (GWQS) (15A NCAC 2L .0202) but below the Gross Contamination Levels (GCL) for groundwater.

For disposal purposes soil from the UST area were staged with soil from another ongoing POL project at Tarawa Terrace for economies in transportation and disposal. A sample from the excavated soils removed from the fuel line trench was analyzed for full TCLP analyses, TPH-GRO, TPH-DRO, and general chemical analysis. Results from these analyses met the allowable State regulatory levels. The soils are currently staged at Lot 203 for anticipated re-use as clean fill for other project sites.

Based on the results of the soil confirmation samples collected from the former UST excavation, all soil contamination was removed, and we recommend that no further action with respect to the UST be required. However, some of the samples from beneath the underground piping exceeded the 10 mg/kg TPH-DRO action level and elevated VOC concentrations were detected in groundwater at the site. Additional assessment and remediation therefore is required and Catlin Engineering is expected to begin additional assessment work at the site in early 2005.

PHASE I LIMITED SITE ASSESSMENT
DATA AND FIGURES



Analytical Method: EPA Method 8260B/5035

Sample ID	Contaminant of Concern → Date Collected	Sample Depth (ft. BLS)	Acetone	2-Butanone	sec-Butylbenzene	tert-Butylbenzene	Naphthalene	1,3,5-Trimethylbenzene	Remaining EPA Method 8260 parameters
UST1070-MW01	3/4/2005	4-5'	0.0542	0.00889	<0.00596	<0.00596	<0.00596	<0.00596	BQL
UST1070-MW02	3/4/2005	1-2'	0.0072	<0.0217	<0.00434	<0.00434	<0.00434	<0.00434	BQL
UST1070-SB01	3/7/2005	4-6'	0.00813	<0.0243	<0.00487	<0.00487	<0.00487	<0.00487	BQL
UST1070-SB02	3/7/2005	2-4'	0.0116	<0.0243	<0.00485	<0.00485	<0.00485	<0.00485	BQL
UST1070-SB03	3/7/2005	4-6'	0.0152	<0.025	<0.00501	<0.00501	<0.00501	<0.00501	BQL
UST1070-SB04	3/7/2005	2-4'	0.00438	<0.0251	<0.00502	<0.00502	<0.00502	<0.00502	BQL
UST1070-SB05	3/7/2005	4-6'	0.0224	0.00489	<0.00431	<0.00431	0.00312	<0.00431	BQL
UST1070-SB06	3/7/2005	4-6'	0.013	<0.028	<0.00559	<0.00559	<0.00559	<0.00559	BQL
UST1070-SB07	3/7/2005	2-4'	0.0148	<0.0234	<0.00468	<0.00468	<0.00468	<0.00468	BQL
UST1070-SB08	3/7/2005	4-6'	<0.0503	<0.0252	0.011	<0.00503	0.0541	0.0311	BQL
UST1070-MW01 Duplicate	3/7/2005	4-5'	0.0585	0.00892	<0.00666	<0.00666	<0.00666	<0.00666	BQL
Residential MSCC (mg/kg)			1,584	None Established	156	156	63	782	Varies
Industrial/Commercial MSCC (mg/kg)			40,880		4,088	4,088	1,635	20,440	
Soil to Groundwater MSCC (mg/kg)			3		3	3	0.58	8	

ALL RESULTS IN mg/Kg.

LEGEND

EXISTING	NEW	DESCRIPTION
	■	DPT SOIL SAMPLE
○	●	TYPE II MONITORING WELL
○		TYPE III MONITORING WELL
		EXISTING 4" PIPING
		FORMER FUEL LINE
		FORMER ANODE TEST STATION
BQL		BELOW QUANTITATION LIMIT

NOTE:
1. SITE MAP ADAPTED FROM SHAW ENVIRONMENTAL, INC.
2. * MONITORING WELL IS FOR ASSESSMENT OF A SEPARATE GROUNDWATER INCIDENT.

40 20 0 40
SCALE IN FEET

CAELUM ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT: MICHAEL ROAD FUEL FARM
MCB
CAMP LEJEUNE, NC

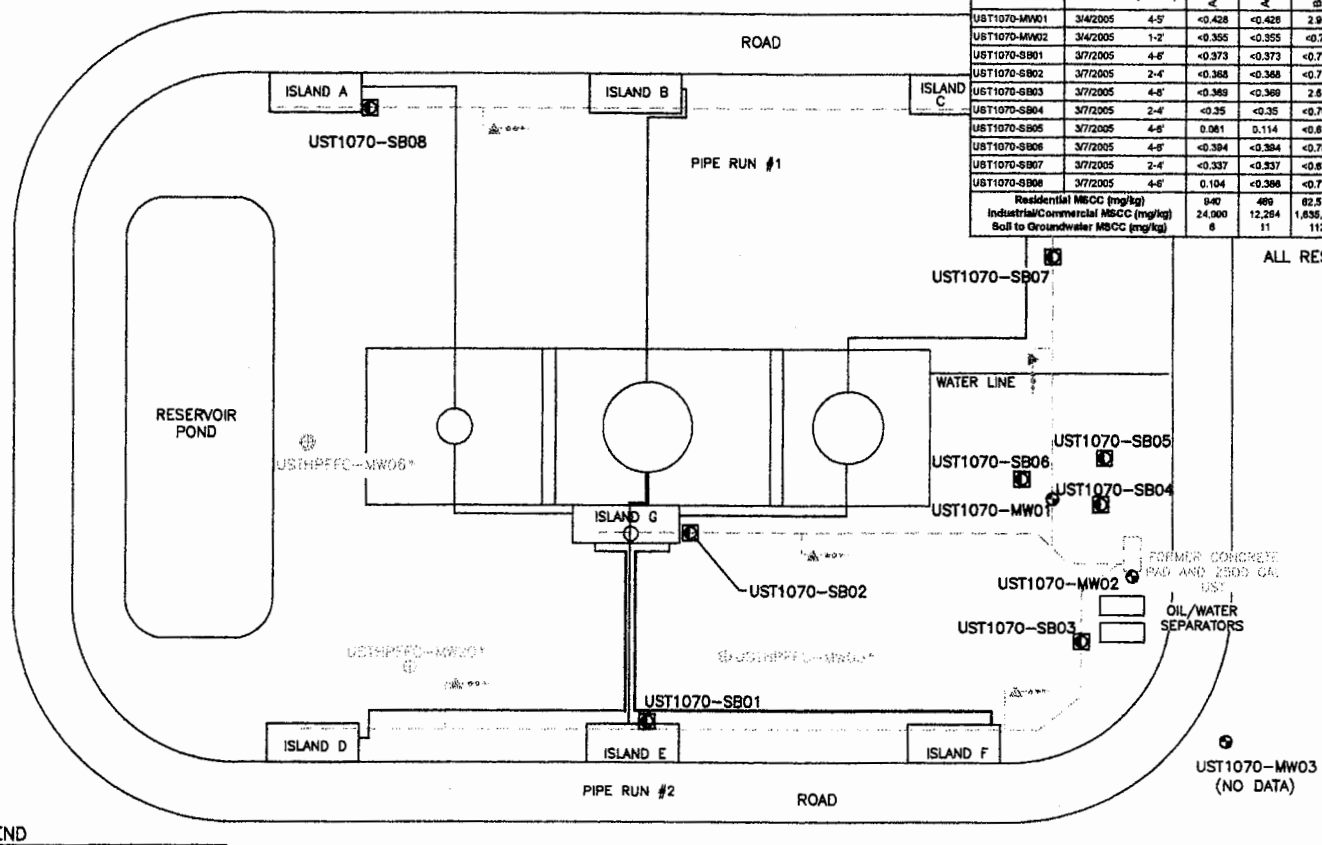
JOB NO. 204-100 DATE MAR 2005

TITLE: SITE MAP WITH
SOIL LABORATORY RESULTS -
EPA METHOD 8260B/5035

SCALE 1"=40' DRAWN BY: HCS CHECKED BY: MEM

FIGURE 4A

204100-2039-04A



Sample ID	Contaminant of Concern →		Acenaphthene	Acenaphthylene	Benzoic Acid	Bis(2-ethylhexyl) phthalate	Chrysene	Fluoranthene	Fluorene	2-Methylnaphthalene	Naphthalene	Pyrene	Remaining EPA Method 8270
	Date Collected	Sample Depth (ft. BLS)											
UST1070-MW01	3/4/2005	4-5'	<0.428	<0.428	2.96	<0.428	<0.428	<0.428	<0.428	<0.428	<0.428	<0.428	BQL
UST1070-MW02	3/4/2005	1-2'	<0.355	<0.355	<0.71	<0.355	<0.355	<0.355	<0.355	<0.355	<0.355	<0.355	BQL
UST1070-SB01	3/7/2005	4-6'	<0.373	<0.373	<0.746	<0.373	<0.373	<0.373	<0.373	<0.373	<0.373	<0.373	BQL
UST1070-SB02	3/7/2005	2-4'	<0.368	<0.368	<0.736	<0.368	<0.368	0.059	<0.368	<0.368	<0.368	<0.368	BQL
UST1070-SB03	3/7/2005	4-6'	<0.369	<0.369	2.63	<0.369	<0.369	<0.369	<0.369	<0.369	<0.369	<0.369	BQL
UST1070-SB04	3/7/2005	2-4'	<0.35	<0.35	<0.701	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	BQL
UST1070-SB05	3/7/2005	4-6'	0.061	0.114	<0.672	0.279	0.054	<0.336	0.057	<0.336	0.071	0.077	BQL
UST1070-SB06	3/7/2005	4-6'	<0.394	<0.394	<0.788	<0.394	<0.394	<0.394	<0.394	<0.394	<0.394	<0.394	BQL
UST1070-SB07	3/7/2005	2-4'	<0.337	<0.337	<0.673	<0.337	<0.337	<0.337	<0.337	<0.337	<0.337	<0.337	BQL
UST1070-SB08	3/7/2005	4-6'	0.104	<0.386	<0.772	<0.386	<0.386	<0.386	<0.386	2.14	0.486	<0.386	BQL
Residential MSCC (mg/kg)			940	469	62,571	46	88	820	820	63	63	469	Varies
Industrial/Commercial MSCC (mg/kg)			24,000	12,264	1,835,200	410	780	16,400	16,400	1,635	1,635	12,264	
Soil to Groundwater MSCC (mg/kg)			6	11	112	6.67	38	44	276	3	0.58	286	

ALL RESULTS IN mg/Kg.

LEGEND

EXISTING	NEW	DESCRIPTION
	■	DPT SOIL SAMPLE
	●	TYPE II MONITORING WELL
	●	TYPE III MONITORING WELL
———		EXISTING 4" PIPING
- - - -		FORMER FUEL LINE
		FORMER ANODE TEST STATION
BQL		BELOW QUANTITATION LIMIT

NOTE:
1. SITE MAP ADAPTED FROM SHAW ENVIRONMENTAL, INC.
2. * MONITORING WELL IS FOR ASSESSMENT OF A SEPARATE GROUNDWATER INCIDENT.

40 20 0 40
SCALE IN FEET

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

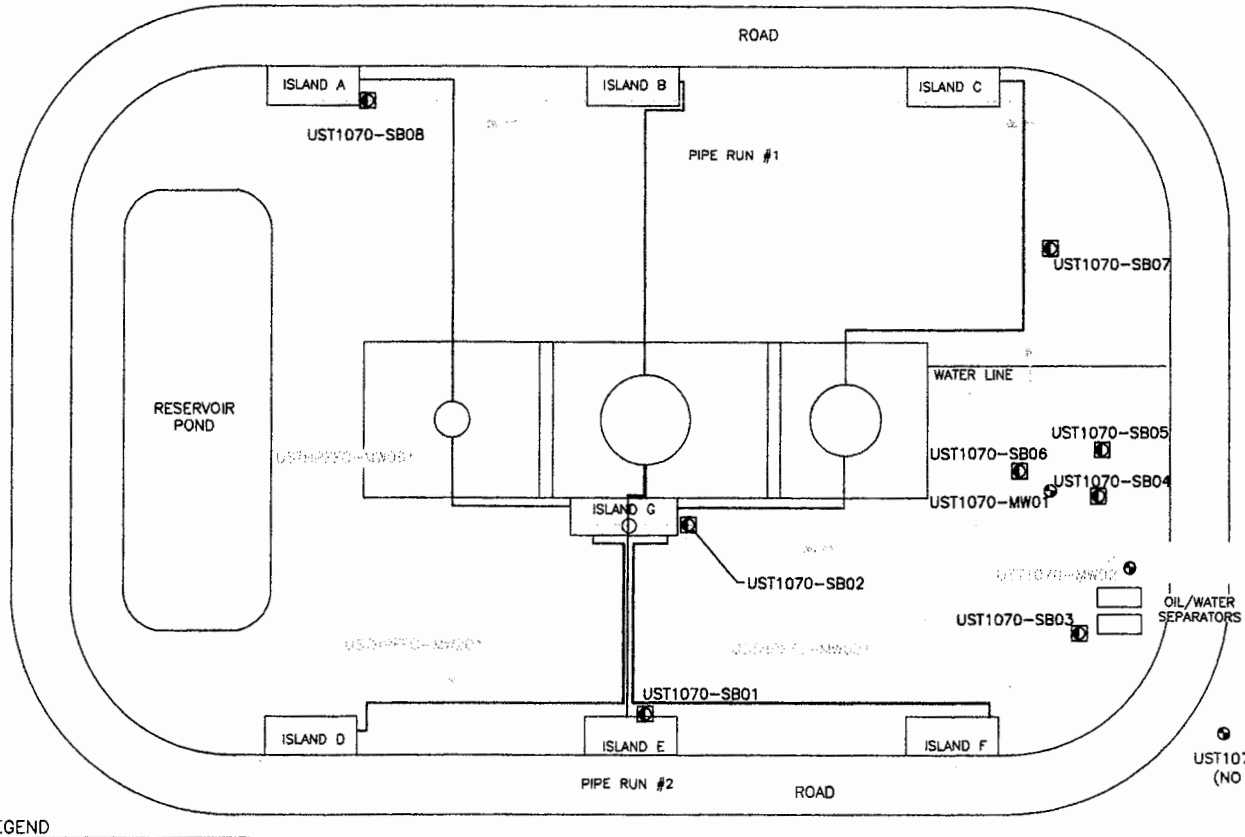
PROJECT: MICHAEL ROAD FUEL FARM
MCB
CAMP LEJEUNE, NC

JOB NO. 204-100 | DATE: MAR 2005 | SCALE: 1"=40' | DRAWN BY: HCS | CHECKED BY: MEM

TITLE: SITE MAP WITH SOIL LABORATORY RESULTS - EPA METHOD 8270

FIGURE 4B

204100-2039-248



Analytical Method: MADEP Method EPH/VPH

Sample ID	Contaminant of Concern → Date Collected	Sample Depth (ft. BLS)	C5-C8 Aliphatics	C9-C18 Aliphatics	C19-C36 Aliphatics	C9-C22 Aromatics
UST1070-MW01	3/4/2005	4-6'	<10	<10	<10	<20
UST1070-MW02	3/4/2005	1-2'	<10	<10	<10	<20
UST1070-SB01	3/7/2005	4-6'	<10	<10	<10	<20
UST1070-SB02	3/7/2005	2-4'	<10	<10	<10	<20
UST1070-SB03	3/7/2005	4-6'	<10	<10	<10	<20
UST1070-SB04	3/7/2005	2-4'	<10	<10	<10	<20
UST1070-SB05	3/7/2005	4-6'	<10	<1,510	1,700	<700
UST1070-SB06	3/7/2005	4-6'	<10	<10	<10	<20
UST1070-SB07	3/7/2005	2-4'	<10	<10	100	<20
UST1070-SB08	3/7/2005	4-6'	<10	2,619	<10	171
Residential MSCC (mg/kg)			938	9,386	93,860	469
Industrial/Commercial MSCC (mg/kg)			24,528	245,280	**	12,264
Soil to Groundwater MSCC (mg/kg)			72	3,255	***	34

1. ALL RESULTS IN mg/Kg.
2. ** HEALTH BASED LEVEL (>10%).
3. *** CONSIDERED IMMOBILE.

LEGEND

EXISTING	NEW	DESCRIPTION
	■	DPT SOIL SAMPLE
	●	TYPE II MONITORING WELL
		TYPE III MONITORING WELL
———		EXISTING 4" PIPING
		FORMER FUEL LINE
		FORMER ANODE TEST STATION

NOTE:
1. SITE MAP ADAPTED FROM SHAW ENVIRONMENTAL, INC.
2. * MONITORING WELL IS FOR ASSESSMENT OF A SEPARATE GROUNDWATER INCIDENT.

40 20 0 40
SCALE IN FEET

CAELUM ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT: MICHAEL ROAD FUEL FARM MCB CAMP LEJEUNE, NC
JOB NO. 204-100 DATE: MAR 2005

TITLE: SITE MAP WITH SOIL LABORATORY RESULTS - MADEP EPH/VPH AS COMPARED TO NCDENR MSCCs
SCALE: 1"=40' DRAWN BY: HCS CHECKED BY: MEM

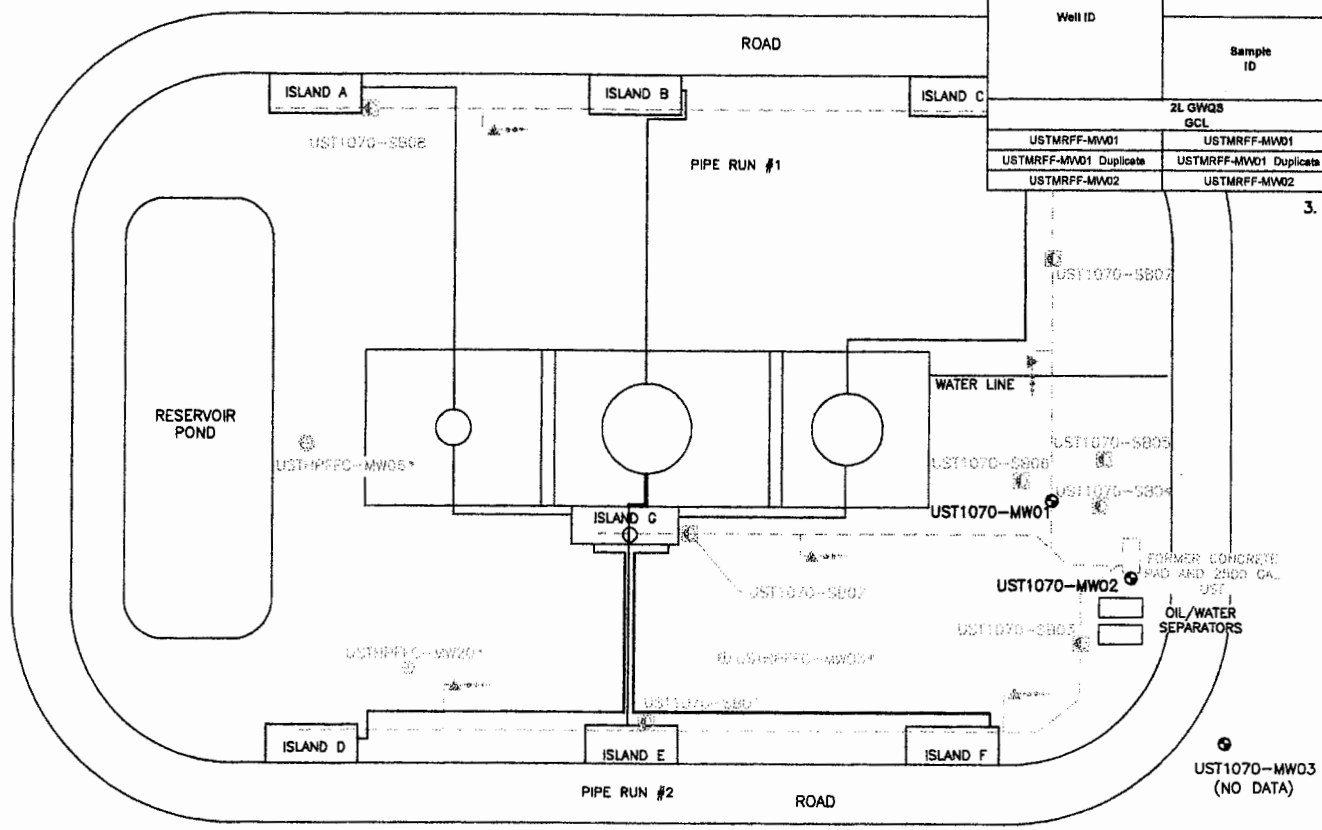
FIGURE 4C

204100-2039-04C

Analytical Method: EPA Method 602+ XYLENES+IPE+MTBE

Well ID	Contaminant of Concern → Sample ID	Date Collected	Benzene	Diisopropyl ether (DIPE)	Ethylbenzene	Methyl-tert butyl ether (MTBE)	Toluene	m/p-Xylene
2L GWQS			1	70	29	200	1000	530
GCL			5,000	70,000	29,000	200,000	257,500	87,500
USTMRFF-MW01	USTMRFF-MW01	3/7/2005	<1	<1	<1	3.22	<1	<4
USTMRFF-MW01 Duplicate	USTMRFF-MW01 Duplicate	3/7/2005	<1	<1	<1	2.88	<1	<4
USTMRFF-MW02	USTMRFF-MW02	3/7/2005	<1	<1	1.08	<2	<1	<4

3. ALL RESULTS IN µg/L.



LEGEND

EXISTING	NEW	DESCRIPTION
		DPT SOIL SAMPLE
		TYPE II MONITORING WELL
		TYPE III MONITORING WELL
		EXISTING 4" PIPING
		FORMER FUEL LINE
		FORMER ANODE TEST STATION

NOTE:
1. SITE MAP ADAPTED FROM SHAW ENVIRONMENTAL, INC.
2. * MONITORING WELL IS FOR ASSESSMENT OF A SEPARATE GROUNDWATER INCIDENT.
3. * MONITORING WELL IS FOR ASSESSMENT OF A SEPARATE GROUNDWATER INCIDENT.

40 20 0 40
SCALE IN FEET

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

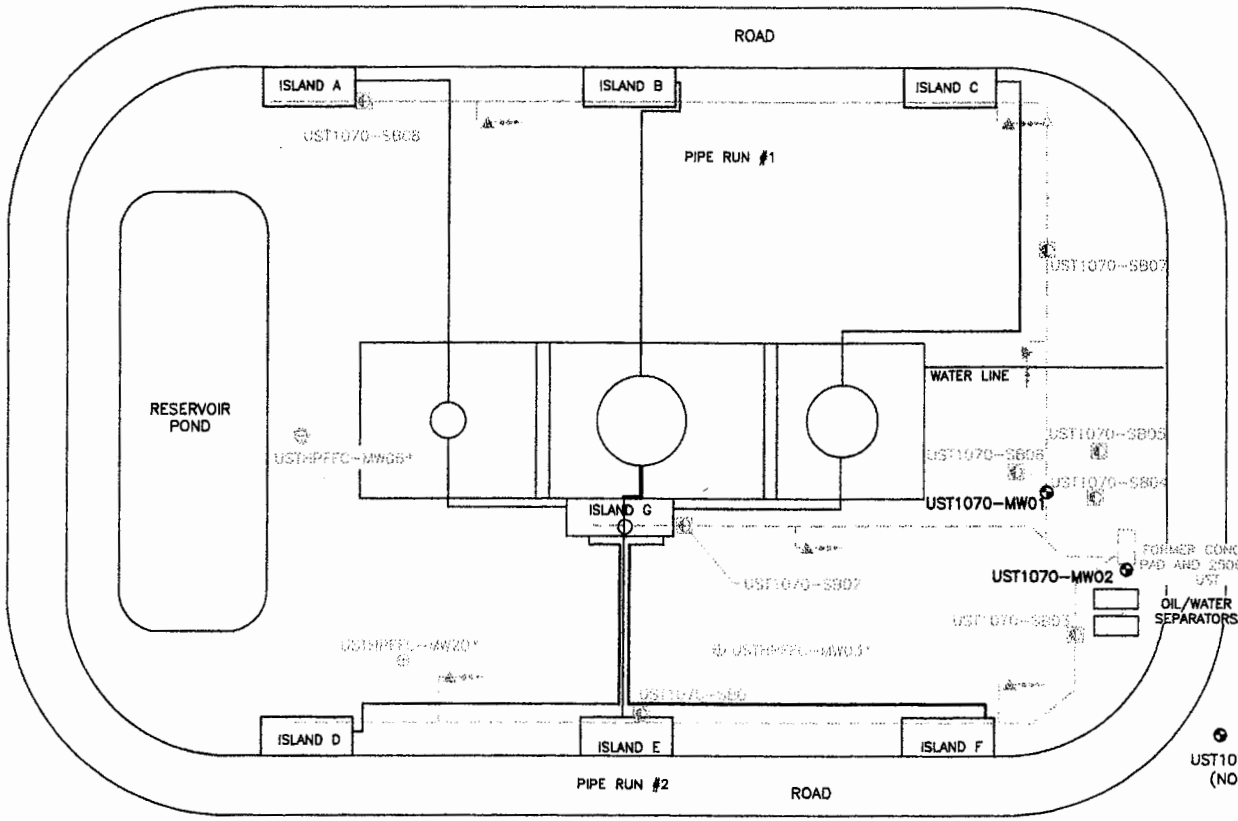
PROJECT: MICHAEL ROAD FUEL FARM
MCB
CAMP LEJEUNE, NC

JOB NO. 204-100 DATE: MAR 2005 SCALE: 1"=40' DRAWN BY: HCS CHECKED BY: MEM

TITLE: SITE MAP WITH GROUNDWATER LABORATORY RESULTS – EPA METHOD 602 + XYLENES + IPE + MTBE

FIGURE 5A

204100-2039-05A



Analytical Method: EPA Method 625 + TICS

Well ID	Contaminant of Concern →		Bis(2-ethylhexyl) phthalate	All Other Target Analytes
	Sample ID	Date Collected		
2L GWQS			3	Varies
GCL			3,000	Varies
USTMRFF-MW01	USTMRFF-MW01	3/7/2005	<10	BQL
USTMRFF-MW02	USTMRFF-MW02	3/7/2005	2.1	BQL

ALL RESULTS IN µg/L.

LEGEND

EXISTING	NEW	DESCRIPTION
		DPT SOIL SAMPLE
		TYPE II MONITORING WELL
		TYPE III MONITORING WELL
		EXISTING 4" PIPING
		FORMER FUEL LINE
		FORMER ANODE TEST STATION
BQL		BELOW QUANTITATION LIMIT

NOTE:
1. SITE MAP ADAPTED FROM SHAW ENVIRONMENTAL, INC.
2. * MONITORING WELL IS FOR ASSESSMENT OF A SEPARATE GROUNDWATER INCIDENT.

40 20 0 40
SCALE IN FEET

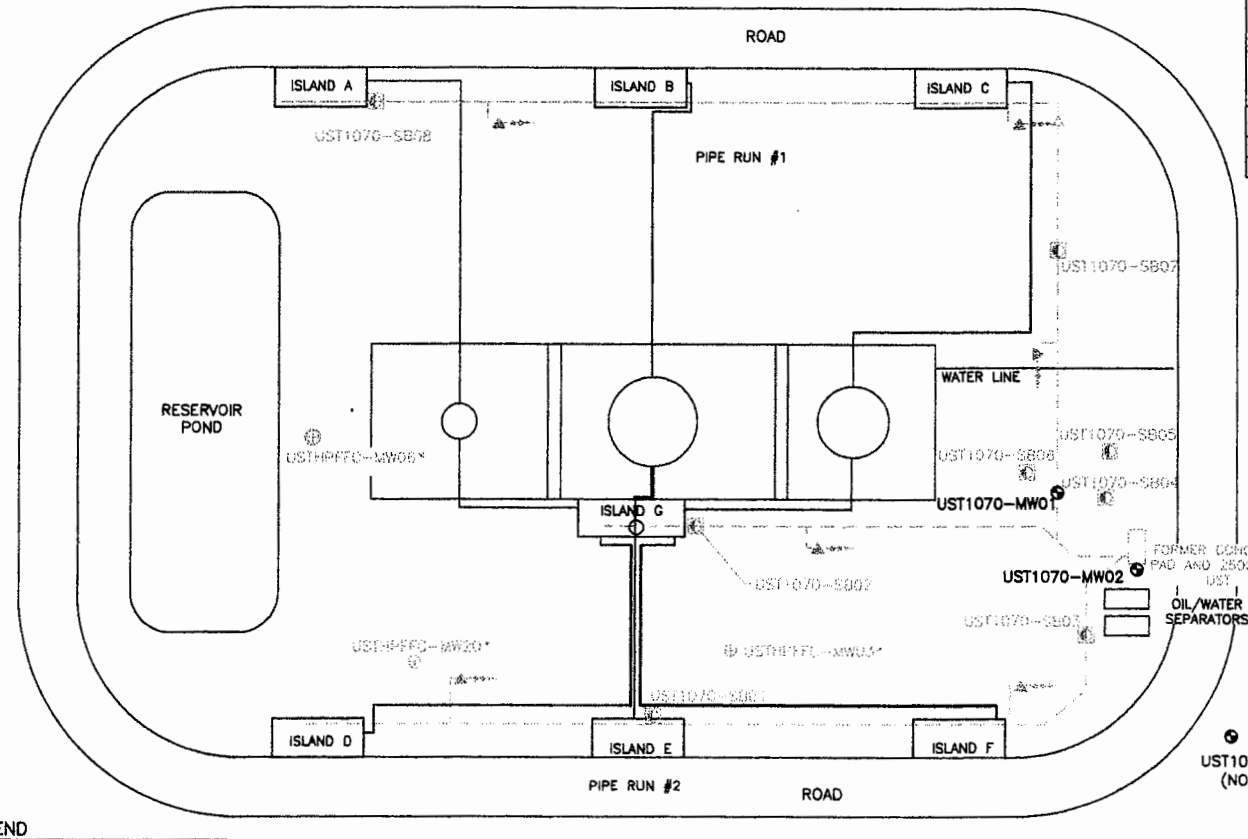
CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT: MICHAEL ROAD FUEL FARM MCB CAMP LEJEUNE, NC
JOB NO. 204-100 DATE: MAR 2005

TITLE: SITE MAP WITH GROUNDWATER LABORATORY RESULTS - EPA METHOD 625 + TICs
SCALE: 1"=40' DRAWN BY: HCS CHECKED BY: MEM

FIGURE 5B

204100-2030-008



Analytical Method: MADEP Method EPH/VPH

Well ID	Contaminant of Concern →		C9-C18 Aliphatics	C19-C36 Aliphatics	C9-C22 Aromatics	C5-C8 Aliphatics
	Sample ID	Date Collected				
2L GWQS			4,200	42,000	210	420
USTMRFF-MW01	USTMRFF-MW01	3/7/2005	<200	<100	<200	<100
USTMRFF-MW02	USTMRFF-MW02	3/7/2005	<200	<100	<230	<100

ALL RESULTS IN µg/L.
SHADED METHOD QUANTITATION LIMIT EXCEEDS APPLICABLE 2L GWQS.

LEGEND

EXISTING	NEW	DESCRIPTION
		DPT SOIL SAMPLE
		TYPE II MONITORING WELL
		TYPE III MONITORING WELL
		EXISTING 4" PIPING
		FORMER FUEL LINE
		FORMER ANODE TEST STATION

NOTE:
1. SITE MAP ADAPTED FROM SHAW ENVIRONMENTAL, INC.
2. * MONITORING WELL IS FOR ASSESSMENT OF A SEPARATE GROUNDWATER INCIDENT.

40 20 0 40
SCALE IN FEET

CAELIN ENGINEERS and SCIENTISTS WILMINGTON, NORTH CAROLINA

PROJECT: MICHAEL ROAD FUEL FARM MCB CAMP LEJEUNE, NC
JOB NO. 204-100 DATE: MAR 2005

TITLE: SITE MAP WITH GROUNDWATER LABORATORY RESULTS - MADEP VPH/EPH AS COMPARED TO NCDENR 2L GWQS
SCALE: 1"=40' DRAWN BY: HCS CHECKED BY: MEM

FIGURE 5C

204100-2036-05C

B. RISK CHARACTERIZATION

Limited Site Assessment Risk Classification and Land Use Form

Part I - Groundwater/Surface Water/Vapor Impacts
High Risk

1. *Has the release contaminated any water supply well including any used for non-drinking purposes?* YES **NO**

   According to I&E/EMD/EQB, the MCB samples the base raw water supply wells semi-annually and no contaminants were reported in the latest sampling event. No information provided indicates a water supply well has been contaminated as a result of the release from the MRFF potential source area.

2. *Is a water supply well used for drinking water located within 1,000 feet of the source area of the discharge or release?* YES **NO**

   The potable water well nearest to the potential source area is PSW HP-642 (active) located approximately 2,300 feet to the east-southeast. See Figure 1.

3. *Is a water supply well not used for drinking water (e.g., irrigation, washing cars, industrial cooling water, filling swimming pools) located within 250 feet of the source area of the release?* YES **NO**

   There is no water supply well located within 1,000 feet of the source area of the release.

4. *Does groundwater within 500 feet of the source area of the release have the potential for future use (there is no other source of water supply other than the groundwater)?* YES **NO**

   Currently there are an adequate number of locations for additional water supply wells to be installed on portions of MCB Camp Lejeune greater than 500 feet from the potential source area.

5. *Do vapors from the release pose a threat of explosion because of accumulation of the vapors in a confined space or pose any other serious threat to public health, public safety or the environment?* YES **NO**
   If YES describe.

   Buildings within 500 feet of the potential source area are slab on grade. No evidence of vapor accumulations has been reported.

6. *Are there any other factors that would cause the discharge or release to pose an imminent danger to public health, public safety, or the environment?* YES **NO**
   If YES describe.

   A review of data collected during this investigation does not provide evidence to suggest other factors that would cause the discharge or release to pose an imminent danger to public health, public safety, or the environment.

Intermediate Risk

7. *Is a surface water body located within 500 feet of the source area of the discharge or release?* YES **NO**

The nearest mapped surface water body is a tributary to Cogdel's Creek located approximately 2,200 feet south of the potential source area. The storm water retention pond located approximately 290 feet west of the source area is a manmade structure.

*If **YES**, does the maximum groundwater contaminant concentration exceed the surface water quality standards and criteria found in 15A NCAC 2B.0200 by a factor of 10?* YES **NO**

8. *Is the source area of the discharge or release located within an approved or planned wellhead protection area as defined in 42 USC 300h-7(e)?* YES **NO**
If YES describe.

Wellhead protection areas defined by 42 USC 300h-7(e) have not, as of this time, been designated by the State. However, MCB Camp Lejeune has identified wellhead protection areas on the base. Based on the most recent Wellhead Protection Plan – 2002 Update, the potential source area is not located within a proposed wellhead protection area.

9. *Is the release located in the Coastal Plain physiographic region as designated on a map entitled "Geology of North Carolina" published by the Department in 1985?* **YES** NO

As identified in the Geologic Map of North Carolina (North Carolina Department of Natural Resources and Community Development 1985), the subject site lies within the Coastal Plain Physiographic Province. Figure 3 illustrates the subject site location in reference to the Geologic Map of North Carolina Coastal Plain physiographic province.

If YES, is the source area of the release located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer that is being used or may be used as a source of drinking water? **YES** NO
If YES describe

The potential source area is located just above an apparent unconfined surficial groundwater aquifer. While there is the potential for recharge by rainfall to the unconfined surficial aquifer at the Base, the surficial aquifer is not used for water supply aboard MCB, Camp Lejeune. Groundwater obtained from the Castle Hayne Aquifer is the raw water source for the MCB, Camp Lejeune potable water treatment facilities. To determine if current petroleum contaminants in the site surficial aquifer could recharge to deeper unconfined or semi-confined aquifer(s), that are or may potentially be utilized as a drinking water source(s), the subject site findings were compared to available data from the MCB Hadnot Point Fuel Farm project (Incident No.'s 3671, 10615 and 27788). The potential Michael Road Fuel Farm source area is located within the boundary of the MCB Hadnot Point Fuel Farm project. The following data was obtained from the report entitled "Identification, Correlation, and Assimilation of Organic Subsurface Soils, Hadnot Point Fuel Farm" dated June 19, 2002.

The Castle Hayne confining unit, where present, appeared to be highly incised by possible paleochannels and other such geologic features that would enable the vertical movement of fluids. Recharge to Coastal Plain aquifers occurs predominantly through direct surface recharge by rainfall in interstream areas (Cardinell, et al, 1995).

The screen interval for the potable water well (PSW HP 642) nearest to the potential source area is 112 to 196 feet BLS or within the Castle Hayne Aquifer (A&H, August 2002). As previously stated, no information provided indicates a water supply well has been contaminated as a result of the release from the MRFF source area.

10. *Do the levels of groundwater contamination for any contaminant exceed the gross contamination levels established by the Department?* YES **NO**

Laboratory analysis of the surficial groundwater samples from site monitoring wells UST1070-MW01 and UST1070-MW02 revealed all EPA Methods 602, 625, MADEP VPH and EPH parameters were well below applicable GCLs.

Part II - Land Use

Property Containing Source Area of Release

The questions below pertain to the property containing the source area of the release.

1. *Does the property contain one or more primary or secondary residences (permanent or temporary)?* YES **NO**
Describe.

MCB, Camp Lejeune does contain primary and secondary residences, however, they are more than 1,500 feet from the potential source area.

2. *Does the property contain a school, daycare center, hospital, playground, park, recreation area, church, nursing home, or other place of public assembly?* YES **NO**
Describe.

MCB, Camp Lejeune does contain above described places of public assembly; however, they are more than 1,500 feet from the potential source area.

3. *Does the property contain a commercial (e.g., retail, warehouse, office/business space, etc.) or industrial (e.g., manufacturing, utilities, industrial research and development, chemical/petroleum bulk storage, etc.) enterprise, an inactive commercial or industrial enterprise, or is the land undeveloped?* **YES** NO
Describe.

The nearest building is 1070, a slab on grade office building for MRFF, located approximately 800 feet south west of the potential source area.

4. *Do children visit the property?* YES **NO**
Explain.

Children are not expected to visit the property.

Is access to the property reliably restricted consistent with its use (e.g., by fences, security personnel or both)? **YES** NO
Explain.

There is a security fence around the perimeter of the MRFF facility and access is restricted to military vehicles. In addition military and civil service personnel operate the facility.

5. *Do pavement, buildings, or other structures cap the contaminated soil?* YES **NO**
Describe.

The potential source area is capped by grass-covered topsoil.

If YES, what mechanisms are in place or can be put into place to ensure that the contaminated soil will remain capped in the foreseeable future?

6. *What is the zoning status of the property?*

While MCB, Camp Lejeune is not subject to local or county-zoning requirements; MRFF is located within an area considered as Industrial/Commercial use.

7. *Is the use of the property likely to change in the next 20 years?* YES **NO**
Explain.

The current use of the local MCB, Camp Lejeune area is not likely to change in the near future.

Property Surrounding Source Area of Release
The questions below pertain to the area within 1,500 feet of the source area of the release (excludes property containing source area of the release):

1. *What is the distance from the source area of the release to the **nearest** primary or secondary residence (permanent or temporary)?*

Primary and secondary residence areas are greater than 1,500 feet from the potential source area.

2. *What is the distance from the source area of the release to the **nearest** school, daycare center, hospital, playground, park, recreation area, church, nursing home or other place of public assembly?*

There were no places of public assembly identified within a 1,500 feet radius of the potential source area (See Figure 1).

3. *What is the zoning status of properties in the surrounding area?*

MCB, Camp Lejeune is not subject to local or county zoning requirements. However, MRFF is located within an Industrial/Commercial use area.

4. *Briefly characterize the use and activities of the land in the surrounding area.*

MRFF is a facility for storing and distributing mixed fuel to military vehicles. Military use of the surrounding properties are storage, railroad transport yard, and military/civil service office buildings.

C. RECEPTOR INFORMATION

1. Water Supply Wells

The nearest active potable water well is PSW HP-642. This well is located approximately 2,300 feet to the east-southeast of the source area.

2. Public Water Supplies

Are public water supplies available within 1,500 feet of the source area of the release?

YES NO

If YES, where is the location of the nearest public water lines and the source(s) of the public water supply (indicate on map). Describe.

Public water is provided to building AS 1070, as well as other buildings within 1,500 feet of the potential source area by water mains, which carry, treated potable water. Potable water is supplied to the site and surrounding areas by the MCB, Camp Lejeune water supply system. Groundwater obtained from the Castle Hayne Aquifer is the raw water source for the MCB, Camp Lejeune potable water treatment facilities.

3. Surface Water

The nearest mapped surface water body is a tributary to Cogdel's Creek located approximately 2,200 feet south of the potential source area.

4. Wellhead Protection Areas

MCB Camp Lejeune has identified wellhead protection areas on the base. Based on the most recent Wellhead Protection Plan – 2002 Update, the potential source area is not located within a proposed wellhead protection area.

5. Deep Aquifers in the Coastal Plain Physiographic Region

To determine deep aquifers underlying the subject site was profiled in the "Visual Hydrogeologic

Framework" of the NCDENR Division of Water Resources website (VHF website). Including the Surficial aquifer there are eleven identified aquifers (seven principal aquifers and four minor ones) within the North Carolina Coastal Plain Physiographic Region. A borehole identified as Hadnot Point Station was installed approximately 1.86 miles from the potential source area to a depth of approximately 1,520 feet BLS. A copy of the Hadnot Point Station borehole data has been provided in Appendix A. Subsurface aquifers identified from this borehole in order of increasing depth were as follows: Surficial, Castle Hayne, Pee Dee, Black Creek, Upper Cape Fear, and Lower Cape Fear. The principal aquifer utilized for potable water in the area of MCB, Camp Lejeune is the Castle Hayne Aquifer.

6. Subsurface Structures

Numerous underground utilities are present throughout MRFF facility. These utilities are reportedly located above the surficial groundwater table (± 7 feet BLS) and therefore, are not considered potential receptors.

7. Property Owners and Occupants

The subject site is owned and operated by the Commanding General – Marine Corps Base, Camp Lejeune. Refer to Table 1.

D. SITE GEOLOGY AND HYDROGEOLOGY

D.1 Site Geology

Description to the subsurface geology encountered at the site can be summarized as follows:

UST1070-MW01			UST1070-MW02	
Depth in feet BLS	Soil Description	USCS	Soil Description	USCS
0	Olive/Tan, silty fine grained sands, few organics	SM	Tan, fine sand, few fines (Fill)	SP
1				
2				
3				
4				
5	Black, organic, fine grain sands with organic fines	OH		
6				
7				
8	Light grey, silty fine grained sands	SM	Olive, fine to medium grained sand, few fines	
9				
10				
11				
12			Light grey, silty fine grained sands	SM
13				
14				
15				
16			Organic clayey sand	OH
17			Same as 12 to 15 feet BLS	SM

APPENDIX B

LABORATORY REPORTS AND CHAIN OF CUSTODY DOCUMENTATION FROM JANUARY 2006 GROUNDWATER SAMPLING EVENT

Mr. Chris Murray
Sovereign Consulting
606 Thimble Shoals Rd.
Suite A1
Newport-News VA 23606
Report Number: G650-20

Client Project: 1070 (MSFF)

Dear Mr. Murray:

Enclosed are the results of the analytical services performed under the referenced project. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of five years in the event they are required for future reference. Any samples submitted to our laboratory will will be retained for a maximum of thirty (30) days from the date of this report unless other arrangements are requested.

If there are any questions about the report or the services performed during this project, please call Paradigm at (910) 350-1903. We will be happy to answer any questions or concerns which you may have.

Thank you for using Paradigm Analytical Labs for your analytical services. We look forward to working with you again on any additional analytical needs which you may have.

Sincerely,
Paradigm Analytical Laboratories, Inc.

1/25/06

Laboratory Director — Date
J. Patrick Weaver

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Sovereign Consulting

Project Name: 1070 (MSFF)

Sample Information and Analytical Results	
Sample Identification	UST1070-MW02
Sample Matrix	Water
Collection Option (for Soil)*	
Date Collected	01/12/06
Date Received	01/12/06
Date Extracted	01/19/06
Date Analyzed	01/19/06
Dry Weight	
Dilution Factor	1
C_5-C_8 Aliphatics**	< 100 (µg/L)
C_9-C_{12} Aliphatics**	< 100 (µg/L)
C_9-C_{10} Aromatics**	< 100 (µg/L)
Surrogate % Recovery - PID	98
Surrogate % Recovery - FID	110

* = Option 1 = Established fill line on vial, Option 2 = Sampling Device/Brand, or Option 3 = Field weight of soil.

** = Excludes any surrogates or internal standards.

Lab Info: g650-20-1a

Reviewed By: RW

Attachment 2

VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 10/31/05 PID Initial Calibration Date: 10/31/05

Calibration Ranges and Limits

Range	MDL (07/15/2004) (µg/L)	ML (µg/L)	RL (µg/L)	RL (mg/Kg)
C_5-C_8 Aliphatics	4.4	14	100	10
C_9-C_{12} Aliphatics	3.4	11	100	10
C_9-C_{10} Aromatics	0.13	0.41	100	10

Calibration Concentration Levels

Range	Levels (µg/L)	%RSD or CCC	Method of Quantitation
C_5-C_8 Aliphatics	40	7.9	Calibration Factor
	1000		
	2000		
	3000		
	4000		
C_9-C_{12} Aliphatics	10	1.00	Linear Regression
	250		
	500		
	750		
	1000		
C_9-C_{10} Aromatics	10	16.20	Calibration Factor
	250		
	500		
	750		
	1000		

Calibration Check Date: 01/18/06

Calibration Check

Range	Levels (µg/L)	Levels (mg/Kg)	RPD
C_5-C_8 Aliphatics	2000	200	1.1
C_9-C_{12} Aliphatics	500	50	-5.9
C_9-C_{10} Aromatics	500	50	17.2

MDL = Method Detection Limit
ML = Minimum Limit
RL = Reportable Limit
RPD = Relative Percent Difference
%RSD = Percent Relative Standard Deviation
CCC = Correlation Coefficient of Curve

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Sovereign Consulting

Project Name: 1070 (MSFF)

Sample Information and Analytical Results	
Sample Identification	UST1070-MW02
Sample Matrix	Water
Date Collected	01/12/06
Date Received	01/12/06
Date Extracted	01/16/06
Date Analyzed	01/18/06
Dry Weight	
Dilution Factor	1
C_9-C_{18} Aliphatics*	< 100 (ug/L)
C_{19}-C_{36} Aliphatics*	< 100 (ug/L)
C_{11}-C_{22} Aromatics*	< 100 (ug/L)
Aliphatic Surrogate % Recovery	20
Aromatic Surrogate % Recovery	20

Comments:

* = Excludes any surrogates or internal standards.
Sample did not require fractionation.
Insufficient volume to confirm low surrogates.

Lab info: G650-20-1D

Reviewed By: [signature]

Attachment 3

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 12/28/05

Calibration Ranges and Limits

Range	MDL (2/2004) (µg/L)	ML (µg/L)	RL (µg/L)	RL (mg/Kg)
C_9-C_{18} Aliphatics	3.84	12.2	100	10
C_{19}-C_{36} Aliphatics	0.57	1.8	100	10
C_{11}-C_{22} Aromatics	4.54	14.4	100	10

Calibration Concentration Levels

Range	Levels (µg/mL)	%RSD or CCC	Method of Quantitation
C_9-C_{18} Aliphatics	6	24.90	Calibration Factor
	30		
	60		
	120		
	240		
C_{19}-C_{36} Aliphatics	8	15.4	Calibration Factor
	40		
	80		
	160		
	320		
C_{11}-C_{22} Aromatics	17	9.8	Calibration Factor
	85		
	170		
	340		
	680		

Calibration Check Date: 01/18/06

Calibration Check

Range	Levels (µg/mL)	RPD
C_9-C_{18} Aliphatics	120	21.5
C_{19}-C_{36} Aliphatics	160	13.6
C_{11}-C_{22} Aromatics	340	17.0

MDL = Method Detection Limit
ML = Minimum Limit
RL = Reportable Limit
RPD = Relative Percent Difference
%RSD = Percent Relative Standard Deviation
CCC = Correlation Coefficient of Curve

List of Reporting Abbreviations and Data Qualifiers

B = Compound also detected in batch blank

BQL = Below Quantitation Limit

DF = Dilution Factor

Dup = Duplicate

D = Detected, but RPD is > 40% between results in dual column method.

E = Estimated concentration, exceeds calibration range.

J = Estimated concentration, below calibration range and above MDL

LCS(D) = Laboratory Control Spike (Duplicate)

MDL = Method Detection Limit

MS(D) = Matrix Spike (Duplicate)

PQL = Practical Quantitation Limit

RL = Reporting Limit

RPD = Relative Percent Difference

mg/kg = milligram per kilogram, ppm, parts per million

ug/kg = micrograms per kilogram, ppb, parts per billion

mg/L = milligram per liter, ppm, parts per million

ug/L = micrograms per liter, ppb, parts per billion

% Rec = Percent Recovery

% soilds = Percent Solids

Special Notes:

1) Metals and mercury samples are digested with a hot block, see the standard operating procedure document for details.

2) Uncertainty for all reported data is less than or equal to 30 percent.

MI34.092205.2

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(1)

CLIENT: SOVEREIGN Consulting, Inc

CONTACT: THERESA ELLERMAN PHONE NO: 910 526-3941

PROJECT: SITE/PWSID#: 1070 (MSFF)

REPORTS TO: Cell: (757) 777-8982
Chris Murray FAX NO.: (757) 794-9227

INVOICE TO: QUOTE #

Chris Murray P.O. NUMBER NV008

SGS Reference: G650-20

PAGE 1 OF 1

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE (C=COMP G=GRAB)	Preservatives Used	Analysis Required (3) VPH	BPH	REMARKS
	UST1070-MW02	1/12/06	1035	W	3		HCl HCl	2	1	Email Results to: cmurray@sovcon.com USE "EDD" FORMAT

(5)

Collected/Relinquished By:(1)	Date	Time	Received By:
THERESA ELLERMAN	1/12/06	1620	
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date	Time	Received By:

(4)

Shipping Carrier:

Shipping Ticket No:

Special Deliverable Requirements:

Samples Received Cold? (Circle) YES NO

Temperature ∫C: 5.8C

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

❑ 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
❑ 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557
❑ 1258 Greenbrier Street Charleston, WV 25311 Tel: (304) 346-0725 Fax: (304) 346-0761

White - Retained by Lab
Yellow - Returned with Report
Pink - Retained by Sampler