COMPREHENSIVE SITE ASSESSMENT ADDENDUM

BUILDING AS-840, AIRCRAFT HANGER FACILITY
ABOVEGROUND STORAGE TANK DISTRIBUTION FUEL LINE RELEASE

MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

JANUARY 6, 2004

LATITUDE: 34° 42' 30"
LONGITUDE: 77° 25' 59"

SITE INFORMATION		RELEASE INFORMATION		
NCDENR Incident No.	PENDING	**Product Released**	Diesel Fuel	Gasoline
Facility Identification No.	N/A	**Date Discovered**	Confirmed April of 2000	Confirmed April of 2001
Risk Classification	PENDING	**Estimated Quantity**	Unknown	Unknown
Site Priority Ranking	PENDING	**Cause of Release**	Breach in Pipeline	Unknown
NCDENR Assigned Land Use	Industrial/ Commercial	**Source of Release**	Underground Fuel Distribution Line	Unknown

CONTRACT NO. N62470-01-D-3009
DELIVERY ORDER NO. 0089
CATLIN PROJECT NO. 203-060

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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
ARO	Asheville Regional Office
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
CATLIN	CATLIN Engineers and Scientists (Formerly RC&A)
CFR	Code of Federal Regulations
Cr	Chromium
CSA	Comprehensive Site Assessment
CNP	Carbon Nitrogen Phosphorous
CPT	Cone Penetrometer Test
DEM	Division of Environmental Management
DIPE	Diisopropyl 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
EAD	Environmental Affairs Department
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
FOD	Foreign Object Debris
FRO	Fayetteville Regional Office
FT	Feet

GCL	Gross Contaminant Level
GIS	Geographic Information System
GPS	Global Positioning System
Guidelines Vol. I	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume I, Sources Other Than Petroleum Underground Storage Tanks (May 1998)
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
LANTDIV	Atlantic Division
LSA	Limited Site Assessment
LUST	Leaking Underground Storage Tank
m-	meta
m	meter
MADEP	Massachusetts Department of Environmental Protection
MCALF	Marine Corps Auxiliary Landing Field
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCOLF	Marine Corps Outlying Landing Field
MDL	Method Detection Limit
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
MRO	Mooresville Regional Office
MSCC	Maximum Soil Contaminant Concentration
MSL	Mean Sea Level
MTBE	Methyl tertiary butyl ether
µg/Kg	Micrograms per Kilogram
µg/L	Micrograms per Litre
NA	Not Analyzed
N/A	Not Applicable
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NCDOC	North Carolina Department of Corrections
NCDOT	North Carolina Department of Transportation
NCSP	North Carolina State Plane
NCSPA	North Carolina State Ports Authority
NE	None Established
NM	Not Measured
NMT	No Measurable Thickness
NS	Not Sampled

o-	ortho
OVA	Organic Vapor Analyzer
p-	para
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
ROI	Radius of Influence
RRO	Raleigh Regional Office
SOW	Scope of Work
STGW	Soil-to-Groundwater
SVE	Soil Vapor Extraction
SVOC	Semi Volatile Organic Compound
TDHF	Toxicologically Defined Hydrocarbons Fractions
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Tentatively Identified Compound
TKN	Total Kjeldahl Nitrogen
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
WaRO	Washington Regional Office
WiRO	Wilmington Regional Office
WSRO	Winston-Salem Regional Office

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MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

JANUARY 6, 2004

EXECUTIVE SUMMARY

The purpose of this Comprehensive Site Assessment Addendum (CSAA) was to further define the extent of soil and groundwater contamination and free product accumulation in the vicinity of Building AS-840 aboard Marine Corps Air Station (MCAS), New River, North Carolina.

In April of 2000 a breach in an underground distribution line utilized to transport fuel oil from an Aboveground Storage Tank (AST) to a boiler within Building AS-840 was reported. J.A. Jones Environmental Services (J.A. Jones) removed and replaced the distribution line effectively removing the primary source of fuel oil. Subsequently, Law Engineering and Environmental Services, Inc. (LAW) prepared a Comprehensive Site Assessment (CSA) report which involved installation of eight direct push boreholes for the collection of soil samples, and the installation of eight temporary piezometers and six permanent monitoring wells for the collection of groundwater samples. The CSA investigation partially delineated vadose zone soil, free-phase product, and dissolved surficial groundwater contamination at the subject site. This CSAA investigation was conducted in response to a North Carolina Division of Environment and Natural Resources (NCDENR) request for additional assessment of groundwater quality data within the site radar tower area.

This CSAA project consisted of the installation of two (2) shallow (Type II) surficial groundwater monitoring wells northeast of the source area, within the fenced radar tower area. During each monitoring well borehole installation, a soil sample was obtained from just above the apparent capillary fringe. An independent, off-base laboratory analyzed each soil sample for selected volatile organic compounds, semi-volatile organic compounds, and hydrocarbon fractions per the following methods:

- EPA 8260/5030 Preparation
- EPA 8270
- MADEP VPH/EPH

Following complete installation of the additional monitoring wells, representative groundwater samples were obtained from each well. An independent, off-base laboratory analyzed the groundwater samples for selected volatile organic compounds, semi volatile organic compounds, and hydrocarbon fractions per the following methods:

- EPA 602+MTBE
- EPA 625+TICs
- MADEP VPH/EPH

Based on the CSA and CSAA investigation findings, the source area at the subject site has been delineated. The site vadose zone soils and surficial groundwater remain impacted with relatively low levels of free-phase product and relatively low concentrations of compounds of concern. A more detailed review of the source area is as follows:

Source Area –Vadose Zone Soil Compounds of Concern

- 2-Methylnaphthalene at two locations, SB02 3-4 feet BLS (5.3 mg/Kg) and SB06 1-2 feet BLS (10.0 mg/Kg); greater than Soil-to-Groundwater MSCC of 3 mg/Kg.
- Naphthalene at two locations SB02 3-4 feet BLS (1.5 mg/Kg) and SB06 1-2 feet BLS (2.2 mg/Kg); greater than Soil to Groundwater MSCC of 0.58 mg/Kg.
- C_9-C_{22} Aromatics at three locations, SB02 3-4 feet BLS (46 mg/Kg) and SB06 1-2 feet BLS (134 mg/Kg); greater than Soil to Groundwater MSCC of 34 mg/Kg.

Source Area – Surficial Groundwater Compounds of Concern

- Benzene - two locations PZ03 (140 ug/L) and PZ02 (2 ug/L); greater than 2L GWQS of 1ug/L.
- Ethylbenzene - one location PZ03 at 130 ug/L; greater than 2L GWQS of 29 ug/L.
- Naphthalene - one location PZ03 at 300 ug/L; greater than 2L GWQS of 21 ug/L.
- C_5-C_8 Aliphatics - one location PZ03 at 800 ug/L; greater than IGWQS of 210 ug/L.
  C_9-C_{22} Aromatics – two locations PZ03 (1,020 ug/L) and MW-7 (<3,100 ug/L); greater than IGWQS of 420 ug/L.

Source Area – Free-Phase Product

- Free-phase product remains evident at site groundwater monitoring well MW02. During the latest (October 23, 2003) CSAA site visit 0.48 feet of free phase product was gauged at monitoring well MW02.

Utilizing the "North Carolina Groundwater Contamination Incident Management Site Priority Ranking Form" a proposed site ranking of 60/E was determined. The 60/E rank classifies the site as a low priority risk. However, in order for the subject site to receive regulatory closure under 15A NCAC 2L .0106(m), NCDENR will likely require a Corrective Action Plan (CAP). This CAP should include the following site remediation goals:

- Remediate the site soil vadose zone compounds of concern to a concentration at or below current applicable MSCCs.
- Removal of free-phase product at MW-02.
- Remediate surficial groundwater dissolved compounds of concern concentrations to at or below applicable 2L GWQS. NCDENR requires four consecutive compliant sample events before considering an incident for "No Further Action".

A copy of this report should be forwarded to the NCDENR WiRO.

BUILDING AS-840, AIRCRAFT HANGER FACILITY
ABOVEGROUND STORAGE TANK DISTRIBUTION FUEL LINE RELEASE

MARINE CORPS AIR STATION
NEW RIVER, NORTH CAROLINA

1.0 TITLE PAGE

Date Of Report: January 6, 2004
Facility ID: N/A UST Incident Number (if known): Pending
Site Name: AS-840
Site Location: Marine Corps Air Station, New River
Nearest City/Town: Jacksonville County: Onslow
Risk Classification: Pending Land Use Classification: Residential

AST Owner: Commanding General – MCB Camp Lejeune
Attn: Director I&E/EMD/EQB
Address: PSC 20004
MCB Camp Lejeune, NC 28542-0004 Phone: (910) 451-5068

AST Operator: Same as above
Address: Same as above Phone: Same as above

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

Property Occupant: Marine Corps personnel
Address: AS-840, New River Air Station Phone: Unknown

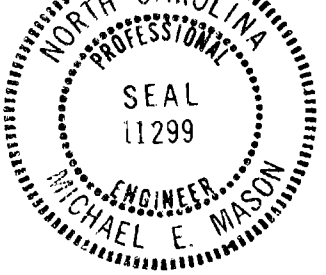
Consultant/Contractor: CATLIN Engineers and Scientists
Address: 220 Old Dairy Road, Wilmington, North Carolina 28405 Phone: (910) 452-5861

Release Information

Date Discovered: Diesel Fuel – April, 2000; Gasoline - April, 2001
Longitude: N 77.25.59 **Latitude:** W 34.42.30
Estimated Quantity of Release: Diesel Fuel – Unknown; Gasoline - Unknown
Cause of Release: Diesel Fuel – buried distribution line leak; Gasoline - Unknown
Source of Release (e.g. Piping/UST):
Diesel Fuel – buried distribution line leak; Gasoline - Unknown

Sizes and contents of AST system from which the release occurred:
Non-regulated, non-commercial, 2,900-gallon fuel oil AST and associated distribution line, for a boiler System within Building AS-840.

I, **Michael E. Mason** a Professional Engineer/Licensed Geologist (**circle one**) for CATLIN Engineers and Scientists, do certify that the information contained in this report is correct and accurate to the best of my knowledge.



(Please Affix Seal and Signature)

2.0 INTRODUCTION

2.1 AUTHORIZATION

A written report entitled *Comprehensive Site Assessment Report, Aboveground Storage Tank Fuel Distribution Line Release, Building AS-840, Aircraft Hanger Facility Marine Corp Air Station New River, North Carolina, October 23, 2001*, was submitted to NCDENR WiRO. In a "Review of CSA" letter dated August 29, 2002, the NCDENR WiRO requested additional assessment of surficial groundwater quality northeast of the AST, within the building AS-840 site radar tower area. CATLIN Engineers and Scientists (CATLIN) were authorized to perform the additional assessment activities, or CSAA, by the LANTDIV NAVFACENGCOM in accordance with the Order of Supplies Contract Number N62470-01-D-3009, Delivery Order Number 0089.

2.2 PURPOSE OF INVESTIGATION

(Refer to Figures 1 and 2)

The CSA findings partially delineated soil vadose zone, free phase product, and dissolved surficial groundwater contamination due to the diesel fuel release from an underground distribution line associated with Building AS-840. Within the same area of interest, remnants of a previously unknown gasoline release were also detected. The purpose of this investigation was to complete the site assessment by assessing the subsurface soil and surficial groundwater quality to the northeast of the source area, or within the site radar tower area. See Figure 1 for the site map location map. Figure 2 illustrates the layout of subject site AS-840, aboard MCAS, New River, North Carolina.

2.3 SCOPE OF WORK

(Refer to Appendix A)

The project consisted of the installation of two (2) shallow (Type II) surficial groundwater monitoring wells northeast of the source area, within the fenced radar tower area. During each monitoring well borehole installation, one soil sample was obtained, just above the apparent capillary fringe. An independent, off-base laboratory analyzed each soil sample for selected volatile organic compounds, semi volatile organic compounds, and hydrocarbon fractions per the following methods:

- EPA 8260/5030 Preparation
- EPA 8270

Following installation of the additional monitoring wells, representative groundwater samples were obtained from each well. An independent, off-base laboratory analyzed the groundwater samples for selected volatile organic compounds, semi volatile organic compounds, and hydrocarbon fractions per the following methods:

- EPA 602+MTBE
- EPA 625+TICs

All CATLIN fieldwork and sample protocol was conducted in accordance with NCDENR regulations and CATLIN Standard Methods of Investigation. A copy of the CATLIN Standard Methods of Investigation has been provided in Appendix A.

For state regulatory compliance the resulting soil sample volatile organic compounds, semi-volatile organic compounds, and hydrocarbon fractions concentrations have been compared to applicable residential or soil-to-groundwater MSCCs (whichever are lower) in accordance with the *2000 Guidelines*. The groundwater sample volatile organic compounds, semi-volatile organic compounds, and hydrocarbon fractions concentrations have been compared to applicable interim and established 2L GWQS.

3.0 PREVIOUS INVESTIGATIONS, REMEDIATION, AND/OR CLOSURE

(Refer to Appendix B)

Following the discovery of the release, environmental activities at the subject site included, initial abatement efforts and a CSA investigation. A report entitled *Comprehensive Site Assessment Report, Aboveground Storage Tank Fuel Distribution Line Release, Building AS-840, Aircraft Hanger Facility Marine Corp Air Station New River, North Carolina, October 23, 2001*, completed by LAW concerns the initial site abatement and CSA findings and is on file at the NCDENR-WiRO. Findings of the previous site initial abatement efforts and CSA activities have been summarized as follows:

Initial Abatement Measures –J. A. Jones Environmental Services, April 2000

- The original underground pipeline was replaced with a double walled fuel distribution line effectively removing the primary source.

- Ten soil samples were obtained from along the former pipeline, for EPA Method 5030/8015 (TPH-diesel) and 3550/8015 (TPH-gasoline) analyses. Laboratory analysis revealed TPH-diesel and TPH-gasoline concentrations in excess of NCDENR Action Levels in six of the ten soil samples. The J.A. Jones Environmental Services soil sample data has not been included in this CSAA.

Comprehensive Site Assessment Report –Law Engineering and Environmental Services, Inc., October 23, 2001

In accordance with the *2000 Guidelines*, the CSA included information regarding the following:

SITE HISTORY AND SOURCE CHARACTERIZATION
Site History and Operations
Contaminant Source Inventory
Release Incident History

POTENTIAL RECEPTOR SURVEY
Water Supply Well Inventory
Public Water Supplies
Surface Water Bodies
Wellhead Protection Areas
Deep Aquifers in the Coastal Plain Physiographic Region
Subsurface Structures
Land Use
Property Owner and Occupants

REGIONAL GEOLOGY AND HYDROGEOLOGY
Regional Geology
Regional Hydrogeology

CSA findings in regard to site areas of environmental concern can be summarized as follows:

- Free-phase product (>0.02') was detected at site monitoring well MW-02 and piezometer PZ-05. Site free-phase product data has been updated.

- Soil samples collected during the CSA activities were analyzed for selected volatile organic compounds, semi-volatile organic compounds, and hydrocarbon fractions per EPA Methods 8260, 8270, and MADEP VPH/EPH. Resulting laboratory analysis revealed concentrations of benzene, 2-methylnaphthalene, naphthalene, and aromatic fraction C9-C22 Aromatics in excess of NCDENR current Soil-to-Groundwater Maximum Soil Contaminant Concentrations (MSCCs).

- Groundwater samples collected during the LAW CSA were analyzed for selected volatile, semi volatile organic compounds, and hydrocarbon fractions per EPA Methods 602+xylenes, 625+TICs, and MADEP VPH/EPH. Resulting laboratory analysis revealed concentrations of benzene, ethylbenzene, naphthalene, and C5-C8 Aliphatics and C9-C22 Aromatics in excess of current interim and established 2L GWQS.

Utilizing the data in the LAW CSA and Marine Corp Base, Camp Lejeune Wellhead Protection Plan–2002 Update (AH Environmental Consultants, 2002) in the "North Carolina Groundwater Contamination Incident Management Site Priority Ranking Form" a proposed site priority rank of **60/E** was determined. A copy of the proposed Site Priority Ranking Form has been provided in Appendix B.

4.0 ADDITIONAL ASSESSMENT ACTIVITIES

(Refer to Appendix C)

CATLIN contacted Building AS-843 personnel to inform them of the planned site drilling activities, and to ensure the drill schedule did not conflict with site operation activities. Professional Locating Service checked the proposed monitoring well locations for potential conflicts with subsurface utilities. On October 3, 2003 CATLIN installed two shallow (Type II) groundwater monitoring wells. Monitoring well boreholes were installed to a total depth of 14 feet BLS, with a Diedrich D-25 hollow auger rig, operated by a North Carolina certified driller. Each monitoring well was constructed of 2-inch diameter, schedule 40 PVC pipe, with a screen interval (0.010 slot) from 4 to 14 feet BLS. The two additional Type II wells monitoring wells CATLIN installed were identified as wells ASTAS840-MW07 and ASTAS840-MW08. A copy of the Well Log and Well Construction Records has been provided in Appendix C.

5.0 SOIL SAMPLING METHODS

(Refer to Appendix D)

During the CSAA activities, CATLIN personnel obtained subsurface soil samples while installing the borehole for monitoring wells MW07 and MW08. At each monitoring well borehole, soil samples were taken from the 0 to 2 foot BLS interval with a decontaminated split spoon and placed in clean laboratory sample glassware. Each soil sample was labeled with the borehole ID, sample date, site name, sampler, and placed in an iced cooler. The samples were then delivered to Paradigm Analytical Laboratories, Inc. (Paradigm; North Carolina Certification #481) in Wilmington, North Carolina. In accordance with the *2000 Guidelines*, site soil samples obtained for the CSAA were analyzed for potential hydrocarbon compound concentrations per the following methods:

- EPA Method 8260B/5035
- EPA Method 8270
- MADEP VPH/EPH *

* - Although not required by the *2000 Guidelines*, as part of the LAW CSA, soil samples were analyzed per MADEP VPH/EPH and revealed a hydrocarbon fraction (C_9-C_{22} Aromatics) of concern. Consequently soil samples for this investigation for this investigation were also analyzed per MADEP VPH/EPH.

A copy of the resulting laboratory report has been provided in Appendix D. Analysis of the soil samples obtained during the CSA and CSAA investigations can be summarized as follows:

5.1 *VOLATILE ORGANIC COMPOUNDS - EPA METHOD 8260B/5035*

(Refer to Table 1 and Figure 3)

Analysis of the site CSA and CSAA soil samples for volatile organic compounds per EPA Method 8260B/5035 revealed one compound of concern at the following locations:

Borehole ID	Sample Depth (feet BLS)	Compound Of Concern	Concentration (mg/Kg)	Soil to Groundwater MSCC Residential MSCC
SB05	5-6	Benzene	**0.018**	**0.0056** 22
SB06	5-6	Benzene	**0.028**	**0.0056** 22

NOTE –In reviewing the CSA and CSAA field data the depth to surficial water table, within the SB05 and SB06 area has ranged from approximately 5.2 to 6.3 feet below the BLS. Therefore, the SB05 (5-6) and SB06 (5-6) soil sample locations are within the apparent seasonal high water table zone and have not been considered representative of subsurface vadose zone soil contamination.

Analytical results for the remaining EPA Method 8260B/5035 compounds revealed concentration levels that were either BQL or below applicable Soil to Groundwater and Residential MSCCs.

A summary of the EPA Method 8260B/5035 laboratory report data regarding CSAA soil samples has been listed on Table 1. CSA and CSAA data regarding benzene concentration levels, in relation to the site map, have been summarized on Figure 3.

5.2 *SEMI-VOLATILE ORGANIC COMPOUNDS - EPA METHOD 8270*

(Refer to Table 2 and Figure 4)

Analysis of the site CSA and CSAA soil samples for volatile organic compound concentrations per EPA Method 8270 revealed two compounds of concern at the following locations:

Borehole ID	Sample Depth (feet BLS)	Compound Of Concern	Concentration (mg/Kg)	Soil to Groundwater MSCC Residential MSCC
SB02	3-4	2-Methyl naphthalene	**5.3**	**3** 63
		Naphthalene	**1.5**	**0.58** 63
SB06	1-2	2-Methyl naphthalene	**10.0**	**3** 63
		Naphthalene	**2.2**	**0.58** 63

Analytical results for the remaining EPA Method 8270 compounds revealed

concentration levels that were either BQL or below applicable Soil-to-Groundwater and Residential MSCCs.

The EPA Method 8270 laboratory report data regarding CSAA soil samples has been summarized on Table 2. CSA and CSAA data regarding 2-Methylnapthalene and naphthalene concentration levels, in relation to the site map, have been summarized on Figure 4. The estimated horizontal extent of the primary EPA Method 8270 compounds of concern (2-Methylnapthalene and naphthalene) has also been illustrated on Figure 4.

5.3 HYDROCARBON FRACTIONS - MADEP VPH/EPH

(Refer to Tables 3A, 3B, and Figure 5)

Analysis of the CSA and CSAA soil samples for volatile organic compounds per MADEP VPH/EPH revealed one hydrocarbon fractions of concern at the following locations:

Borehole ID	Sample Depth (feet BLS)	Hydrocarbon Fraction	Concentration (mg/Kg)	Soil to Groundwater MSCC Residential MSCC
SB02	3-4	C_9-C_{22}	**46**	**34** 469
SB05	5-6	C_9-C_{22}	**60**	**34** 469
SB05	1-2	C_9-C_{22}	**134**	**34** 469

NOTE – In reviewing the CSA and CSAA field data the depth to surficial water table, within the SB05 area has ranged from approximately 5.2 to 6.3 feet below the BLS. Therefore, the SB05 (5-6) soil sample location is within the apparent seasonal high water table zone and has not been considered representative of subsurface vadose zone soil contamination.

Analytical results for the remaining MADEP VPH/EPH revealed hydrocarbon fractions revealed concentration levels that were either BQL or below applicable Soil-to-Groundwater and Residential MSCCs.

The MADEP VPH/EPH laboratory report data regarding CSAA soil samples has been summarized on Tables 3A and 3B. CSA and CSAA data regarding C_9-C_{22} Aromatics concentration levels, in relation to the site map, have been summarized on Figure 5. The estimated horizontal extent of the primary MADEP VPH/EPH hydrocarbon fraction of concern (C_9-C_{22} Aromatics) has also been illustrated on Figure 5.

6.0 GROUNDWATER SAMPLING METHODS

(Refer to Appendix D)

As detailed previously in Section 4.0, CATLIN personnel installed two additional shallow (Type II) monitoring wells to assess surficial groundwater within the area requested by NCDENR WiRO. On October 6, 2003 CATLIN gauged site monitoring wells MW07 and MW08 for depth to water table, potential free-phase product thickness, and to determine well volume. CATLIN purged a minimum of three well volumes from monitoring wells MW07 and MW08, prior to pumping surficial groundwater directly into laboratory sample glassware. All surficial groundwater samples were labeled with the well ID, sample date, site name, sampler, and placed in an iced cooler. Samples were then delivered to Paradigm Analytical Laboratories, Inc. (Paradigm; North Carolina Certification #481) in Wilmington, North Carolina. In accordance with the *2000 Guidelines*, surficial groundwater samples obtained from MW07 and MW08 were analyzed for potential petroleum hydrocarbon compound concentrations, in micrograms per liter (ug/L), per the following methods:

- EPA Method 602 + MTBE
- EPA Method 625 + TICs
- MADEP VPH/EPH *

* - Although not required by the *2000 Guidelines*, as part of the LAW CSA, groundwater samples were analyzed per MADEP VPH/EPH and revealed hydrocarbon fractions (C_5-C_8 Aliphatics and C_9-C_{22} Aromatics) of concern. Consequently groundwater samples for this investigation for this investigation were also analyzed per MADEP VPH/EPH.

A copy of the resulting laboratory report has been provided in Appendix D. Analysis of the groundwater samples obtained during the CSA and CSAA investigations are summarized as follows:

6.1 VOLATILE ORGANIC COMPOUNDS - EPA METHOD 602 PLUS MTBE

(Refer to Table 4 and Figure 6)

Analysis of the site CSA and CSAA groundwater samples for volatile organic compound concentrations per EPA Method 602 plus MTBE revealed two compounds of concern at the following location:

Well ID	Compound Of Concern	Concentration (ug/L)	2L GWQS
PZ02	Benzene	**2**	**1**
PZ03	Benzene	**140**	**1**
	Ethylbenzene	**130**	**29**

Analytical results for the remaining EPA Method 602 plus MTBE compound concentrations were either BQL or below applicable 2L GWQS.

A summary of the EPA Method 602 + MTBE laboratory report data regarding CSAA groundwater samples has been listed on Table 4. CSA and CSAA data regarding the primary EPA Method 602 + MTBE compounds of concern (benzene and Ethylbenzene) concentration levels, in relation to the site map, have been summarized on Figure 3. The estimated horizontal extent of surficial groundwater with benzene and Ethylbenzene concentrations in excess of applicable 2L GWQS have also been illustrated on Figure 6.

6.2 SEMI-VOLATILE ORGANIC COMPOUNDS - EPA METHOD 625 + TEN LARGEST NON-TARGET COMPOUNDS (TICS)

(Refer to Table 5 and Figure 7)

Analysis of the site CSA and CSAA groundwater samples for volatile organic compound concentrations per EPA Method 625 revealed one compound of concern at the following location:

Well ID	Compound Of Concern	Concentration (ug/L)	2L GWQS GCL
PZ03	Naphthalene	**300**	**21** 15,500

Analytical results for the remaining EPA Method 625 compound concentrations were either BQL or below applicable 2L GWQS.

A summary of the EPA 625 Method laboratory report data regarding CSAA groundwater samples has been listed on Table 5. CSA and CSAA data regarding the primary EPA Method 625 compound of concern (naphthalene) concentration levels, in relation to the site map, have been summarized on Figure 7. The estimated horizontal extent of surficial groundwater with naphthalene concentrations in excess of applicable 2L GWQS has been illustrated on Figure 7.

Ten (10) largest (peak area) non-target compounds, or TICs

In accordance with the *2000 Guidelines* EPA Method 625 sample(s) are also analyzed for the ten (10) largest (peak area) non-target compounds, or TICs. TICs refer to detected compounds, which are not present in the EPA Method 625 list of analysis compounds. Laboratory analysis of the CSAA surficial groundwater samples for the ten largest TICs can be summarized as follows:

MW-07

Ten TICs were detected in the MW-07 groundwater sample.

MW-08

No library search compounds were detected in the MW-08 groundwater sample.

6.3 HYDROCARBON FRACTIONS - MADEP VPH/EPH

(Refer to Tables 6A, 6B, and Figure 8)

The site CSA and CSAA groundwater samples were analyzed for MADEP VPH/EPH hydrocarbon fractions. Analysis results revealed one hydrocarbon fraction of concern at the following locations:

Well ID	Toxicological Defined Hydrocarbon Fraction of Concern	Concentration (ug/L)	Interim 2L GWQS
PZ03	C_9-C_{22} Aromatics	**1,020**	**210**
MW-07	C_9-C_{22} Aromatics	**<3,100**	**210**

Laboratory analysis for the remaining MADEP VPH/EPH hydrocarbon fraction concentrations were either BQL or below applicable interim 2L GWQS.

The CSA groundwater MADEP EPH/VPH analysis results have been listed on Tables 6A and 6B. CSA and CSAA data regarding the primary MADEP VPH/EPH hydrocarbon fraction (C_9-C_{22} Aromatics) concentration levels, in relation to the site map, have been summarized on Figure 8. The estimated horizontal extent of surficial groundwater with C_9-C_{22} Aromatics in excess of applicable interim 2L GWQS has been illustrated on Figure 8.

7.0 SURFICIAL GROUNDWATER TABLE

(Refer to Figure 9)

Once installation of the additional monitoring wells was completed, MW07 and MW08 TOC elevations were surveyed in relation to elevation of the existing site monitoring wells. CATLIN personnel gauged all site monitoring wells for depth to groundwater table, and potential free-phase product thickness, on October 23, 2003. The depth to groundwater table measurement was subtracted from the corresponding TOC elevation data to determine the latest surficial groundwater table elevations. The October 23, 2003 surficial groundwater table contours, illustrated on Figure 9, were generated by entering the groundwater elevation data for the site Type II monitoring wells into a contouring software program (AutoCAD Land Development).

A review of Figure 9 illustrates a relatively flat groundwater table and the apparent surficial groundwater flow within the source area is toward the northeast. To evaluate the surficial groundwater table hydraulic gradient, the difference in surficial water table elevations from site monitoring wells MW-01 (9.50 feet), and MW-08 (8.41 feet) was divided by the distance

between the wells (182 feet) to determine an approximate gradient of 0.005 foot per foot or 0.5%.

8.0 FREE-PHASE PRODUCT

(Refer to Figures 6, 7, and 8)

During the CSA investigation free-phase product was detected at temporary piezometer PZ05 (0.10') and monitoring well MW02 (0.22'). All of the site temporary piezometers were properly abandoned during the CSA investigation.

As discussed in Section 7.0 CATLIN gauged all site monitoring wells for depth to groundwater table, and potential free-phase product, on October 23, 2003. During this site visit 0.48 feet of free-phase product was gauged at monitoring well MW02. Free-phase product was not evident (>0.01') at the remaining site monitoring wells. The estimated horizontal extent of free-phase product has been illustrated on Figures 6 through 8.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 CONCLUSIONS

Based on the results of the CSA and CSAA investigations, the following conclusions are made:

Site Owner

The U.S. Government owns the AS-840 facility as well as the surrounding MCAS New River, North Carolina property.

Site Priority Rank

(Refer to Appendix B)

Utilizing the "North Carolina Groundwater Contamination Incident Management Site Priority Ranking Form" a proposed site ranking of **60/E** was determined. A copy of the proposed Site Priority Ranking Form has been provided in Appendix B.

Potable Water Supply

The MCAS water treatment plant currently supplies Building AS-840 as well as the local area with potable water. The raw water source for the MCAS water treatment plant is the Castle Hayne Aquifer.

Wellhead Protection Program

As of October 3, 2003, the State of North Carolina Public Water Supply Section does not list the MCAS New River, North Carolina as having an approved wellhead

protection plan. In reviewing the Marine Corp Base, Camp Lejeune Wellhead Protection Plan–2002 Update (AH Environmental Consultants, 2002), the nearest water supply well is PSWAS-4150 located approximately 7,000 feet west of the Building AS-840 source area.

Surface Water
(Refer to Figure 1)

The closest surface water body is the New River, located approximately 1,300 feet east of the Building AS-840 source area. Refer to Figure 1.

Source Area – Vadose Zone Soil Compounds of Concern

Soil EPA Method 8260B/5035

- Analysis of soil samples obtained from the site vadose zone revealed EPA Method 8260B/5035 parameter concentration levels that were either below quantitation limits or below applicable 2l GWQS.

Soil EPA Method 8270

- 2-Methylnaphthalene at two locations, SB02 3-4 feet BLS (5.3 mg/Kg) and SB06 1-2 feet BLS (10.0 mg/Kg); greater than Soil-to-Groundwater MSCC of 3 mg/Kg.
- Naphthalene at two locations SB02 3-4 feet BLS (1.5 mg/Kg) and SB06 1-2 feet BLS (2.2 mg/Kg); greater than Soil-to-Groundwater MSCC of 0.58 mg/Kg.

Soil MADEP VPH/EPH

- C_9-C_{22} Aromatics at three locations, SB02 3-4 feet BLS (46 mg/Kg) and SB06 1-2 feet BLS (134 mg/Kg); greater than Soil-to-Groundwater MSCC of 34 mg/Kg.

Source Area – Surficial Groundwater Compounds of Concern

Surficial Groundwater EPA Method 602 + MTBE

- Benzene - one location PZ03 at 140 ug/L; greater than 2L GWQS of 1 ug/L.
- Ethylbenzene - one location PZ03 at 130 ug/L; greater than 2L GWQS of 29 ug/L.

Surficial Groundwater EPA Method 625

- Naphthalene - one location PZ03 at 300 ug/L; greater than 2L GWQS of 21 ug/L.

Surficial Groundwater Water MADEP VPH/EPH

- C_5-C_8 Aliphatics – one location PZ03 at 1,020 ug/L; greater than IGWQS of 210 ug/L.

- C_9-C_{22} Aromatics - one location PZ03 at 800 ug/L; greater than IGWQS of 420 ug/L.

Free Phase Product

- Free-phase product was detected at temporary piezometer PZ05 (0.10') and monitoring well MW02 (0.22') during the CSA investigation. All site temporary piezometers were properly abandoned during the CSA investigation.
- Free-phase product remains evident at site groundwater monitoring well MW02. During the latest (October 23, 2003) CSAA site visit 0.48 feet of free phase product was measured at monitoring well MW02.

Source Area – Deep Groundwater Compounds of Concern

Based on the analysis (EPA Method 602 + MTBE, EPA Method 625 + TICs and MADEP VPH/EPH) of groundwater samples obtained from Type III monitoring well MW-03, no evidence of deep groundwater (>22' BLS) contaminants exist.

9.2 RECOMMENDATIONS

Ultimately, the NCDENR will determine if any additional assessment and/or remediation are required at the site. The site surficial groundwater remains impacted with free-phase product and dissolved compounds of concern (benzene, Ethylbenzene, naphthalene, C_5-C_8 Aliphatics, and C_9-C_{22} Aromatics). Vadose zone soils at the site remain impacted with compounds of concern (benzene, 2-Methylnaphthalene, naphthalene, and C_9-C_{22} Aromatics). In order for the subject site to receive regulatory closure under 15A NCAC 2L .0106(m), NCDENR will likely require a CAP for achieving the following site goals:

1) Vadose Zone Soils

   Section 5.0 Cleanup Requirements for Contaminated Soil of the *2000 Guidelines* state "Contaminated soil must be cleaned up to the residential or soil-to-groundwater maximum contaminant concentrations, whichever are lower". Soil-to-Groundwater MSCCs are typically lower than the Residential MSCCs. The site CAP should include goals to remediate the current site contaminants to at or below current applicable MSCCs.

2) Free-Phase Product

   When free-phase product (>0.02') is encountered, 15A NCAC 2L .0106 requires the immediate and ongoing removal of free-phase product. As of October 23, 2003 only site monitoring well MW-02 exhibited free-phase product (0.48'). The site CAP should include free-phase product recovery measures at MW-02.

3) Surficial Groundwater Conditions

Section 7.0 Cleanup Requirements for Groundwater of the *2000 Guidelines* states "Contaminated groundwater must be cleaned up to levels of the interim standards and the standards established in 15A NCAC 2L .0202. The site CAP should include measures for reducing dissolved compounds of concern concentrations to at or below applicable 2L GWQS. NCDENR requires four consecutive compliant sample events before considering an incident for "no further action".

A copy of this report should be forwarded to the NCDENR WiRO at the following address:

North Carolina Department of Environment and Natural Resources
Division of Water Quality
Groundwater Section
Attention: Dr. Charles F. Stehman, Ph.D., P.G.
127 Cardinal Drive Extension
Wilmington, North Carolina 28405

10.0 LIMITATIONS

The field, soil, and groundwater data evaluated as part of this investigation only provide isolated data points and may not represent conditions at every location in the project area. Analyses and conclusions of this report, being based on interpolation between data points at the project area, may not be completely representative of all site conditions. Conclusions and recommendations of this investigation and report are based on the best available data in an effort to comply with current regulatory requirements.

11.0 REFERENCES

AH Environmental Consultants, Wellhead Protection Plan – 2002 Update, Marine Corp Base, Camp Lejeune, North Carolina, August 2002.

Law Engineering and Environmental Services, Inc., Comprehensive Site Assessment Report, Aboveground Storage Tank Fuel Distribution Line Release, Building AS-840, Aircraft Hanger Facility Marine Corp Air Station New River, North Carolina, October 23, 2001.

North Carolina Department of Environment and Natural Resources (NCDENR), Groundwater Section. *Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume I Sources other than Petroleum Underground Storage Tanks.* Effective July 1, 2000.

North Carolina Department of Environment and Natural Resources (NCDENR), Division of Water Resources, Hydrogeology Framework Database. http:/www.ehnr.state.nc.us/Data_and_Modeling/Ground_Water_Databases/frametstnew.php.

North Carolina Wellhead Protection Program Website. http://www.deh.enr.state.nc.us/pws/welhead/update/wellhead_protection program.htm.

U.S. Geological Survey. Jacksonville South, North Carolina Topographic Quadrangle. Dated 1952.

TABLES

TABLE 1 SUMMARY OF SOIL LABORATORY RESULTS

Date: October 2003 Incident Number and Name: Pending - AS-840 Facility ID#: N/A

Analytical Method: EPA Method 8260B/5035

Sample ID	Date Collected	Sample Depth (ft. BGS)	Toluene	All Other Analytes
		Contaminant of Concern →		
Residential MSCC (mg/kg)			3,200	Varies
Soil to Groundwater MSCC (mg/kg)			7	Varies
ASTAS840-MW-07 (0-2)	10/6/2003	0-2	<0.0055	BQL
ASTAS840-MW-08 (0-2)	10/6/2003	0-2	0.018	BQL
ASTAS840-MW-08 (0-2) D	10/6/2003	0-2	0.01	BQL

All results in mg/kg.

TABLE 2 SUMMARY OF SOIL LABORATORY RESULTS

Date: October 2003 Incident Number and Name: Pending - AS-840 Facility ID#: N/A

Analytical Method: EPA Method 8270

Sample ID	Contaminant of Concern →		All Analytes
	Date Collected	Sample Depth (ft. BGS)	
Residential MSCC (mg/kg)			Varies
Soil to Groundwater MSCC (mg/kg)			Varies
ASTAS840-MW-07 (0-2)	10/6/2003	0-2	BQL
ASTAS840-MW-08 (0-2)	10/6/2003	0-2	BQL

All results in mg/kg.

TABLE 3A SUMMARY OF SOIL LABORATORY RESULTS

Date: October 2003 Incident Number and Name: Pending - AS-840 Facility ID#: N/A

Analytical Method: MADEP VPH/EPH

Sample ID	Contaminant of Concern →		C9-C18 Aliphatics	C19-C36 Aliphatics	C11-C22 Aromatics	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics
	Date Collected	Sample Depth (ft. BGS)						
ASTAS840-MW-07 (0-2)	10/6/2003	0-2	<10	<10	<10	<10	<10	<10
ASTAS840-MW-08 (0-2)	10/6/2003	0-2	<10	<10	<10	<10	<10	<10

All results in mg/kg.

TABLE 3B SUMMARY OF SOIL LABORATORY RESULTS

Date: October 2003 Incident Number and Name: Pending - AS-840 Facility ID#: N/A

Analytical Method: MADEP VPH/EPH AS COMPARED TO NCDENR MSCCs

Sample ID	Contaminant of Concern →		C5-C8 Aliphatics	C9-C18 Aliphatics	C19-C36 Aliphatics	C9-C22 Aromatics
	Date Collected	Sample Depth (ft. BGS)				
Residential MSCC (mg/kg) **Soil to Groundwater MSCC (mg/kg)**			939 72	9,386 3,255	93,860 ##	469 34
ASTAS840-MW-07 (0-2)	10/6/2003	0-2	<10	<20	<10	<20
ASTAS840-MW-08 (0-2)	10/6/2003	0-2	<10	<20	<10	<20

Considered immobile

All results in mg/kg.

TABLE 4 SUMMARY OF GROUNDWATER LABORATORY RESULTS

Date: October 2003 Incident Number and Name: Pending - AS-840 Facility ID#: N/A

Analytical Method: EPA Method 602

Well ID	Contaminant of Concern → Sample ID	Date Collected	Ethylbenzene	All Other Analytes
2L GWQS (µg/L)			29	Varies
ASTAS840-MW-7	ASTAS840-MW-7	10/9/2003	5.2	BQL
ASTAS840-MW-8	ASTAS840-MW-8	10/9/2003	<1.0	BQL
ASTAS840-MW-8D	ASTAS840-MW-8D	10/9/2003	<1.0	BQL
Trip Blank	Trip Blank	10/9/2003	<1.0	BQL

All results in µg/L

TABLE 5 SUMMARY OF GROUNDWATER LABORATORY RESULTS

Date: October 2003 Incident Number and Name: Pending - AS-840 Facility ID#: N/A

Analytical Method: EPA Method 625

Well ID	Contaminant of Concern → / Sample ID	Date Collected	Acenaphthene	Fluorene	Phenanthrene	Pyrene	All Other Analytes
2L GWQS (µg/L)			80	280	210	210	Varies
ASTAS840-MW-7	ASTAS840-MW-7	10/9/2003	18	20	48	12	BQL
ASTAS840-MW-8	ASTAS840-MW-8	10/9/2003	<10	<10	<10	<10	BQL

All results in µg/L

TABLE 6A SUMMARY OF GROUNDWATER LABORATORY RESULTS

Date: October 2003 Incident Number and Name: Pending - AS-840 Facility ID#: N/A

Analytical Method: MADEP VPH/EPH

Well ID	Contaminant of Concern →		C9-C18 Aliphatics	C19-C36 Aliphatics	C11-C22 Aromatics	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics
	Sample ID	Date Collected						
ASTAS840-MW-7	ASTAS840-MW-7	10/9/2003	780	280	3,000	<100	190	<100
ASTAS840-MW-8	ASTAS840-MW-8	10/9/2003	<100	<100	<100	<100	<100	<100

All results in µg/L

TABLE 6B SUMMARY OF GROUNDWATER LABORATORY RESULTS

Date: October 2003 Incident Number and Name: Pending - AS-840 Facility ID#: N/A

Analytical Method: MADEP VPH/EPH AS COMPARED TO NCDENR IGWQS

Well ID	Contaminant of Concern →		C5-C8 Aliphatics	C9-C18 Aliphatics	C19-C36 Aliphatics	C9-C22 Aromatics
	Sample ID	Date Collected				
IGWQS(µg/L)			420	4,200	42,000	210
ASTAS840-MW-7	ASTAS840-MW-7	10/9/2003	<100	970	280	**<3,100***
ASTAS840-MW-8	ASTAS840-MW-8	10/9/2003	<100	<200	<100	<200

All results in µg/L.

* = Result equals the sum of the C11-C22 fraction result (3,000 µg/L) and the C9-C10 fraction quantitation limit (<100 µg/L).

Bold result indicates concentration is greater than the IGWQS.

TABLE 7

MONITORING WELL CONSTRUCTION AND WATER LEVEL GAUGING DATA

Date: Oct-03 Incident Number and Name: Pending - AS-840 Facility ID#: N/A

Well ID	Date Installed (m/dd/yy)	Date Water Level Measured (m/dd/yy)	Well Casing Depth (ft. BGS)	Screened Interval (x to y ft. BGS)	Bottom of Well (ft. BGS)	Ground Surface Elevation* (ft.)	Top of Casing Elevation (ft.)	Depth to Water from Top of Casing (ft.)	Free Product Thickness** (ft.)	Ground Water Elevation* (ft.)	Comments
MW-01	06/19/01	10/23/03	3	3 - 18	18	14.08	13.70	4.20	NMT	9.50	
MW-02	06/19/01	10/23/03	3	3 - 18	18	14.15	13.83	5.22	0.48	9.02	
MW-03	06/20/01	10/23/03	22	22 - 27	27	14.34	13.97	4.92	NMT	9.05	
MW-04	06/20/01	10/23/03	3	3 - 18	18	15.33	14.70	5.75	NMT	8.95	
MW-05	06/20/01	10/23/03	3	3 - 18	18	15.03	14.20	5.56	NMT	8.64	
MW-06	06/20/01	10/23/03	3	3 - 18	18	14.36	13.84	4.97	NMT	8.87	
MW-07	10/06/03	10/23/03	4	4 - 14	14	15.40	14.88	6.04	NMT	8.84	
MW-08	10/06/03	10/23/03	4	4 - 14	14	15.38	14.94	6.53	NMT	8.41	

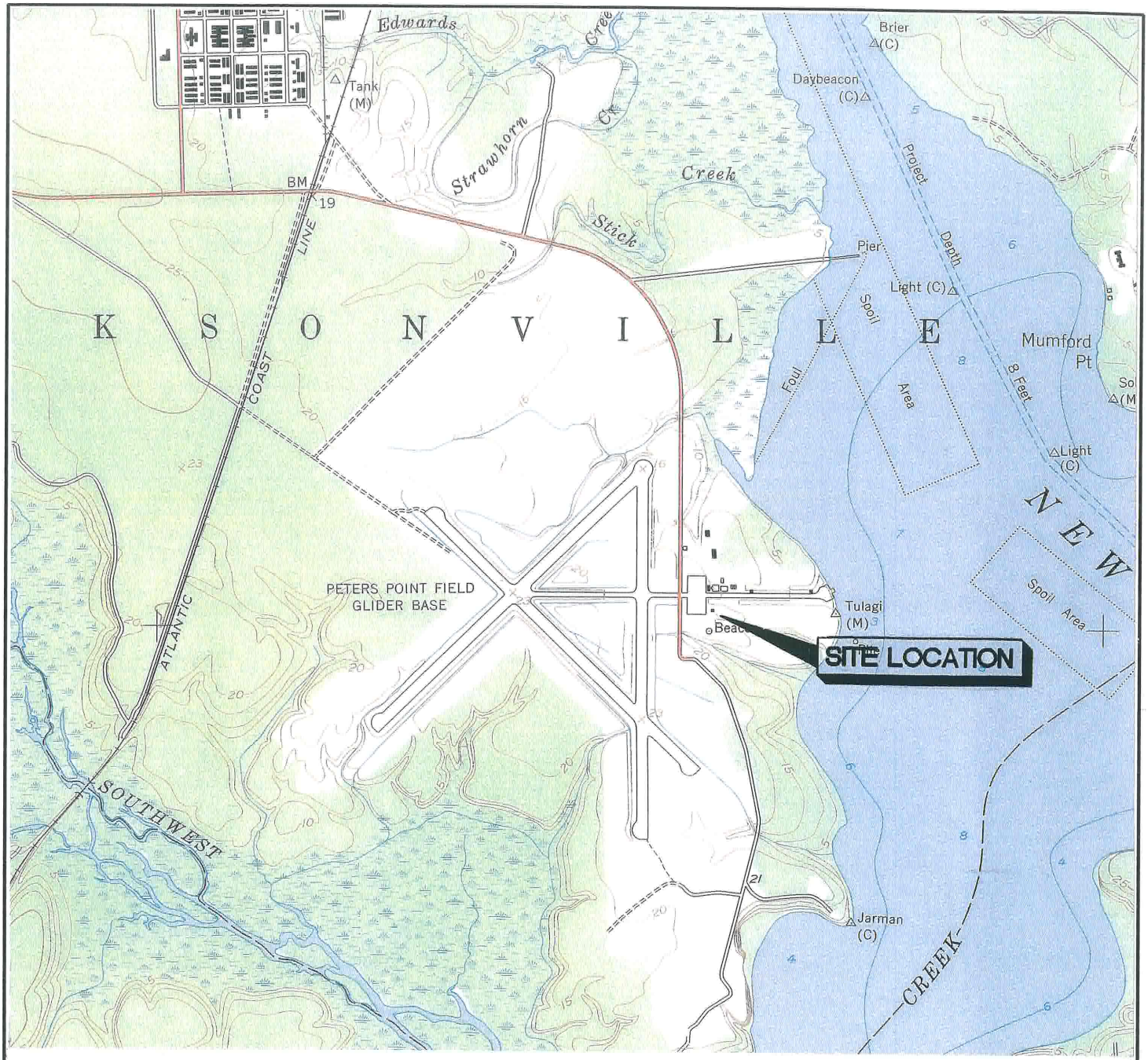
* Reference Point for Elevation Measurements: MCAS geodetic monuments Heinz and Flyboy.

** If free product is present in a well, ground water elevation should be calculated by: [Top of Casing Elevation - Depth to Water] + [free product thickness x 0.8581]

ft BGS = feet below ground surface

NMT = no measurable thickness

FIGURES



SCALE 1:24 000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETRE

MN GN

4° 71 MILS 1°23' 25 MILS

UTM GRID AND 1952 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

N C

QUADRANGLE LOCATION

JACKSONVILLE SOUTH, N. C.

NW/4 NEW RIVER 15′ QUADRANGLE

34077-F4-TF-024

1952

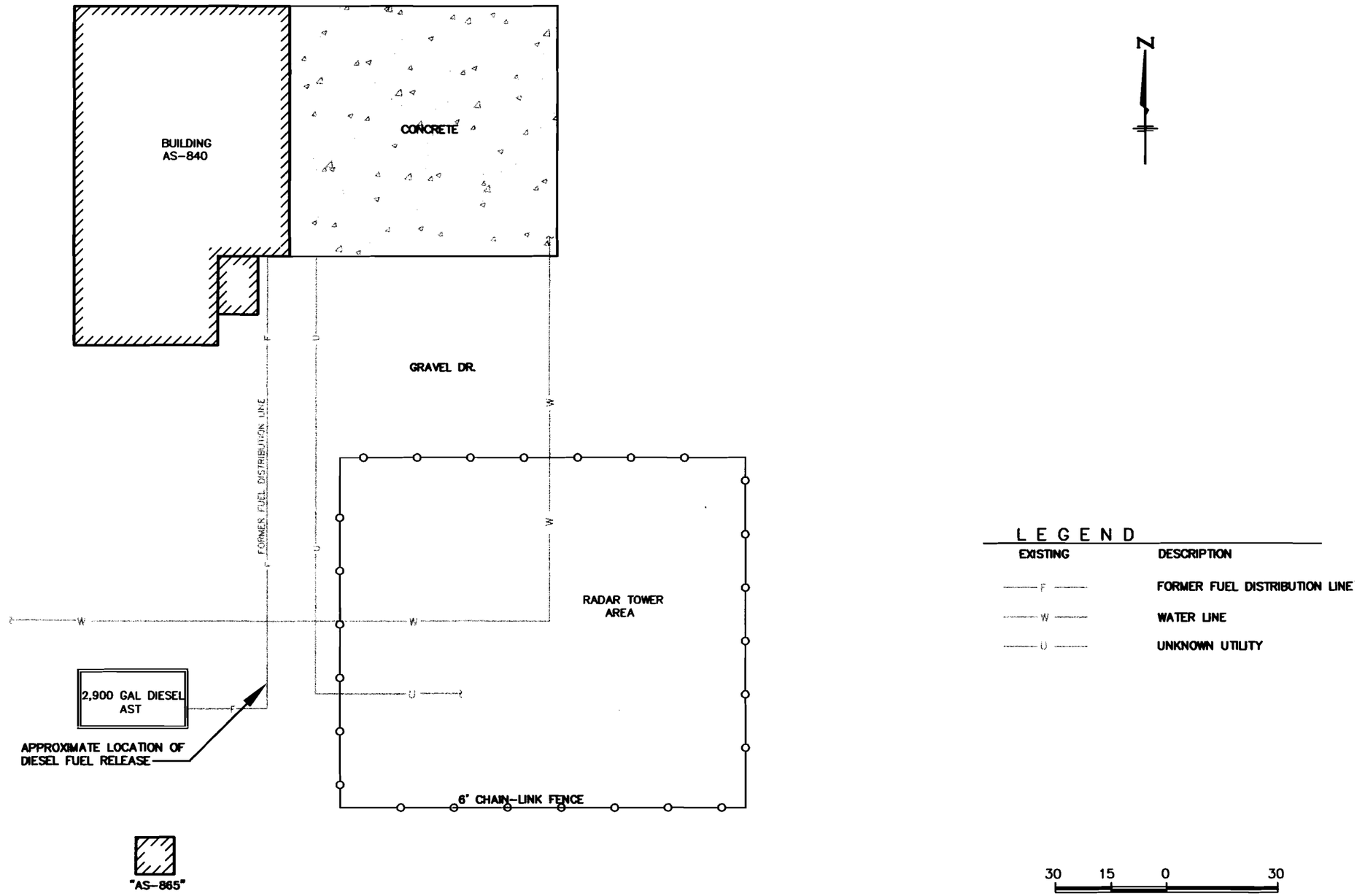
CATLIN ENGINEERS and SCIENTISTS

WILMINGTON, NORTH CAROLINA

PROJECT	TITLE	FIGURE
BUILDING AS-840 MARINE CORPS AIR STATION NEW RIVER, NORTH CAROLINA	SITE LOCATION MAP	1

JOB NO:	DATE:	SCALE:	DRAWN BY:	CHECKED BY:
203060-01	SEP 2003	AS SHOWN	WHW	ST

203060-01-01

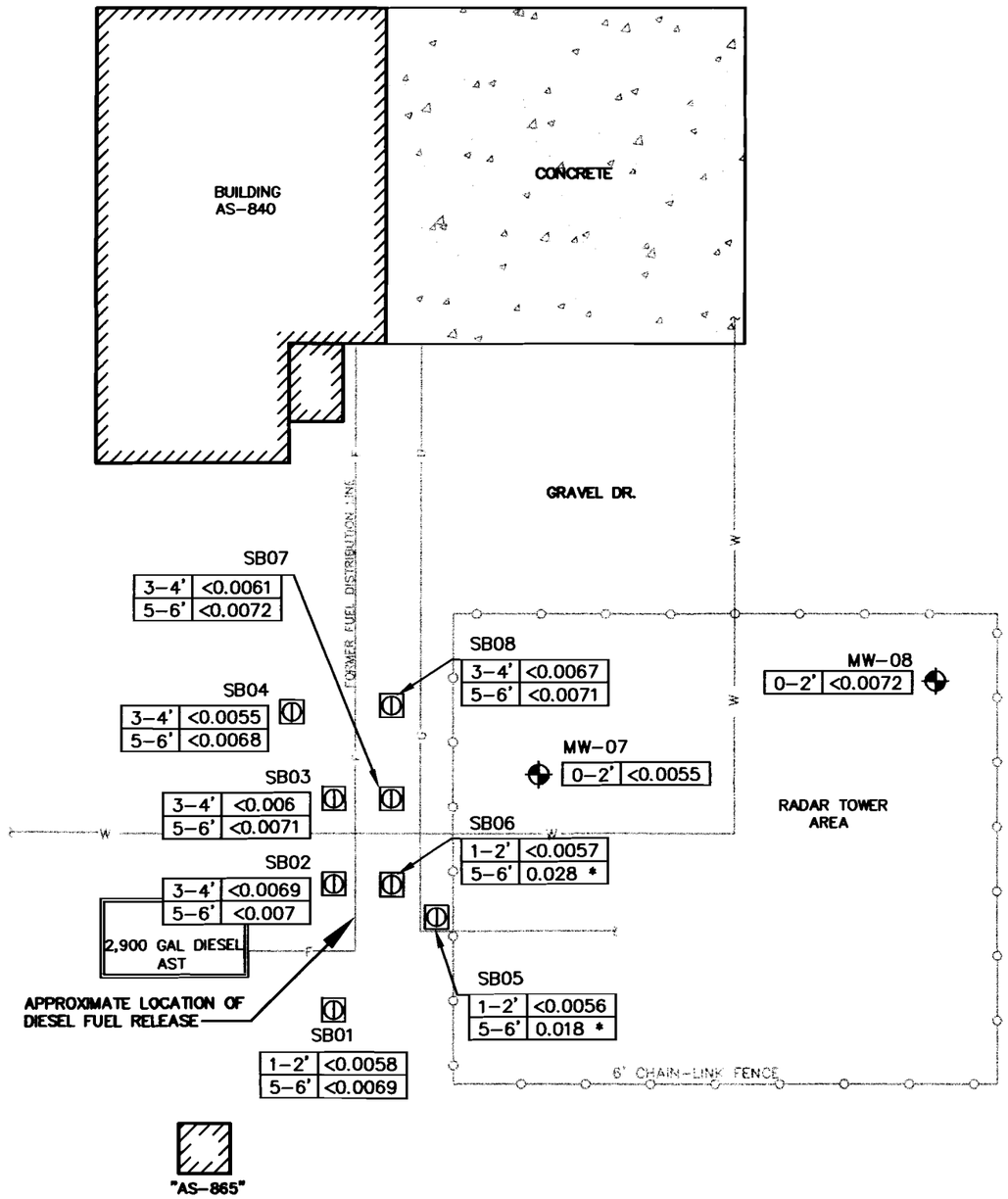


NOTE:
1. MODIFIED FROM ORIGINAL BASE MAP BY TAYLOR, WISEMAN & TAYLOR, PROVIDED BY LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

SAIC
ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT		TITLE			FIGURE
BUILDING AS-840 MARINE CORPS AIR STATION NEW RIVER, NC		SITE MAP			2
JOB NO. 203060	DATE: NOV 2003	SCALE: 1"=30'	DRAWN BY: HCS	CHECKED BY: ST	

203060-1047-02



N

LEGEND

EXISTING	NEW	DESCRIPTION
——F——		FORMER FUEL DISTRIBUTION LINE
——W——		WATER LINE
——U——		UNKNOWN UTILITY
⊕		SOIL BORING (DPT)
	⊕	SOIL BORING (DRILL)
mg/Kg		MILLIGRAMS PER KILOGRAM

SAMPLE DEPTH IN FEET	BENZENE CONCENTRATION (mg/Kg)

30 15 0 30

SCALE IN FEET

NOTE:

1. MODIFIED FROM ORIGINAL BASE MAP BY TAYLOR, WISEMAN & TAYLOR, PROVIDED BY LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
2. SOIL ANALYSIS PER EPA METHOD 8260B/5035, REVEALED BENZENE AS THE ONLY COMPOUND OF CONCERN. DATA FOR THE REMAINING EPA METHOD 8260B/5035 COMPOUNDS WERE EITHER COMPLIANT OR BQL
3. SHADED CONCENTRATIONS EXCEED BENZENE SOIL-TO-GROUNDWATER MSCC OR 0.0056 mg/Kg
4. * SOIL SAMPLE LOCATION IS WITHIN THE APPARENT SEASONAL HIGH WATER TABLE ZONE AND, THEREFORE, HAS NOT BEEN CONSIDERED REPRESENTATIVE OF SUBSURFACE VADOZE ZONE SOIL CONTAMINATION.

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT	TITLE	FIGURE
BUILDING AS-840 MARINE CORPS AIR STATION NEW RIVER, NC	SITE MAP WITH SUMMARY OF SOIL SAMPLE ANALYSIS RESULTS – EPA METHOD 8260B/5035	3

JOB NO.	DATE	SCALE	DRAWN BY	CHECKED BY
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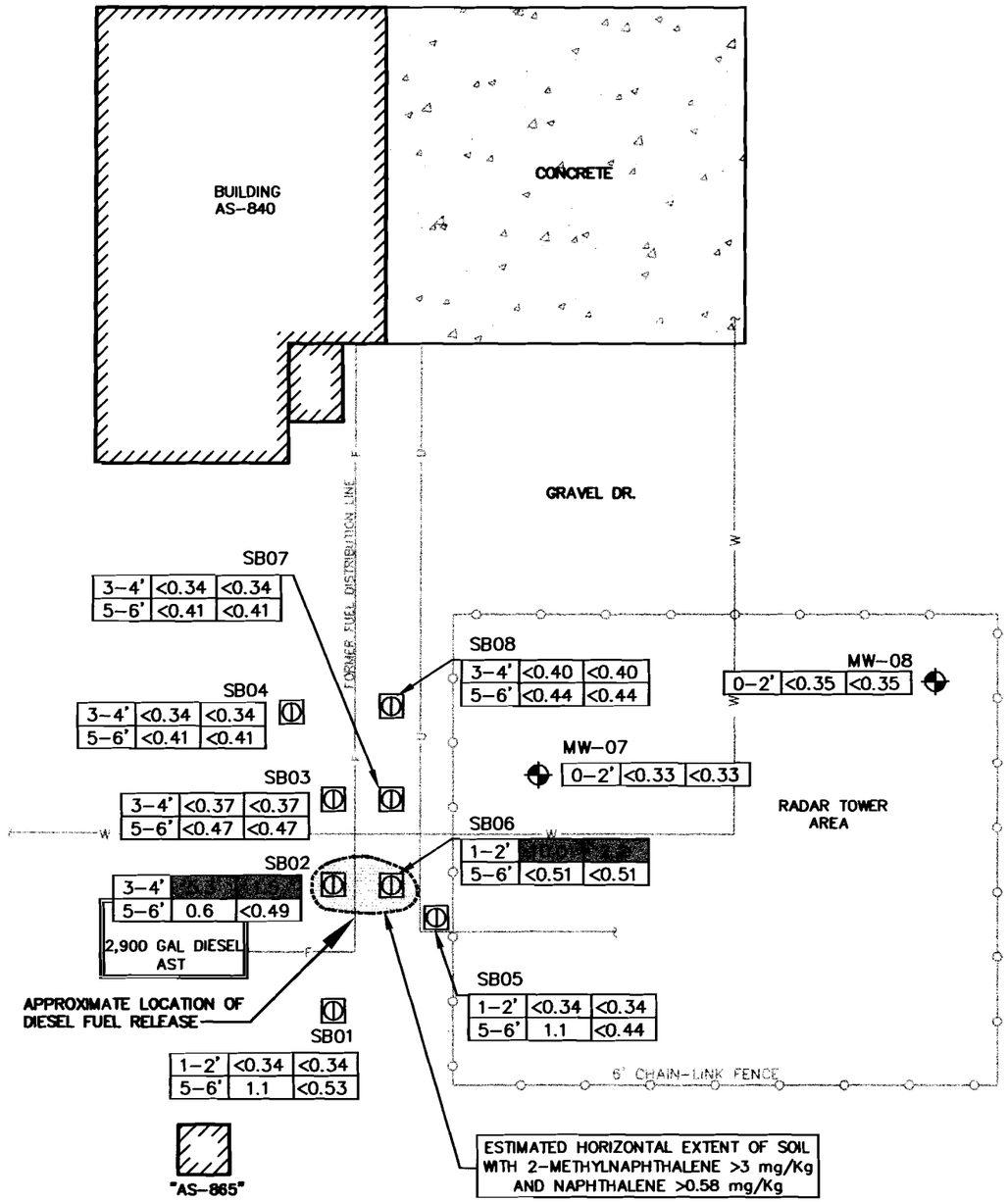
203060-1047-03



N

LEGEND

EXISTING	NEW	DESCRIPTION
——F——		FORMER FUEL DISTRIBUTION LINE
——W——		WATER LINE
——U——		UNKNOWN UTILITY
⊡		SOIL BORING (DPT)
	⊕	SOIL BORING (DRILL)
mg/Kg		MILLIGRAMS PER KILOGRAM
BQL		BELOW QUANTITATION LIMIT
DPT		DIRECT PUSH TECHNOLOGY

SAMPLE DEPTH IN FEET	2-METHYLNAPHTHALENE CONCENTRATION (mg/Kg)	NAPHTHALENE CONCENTRATION (mg/Kg)
SOIL-TO-GROUNDWATER MSCC	3	0.58

30 15 0 30

SCALE IN FEET

NOTE:

1. MODIFIED FROM ORIGINAL BASE MAP BY TAYLOR, WISEMAN & TAYLOR, PROVIDED BY LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
2. SOIL ANALYSIS PER EPA METHOD 8270, REVEALED 2-METHYLNAPHTHALENE AND NAPHTHALENE AS THE ONLY COMPOUNDS OF CONCERN. DATA FOR THE REMAINING EPA METHOD 8270 COMPOUNDS WERE EITHER COMPLIANT OR BQL.
3. SHADED CONCENTRATIONS EXCEED SOIL-TO-GROUNDWATER MSCC.

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT	TITLE	FIGURE
BUILDING AS-840 MARINE CORPS AIR STATION NEW RIVER, NC	SITE MAP WITH SUMMARY OF SOIL SAMPLE ANALYSIS RESULTS - EPA METHOD 8270	4

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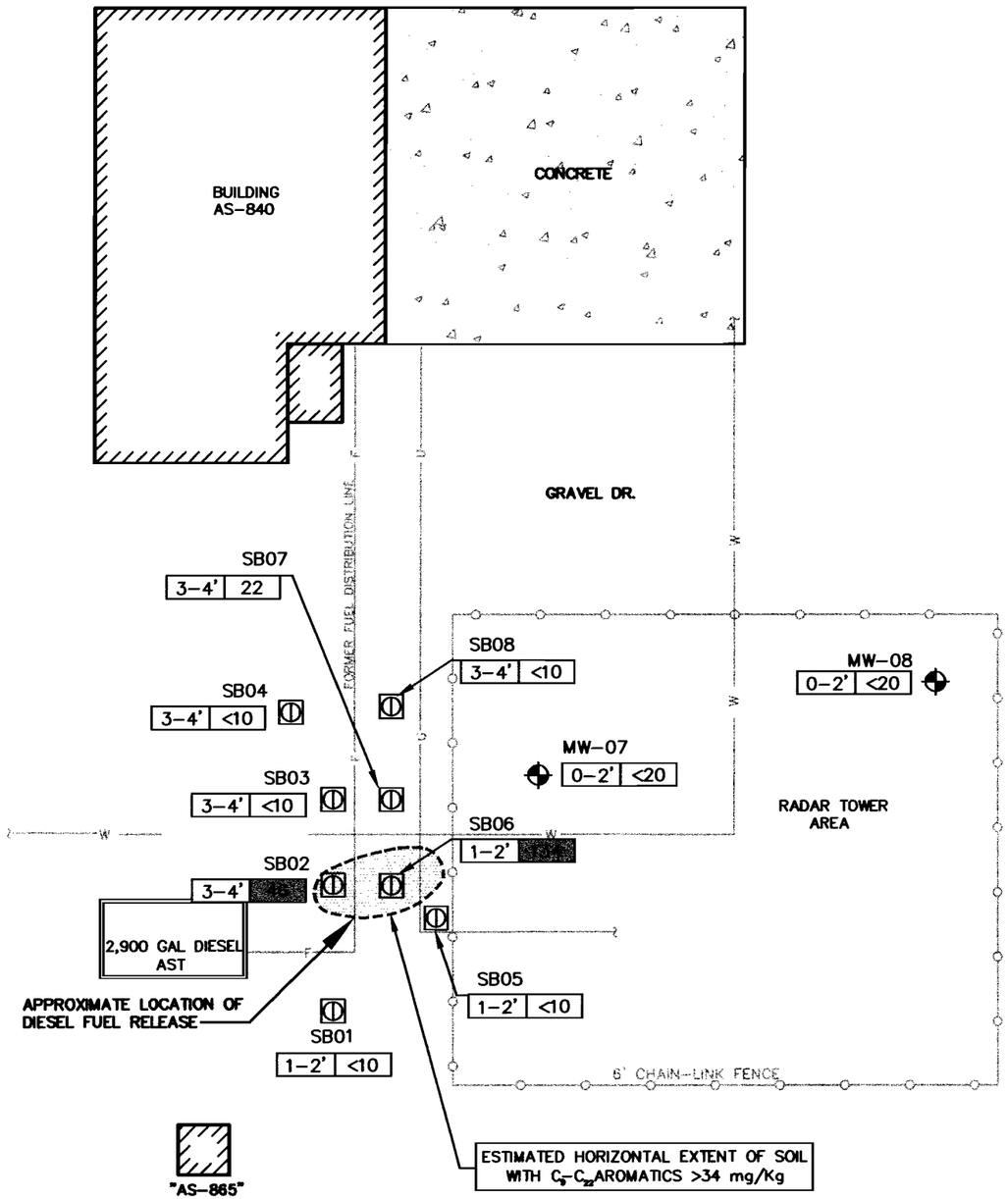
203060-1047-04



N

LEGEND

EXISTING	NEW	DESCRIPTION
——F——		FORMER FUEL DISTRIBUTION LINE
——W——		WATER LINE
——U——		UNKNOWN UTILITY
◫		SOIL BORING (DPT)
	⊕	SOIL BORING (DRILL)
mg/Kg		MILLIGRAMS PER KILOGRAM
BQL		BELOW QUANTITATION LIMIT
DPT		DIRECT PUSH TECHNOLOGY

SAMPLE DEPTH IN FEET	C_9-C_{22} AROMATICS CONCENTRATION (mg/Kg)

30 15 0 30

SCALE IN FEET

NOTE:

1. MODIFIED FROM ORIGINAL BASE MAP BY TAYLOR, WISEMAN & TAYLOR, PROVIDED BY LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
2. SOIL ANALYSIS PER MADEP VPH/EPH , REVEALED C_9-C_{22} AROMATICS AS THE ONLY HYDROCARBON FRACTION IN EXCESS OF SOIL-TO-GROUNDWATER MSCCs. THE REMAINING VPH/EPH HYDROCARBON FRACTIONS WERE EITHER COMPLIANT OR BQL
3. SHADED CONCENTRATIONS EXCEED C_9-C_{22} AROMATICS SOIL-TO-GROUNDWATER MSCC OR 34 mg/Kg

SAIC ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT	TITLE	FIGURE
BUILDING AS-840 MARINE CORPS AIR STATION NEW RIVER, NC	SITE MAP WITH SUMMARY OF SOIL SAMPLE ANALYSIS RESULTS - MADEP VPH/EPH AS COMPARED TO NCDENR MSCCs	5

JOB NO.	DATE	SCALE	DRAWN BY	CHECKED BY
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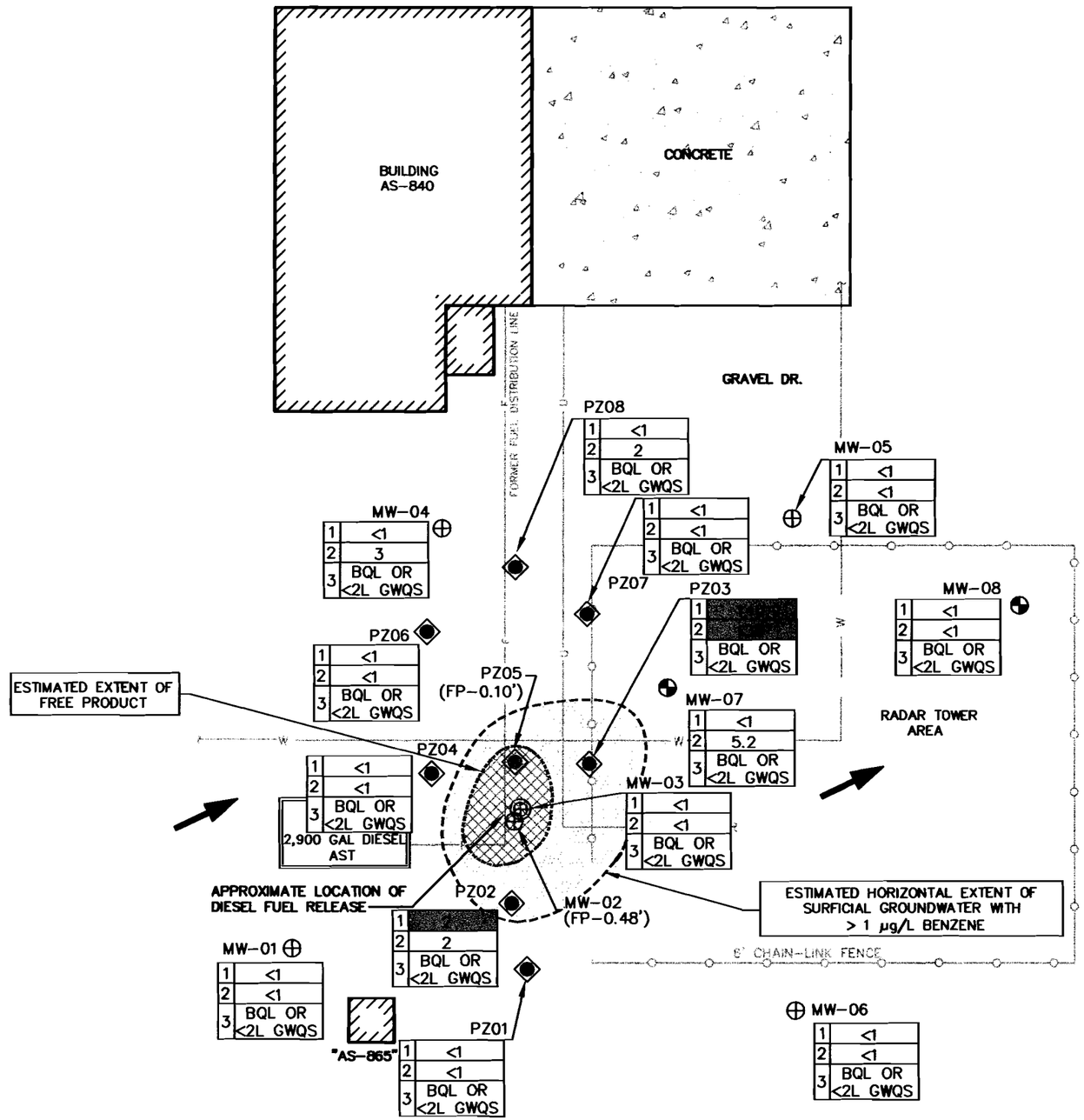
203060-1047-05



N

LEGEND

EXISTING	NEW	DESCRIPTION
——F——		FORMER FUEL DISTRIBUTION LINE
——W——		WATER LINE
——U——		UNKNOWN UTILITY
⊕	◒	SHALLOW (TYPE II) MONITORING WELL
⊕		DEEP (TYPE III) MONITORING WELL
◆		PIEZOMETER
▨		ESTIMATED HORIZINTAL EXTENT OF FREE PRODUCT AS OF 10/23/03
FP		FREE PRODUCT
µg/L		MICROGRAMS PER LITER
BQL		BELOW QUANTITATION LIMIT
2L GWQS		GROUNDWATER QUALITY STANDARD
→		SURFICIAL GROUNDWATER FLOW DIRECTION AS OF 10/23/03

RESULTS KEY		
#	ANALYTE	2L GWQS
1	BENZENE	1
2	ETHYL BENZENE	29
3	ALL OTHER ANALYTES	VARIES

30 15 0 30

SCALE IN FEET

NOTE:

1. ALL RESULTS IN µg/L
2. MODIFIED FROM ORIGINAL BASE MAP BY TAYLOR, WISEMAN & TAYLOR, PROVIDED BY LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
3. GROUNDWATER ANALYSES PER EPA METHOD 602 + MTBE REVEALED BENZENE AND ETHYLBENZENE AS THE COMPOUNDS OF CONCERN. THE REMAINING 602 COMPOUNDS WERE EITHER COMPLIANT OR BQL.
4. SHADED CONCENTRATIONS EXCEED CORRESPONDING 2L GWQS.
5. MW-02 AND PZ05 WERE NOT SAMPLED DUE TO THE PRESENCE OF FREE PRODUCT.
6. MW-02 LAST GAUGED ON 10/23/02.
7. PZ05 LAST GAUGED ON 4/20/01.

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT: BUILDING AS-840 MARINE CORPS AIR STATION NEW RIVER, NC

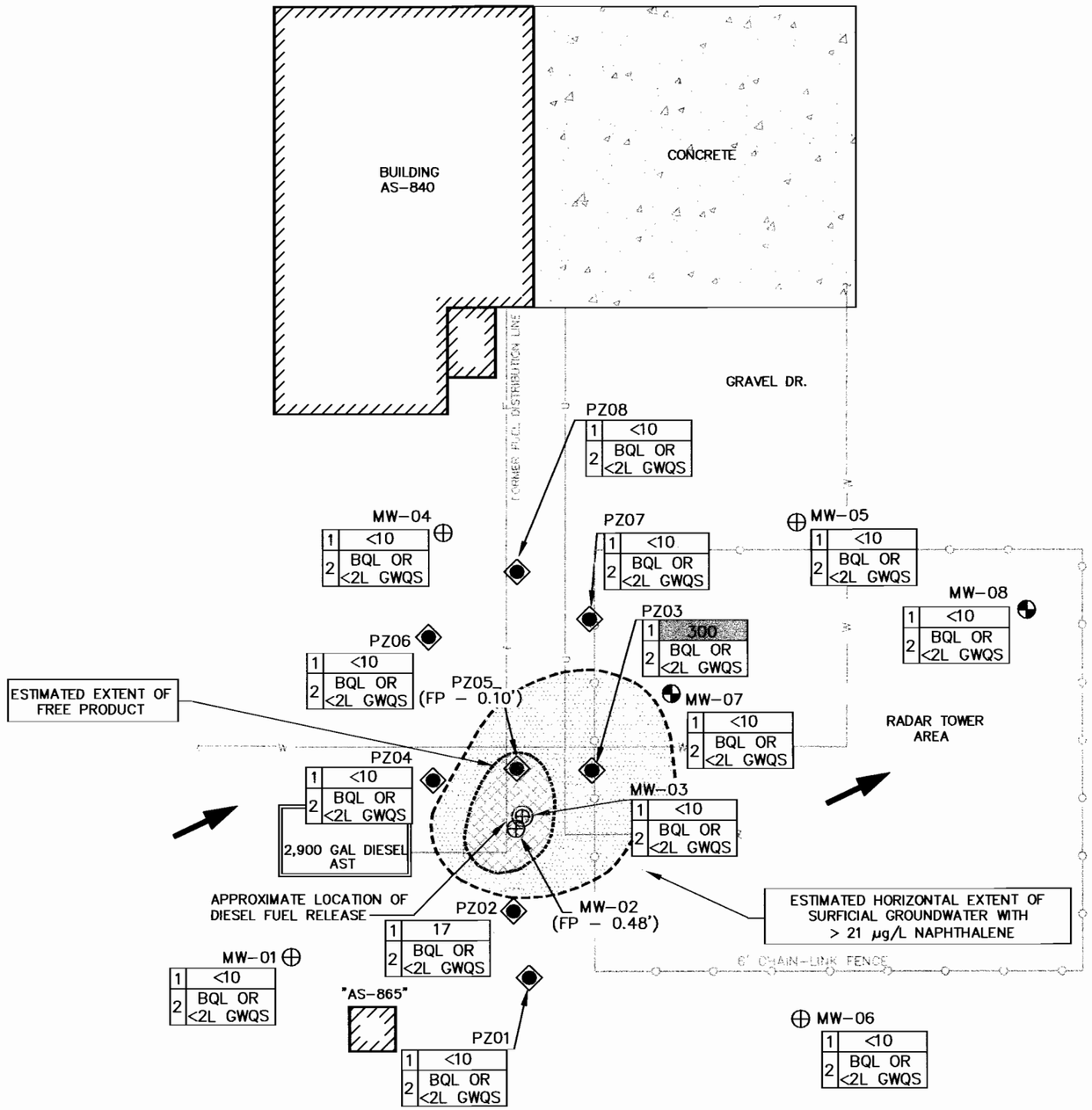
JOB NO. 203060 | DATE: NOV 2003

TITLE: SITE MAP WITH SUMMARY OF GROUNDWATER SAMPLE ANALYSIS RESULTS – EPA METHOD 602

FIGURE 6

SCALE: 1"=30' | DRAWN BY: HCS | CHECKED BY: ST

203060-1047-06



N

LEGEND

EXISTING	NEW	DESCRIPTION
		FORMER FUEL DISTRIBUTION LINE
		WATER LINE
		UNKNOWN UTILITY
⊕	◒	SHALLOW (TYPE II) MONITORING WELL
⊕		DEEP (TYPE III) MONITORING WELL
◆		PIEZOMETER
		ESTIMATED HORIZINTAL EXTENT OF FREE PRODUCT AS OF 10/23/03
(FP)		FREE PRODUCT THICKNESS IN FEET
µg/L		MICROGRAMS PER LITER
BQL		BELOW QUANTITATION LIMIT
2L GWQS		GROUNDWATER QUALITY STANDARD
→		SURFICIAL GROUNDWATER FLOW DIRECTION AS OF 10/23/03

RESULTS KEY		
#	ANALYTE	2L GWQS
1	NAPHTHALENE	21
2	ALL OTHER ANALYTES	VARIES

30 15 0 30

SCALE IN FEET

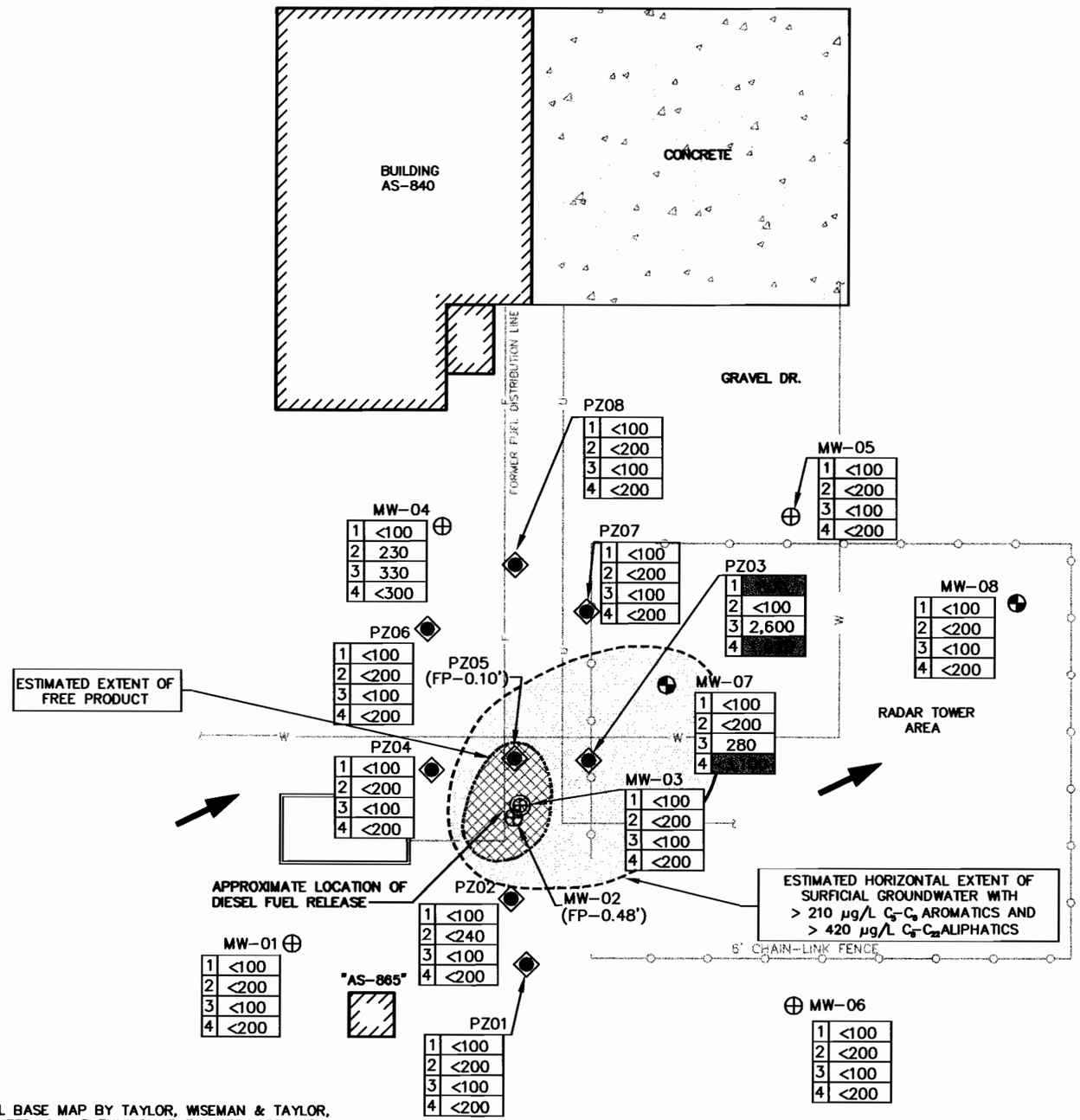
NOTE:

1. ALL RESULTS IN µg/L
2. MODIFIED FROM ORIGINAL BASE MAP BY TAYLOR, WISEMAN & TAYLOR, PROVIDED BY LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
3. GROUNDWATER ANALYSES REVEALED NAPHTHALENE AS THE COMPOUND OF CONCERN. THE REMAINING 625 COMPOUNDS WERE EITHER COMPLIANT OR BQL.
4. SHADED CONCENTRATIONS EXCEED CORRESPONDING 2L GWQS.
5. MW-02 AND PZ05 WERE NOT SAMPLED DUE TO THE PRESENCE OF FREE PRODUCT.
6. MW-02 LAST GAUGED ON 10/23/02.
7. PZ05 LAST GAUGED ON 4/20/01.

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT		TITLE		FIGURE
BUILDING AS-840 MARINE CORPS AIR STATION NEW RIVER, NC		SITE MAP WITH SUMMARY OF GROUNDWATER SAMPLE ANALYSIS RESULTS - EPA METHOD 625		7
JOB NO. 203060	DATE: NOV 2003	SCALE: 1"=30'	DRAWN BY: HCS	CHECKED BY: ST

203060-1047-07



LEGEND

EXISTING	NEW	DESCRIPTION
——F——		FORMER FUEL DISTRIBUTION LINE
——W——		WATER LINE
——U——		UNKNOWN UTILITY
⊕	◒	SHALLOW (TYPE II) MONITORING WELL
⊕		DEEP (TYPE III) MONITORING WELL
◆		PIEZOMETER
▨		ESTIMATED HORIZONTAL EXTENT OF FREE PRODUCT AS OF 10/23/03
(FP)		FREE PRODUCT THICKNESS IN FEET
→		SURFICIAL GROUNDWATER FLOW DIRECTION AS OF 10/23/03
2L IGWQS		INTERIM GROUNDWATER QUALITY STANDARD
µg/L		MICROGRAMS PER LITER

RESULTS KEY		
#	ANALYTE	IGWQS
1	C_5-C_8 ALIPHATICS	420
2	C_9-C_{18} ALIPHATICS	4,200
3	C_{19}-C_{36} ALIPHATICS	42,000
4	C_9-C_{22} AROMATICS	210

30 15 0 30

SCALE IN FEET

NOTE:

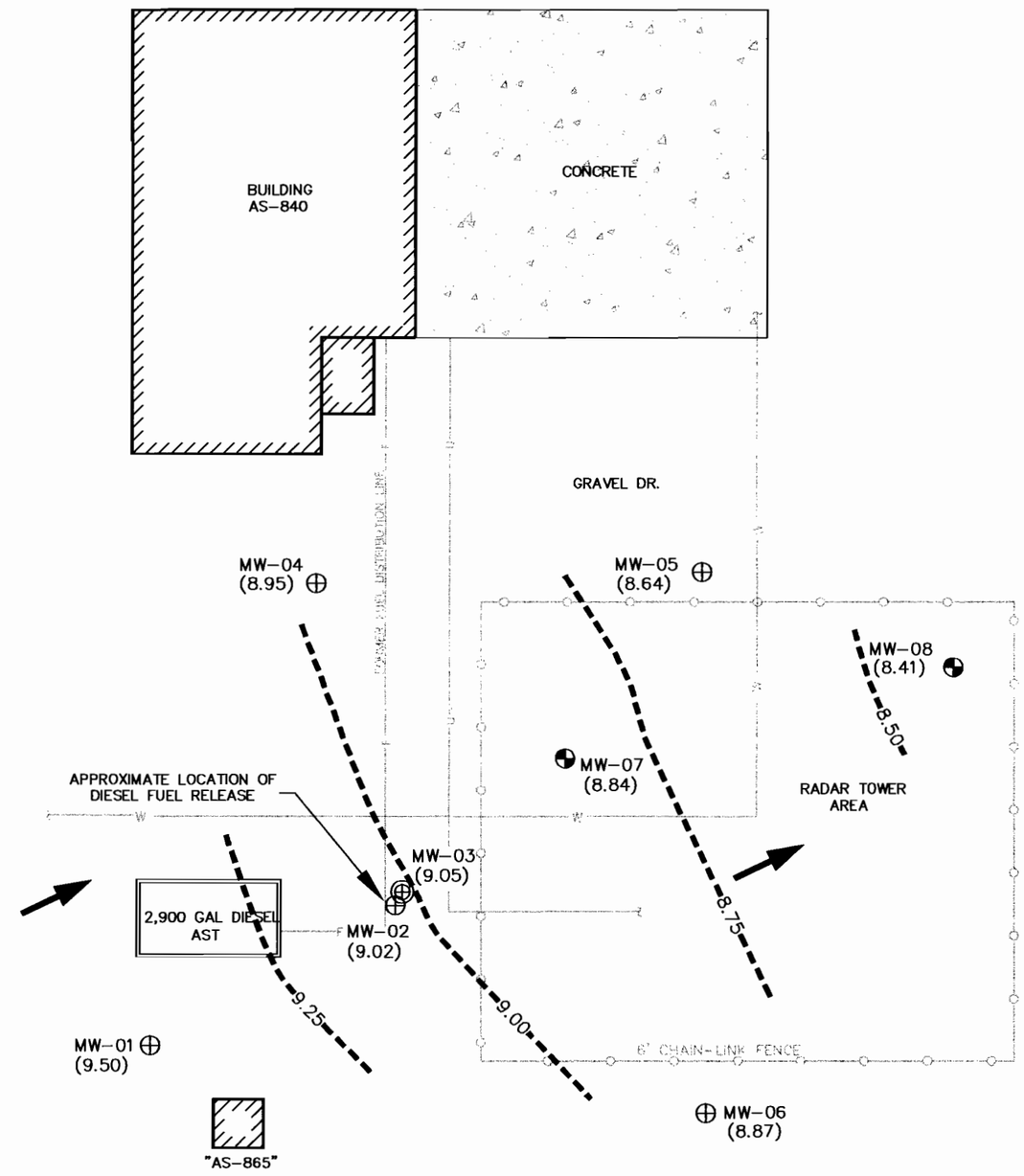
1. ALL RESULTS IN µg/L.
2. MODIFIED FROM ORIGINAL BASE MAP BY TAYLOR, WISEMAN & TAYLOR, PROVIDED BY LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
3. GROUNDWATER ANALYSIS PER MADEP VPH/EPH, REVEALED C_9-C_{22} AROMATICS AND C_5-C_8 ALIPHATICS FRACTIONS AS THE ONLY COMPOUNDS OF CONCERN. THE REMAINING VPH/EPH HYDROCARBON FRACTIONS WERE EITHER COMPLIANT OR BQL.
4. SHADED CONCENTRATIONS EXCEED IGWQS.
5. MW-02 AND PZ05 WERE NOT SAMPLED DUE TO THE PRESENCE OF FREE PRODUCT.
6. MW-02 LAST GAUGED ON 10/23/02.
7. PZ05 LAST GAUGED ON 4/20/01.

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT	TITLE	FIGURE
BUILDING AS-840 MARINE CORPS AIR STATION NEW RIVER, NC	SITE MAP WITH SUMMARY OF GROUNDWATER SAMPLE ANALYSIS RESULTS - MADEP VPH/EPH AS COMPARED TO NCDENR IGWQS	8

JOB NO.	DATE	SCALE	DRAWN BY	CHECKED BY
203060	NOV 2003	1"=30'	HCS	ST

203060-1047-08



N

LEGEND

EXISTING	NEW	DESCRIPTION
——F——		FORMER FUEL DISTRIBUTION LINE
——W——		WATER LINE
——U——		UNKNOWN UTILITY
⊕	◒	SHALLOW (TYPE II) MONITORING WELL
⊕		DEEP (TYPE III) MONITORING WELL
( )		GROUNDWATER TABLE ELEVATION IN FEET
→		SURFICIAL GROUNDWATER FLOW DIRECTION AS OF 10/23/03
- - - -		GROUNDWATER TABLE CONTOUR

30 15 0 30

SCALE IN FEET

NOTE:

1. MODIFIED FROM ORIGINAL BASE MAP BY TAYLOR, WISEMAN & TAYLOR, PROVIDED BY LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
2. TYPE III WELL OMITTED FROM CONTOURING.
3. CONTOUR INTERVAL = 0.25 FOOT
4. MW–02 LAST GAUGED ON 10/23/02.
5. PZ05 LAST GAUGED ON 4/20/01.

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT	TITLE	FIGURE
BUILDING AS–840 MARINE CORPS AIR STATION NEW RIVER, NC	SURFICIAL GROUNDWATER TABLE CONTOURS AS OF OCTOBER 23, 2003	9

JOB NO.	DATE	SCALE	DRAWN BY	CHECKED BY
203060	NOV 2003	1"=30'	HCS	ST

203060-1047-09

APPENDIX A

CATLIN STANDARD PROCEDURES

CATLIN STANDARD METHODS OF INVESTIGATION

(REVISED APRIL 2002)

1.0 DATA COLLECTION

1.1 BACKGROUND DATA

Background data and history information relevant to the site investigation is generated through numerous sources. These sources may include, but are not limited to, the following:

- Conversations with the client and regulatory officials involved with the incident.
- Review of pertinent regulatory correspondence.
- Review of previous and existing reports and other technical data.
- Review of available historical records.

1.2 SURVEYS AND POTENTIAL RECEPTOR DATA

Physical survey and potential receptor data are collected in accordance with the intended level of investigation. In general, the purpose is to collect sufficient information for site assessment and corrective action planning.

Individual receptors are identified and evaluated in the context of their potential for contaminant impact. Potential receptors of contamination can include surface water bodies, groundwater supply wells, wellhead protection areas, and subsurface building structures.

1.2.1 Horizontal Survey

Horizontal survey data are generated using either accepted general field surveying techniques, or existing survey maps; or by using a combination of existing data and field generated information. The survey area generally extends to a point at least 50 feet beyond suspected plume boundaries. A receptor scale survey of a larger area surrounding a site will be made if appropriate and necessary.

1.2.2 Vertical Survey

A vertical survey is conducted at the site typically within an accuracy of 0.01 foot. The datum plane is generally assumed unless otherwise noted. Assumed temporary benchmarks (TBM) are selected near ground level. The vertical survey includes such points as top of all well casings, selected ground shots, important utility inverts, utility fluid levels, important surface water levels, and other items determined to be significant.

1.3 DRILLING AND MONITORING WELL/PIEZOMETER INSTALLATION

Necessary permits are applied for and obtained in accordance with federal, state, and local requirements prior to drilling or well construction activities. Additionally, the well locations are scanned for underground utilities prior to conducting intrusive subsurface activities. Wells are installed under applicable licensing requirements, and are designed and constructed in accordance with accepted standards and practices. Any wells purposely installed at off-site locations are permitted through appropriate right-of-entry agreements with all necessary property owners and/or their agents.

1.3.1 Drilling Methods and Subsurface Data Collection

Drilling is accomplished utilizing one or more of the following methods:

Auger Drilling

Auger drilling is the preferred, most often used method of subsurface investigation and is accomplished using a vehicle or trailer mounted drill rig. Continuous flight auger types used vary upon the site and situation; ranging from the 4-inch outside diameter solid stem to the 12-inch outside diameter hollow stem. Auger type is selected based upon appropriateness and/or site-specific requirements.

Hand Augering

Hand augering is utilized when economically and scientifically feasible, or when no other method is suitable. Hand augers typically produce three-inch diameter holes and are generally limited to depths of less than 15 feet.

Direct Push

Direct push methods of subsurface investigation are used generally for soil screening purposes or collection of groundwater samples where permanent wells are not viable.

Other Methods

Other drilling methods, such as mud and air rotary, rock coring, cable tool, and large bucket augering are used when site conditions or project requirements dictate.

Regardless of the drilling method used, the drill rig(s) and all drilling tools are thoroughly cleaned between boreholes to prevent cross introduction of contaminants. Split spoon samples are collected and field-described at intervals of five feet or less, and cuttings are continuously monitored for organic vapors. Drill cuttings are containerized for off-site disposal or are spread on the ground surface in proximity to the well or boring in accordance with North Carolina Department of Environment and Natural Resources (NCDENR) requirements. A geologist or engineer, trained in using visual/manual techniques, is always present during drilling and is responsible for subsurface contaminant and geologic data collection. Soils are classified in general agreement with the Unified Soils Classification System (USCS).

1.3.2 Hydropunch Installation

Hydropunch penetrometers (Hydropunches) are used to delineate the spatial extent of dissolved and free phase plumes. Soil borings are advanced to the appropriate depth and then the Hydropunch is advanced through the soil boring into undisturbed material. Groundwater samples are collected by pulling back on the body of the Hydropunch and allowing the groundwater to enter the screened portion of the sample chamber. Samples are retrieved using a decontaminated Teflon bailer or peristaltic pump.

1.3.3 Well Installation

Wells are typically constructed of threaded PVC casing and screen. No glues or cements are used in joining PVC components. Well diameter, slot sizes, and protective covers vary depending upon site-specific conditions or situation-specific requirements.

1.3.4 Well Development

Wells are developed by over-pumping or surging using appropriate pumps, blocks, or bailers. Through development, unwanted fine materials are removed from the natural formation surrounding the well. Well development will be performed no sooner than 24-hours after grouting is completed for the Type III wells. Water generated during development is containerized and properly disposed or is discharged onto the ground in proximity of the well in accordance with NCDENR requirements.

1.4 HYDROGEOLOGIC DATA COLLECTION

Data used to help characterize hydrogeologic conditions at a site are obtained through various procedures including, but not necessarily limited to, those described below:

1.4.1 Regional Geology

Information pertaining to the regional geologic framework is compiled from existing publications, maps, and scientific papers.

1.4.2 Site Geology

Shallow site geology is generally determined from field descriptions and borehole samples. Interpretations with regard to hydrogeologically important contacts, zones, fractures, faults, cleavage, and facies changes are made when possible.

1.4.3 Groundwater Occurrence and Characteristics

Groundwater data is obtained utilizing a number of methods and procedures, not limited to the general list below:

Well Water Levels

After well development, wells are allowed to stabilize for a minimum of 24 hours prior to measuring. Water level and free product thickness (where applicable) measurements are performed using an electronic interface probe or steel tape with water/product finding pastes.

The specific gravity of any accumulated product is determined and used to calculate true hydraulic grade from measured water levels. This information is combined with vertical survey data to determine relative potentiometric surface elevations for all wells.

Aquifer Testing

Various aquifer tests may be used to make determinations of hydraulic conductivity. Slug or pumping tests are often used to characterize site hydrogeologic conditions and to develop remedial action alternatives utilizing appropriate pumping technologies.

Other Methods

Other methods may be deemed appropriate for determining various groundwater characteristics. These other methods may include nested well configurations and/or clustered piezometer installations; sieve or pipette analysis; fracture trace analysis; computer modeling; and geophysical logging.

1.5 PETROLEUM HYDROCARBON DATA COLLECTION

1.5.1 Collection Methods

Petroleum hydrocarbon data is obtained through various methods including, but not limited to, the following:

Field Analysis

- Direct thickness measurement of phase separated components using tapes and/or probes.
- Manual vapor analysis using a photoionization detector (PID) or flame ionization detector (FIS).
- Detectable odor and visual observation.

Laboratory Analysis

- Laboratory analysis of phase-separated products.
- Laboratory vapor, soil, and groundwater analysis using appropriate EPA Methods.

1.5.2 Field Sampling

Field sampling procedures are performed in accordance with recommended protocol, accepted industry standards, and under appropriate chain-of-custody procedures. Generally, sampling procedures are as follows:

Product Samples

Product samples are obtained using clean equipment and containers. Each is shipped to the analytical laboratory in protective containers.

Vapor Samples

PID/FID readings are measured from soil sample headspace using containerized samples that have been brought to ambient temperature.

Carbon tubes are utilized in conjunction with a laboratory-calibrated vacuum pump to obtain vapor samples. The carbon tubes are sealed and refrigerated for shipment to the analytical laboratory (This method is known as the Carbon Adsorption Method).

Soil Samples

Soil samples are immediately packed into clean containers, and refrigerated for shipment to the analytical laboratory.

Groundwater Samples

Groundwater samples are collected in accordance with the following procedures:

- Creeks/Lakes/Etc.

  Grab samples are obtained.

- Domestic Wells

  Wells are pumped for a time sufficient to completely purge the well and any pressure or holding tanks prior to sampling.

- Monitoring Wells

  Water level measurements are made and well volumes calculated for each well.

  Three well volumes are removed from each well using a thoroughly cleaned Teflon bailer or appropriate purging pump. If it is not possible to remove three volumes, due to very low yields, a minimum of one volume is removed prior to obtaining a sample.

  Where analysis for metals is required, wells are typically sampled utilizing low flow techniques, which reduce turbidity and the potential for matrix interference.

Samples are collected and containerized in a manner that minimizes agitation and contact with the air.

Sampling records are field prepared.

Samples are labeled and proper chain of custody documents are maintained.

Samples are promptly protectively packed, refrigerated, and shipped to the analytical laboratory for analysis.

2.0 DATA EVALUATION

Data obtained as a result of the site investigation is compiled and evaluated and a report is prepared for client review and distribution to the appropriate agencies. Generally, specific data are evaluated as follows:

- Background data are evaluated in context with the suspected or confirmed problem.
- Survey data are utilized to develop site maps and to evaluate contaminant receptors.
- Well construction records are compiled and presented as part of the report. As-built information is used in combination with other data to evaluate subsurface conditions and monitoring well screen settings as they relate to the investigation.
- Subsurface drilling logs are used to develop geologic cross-sections, fence diagrams, isopachs, structure contours, or other constructions. Regional geologic data are used to obtain an overall framework.
- Hydrogeologic data are used to develop contour maps, flow nets and other constructions. The data is also used to calculate various hydrogeologic parameters that describe aquifer characteristics.
- Hydrocarbon data are utilized to develop various plume geometry and isoconcentration maps.
- All data are compiled and utilized for making specific recommendations with regard to remedial action alternatives.

APPENDIX B

NORTH CAROLINA GROUNDWATER CONTAMINATION INCIDENT MANAGEMENT SITE PRIORITY RANKING FORM

Incident Name: AS-840 **Region/County** WiRO / ONSLOW

GW Incident File #: PENDING **Date:** 11-30-03

NORTH CAROLINA
GROUNDWATER CONTAMINATION INCIDENT MANAGEMENT
SITE PRIORITY RANKING FORM
(To be completed by a North Carolina Licensed Geologist/Professional Engineer or by the appropriate Regional Office)

Points Awarded

I. IMMINENT HAZARD ASSESSMENT

A. Vapor Hazard - free product in confined areas or vapor phase contamination detected at or above 20% of the lower explosive limit or at health concern levels; award 50 points total — 0

B. Fire Hazard - free product subject to ignition in exposed areas such as surface water impoundments, streams, excavations, etc.; award 50 points total — 0

II. EXPOSURE ASSESSMENT

A. Contaminated Water Supplies

1. Private domestic water supply well containing substances in concentrations exceeding 15A NCAC 2L groundwater quality standards; award 10 points per well — 0
2. Public or institutional water supply well containing substances in concentrations exceeding 15A NCAC 2L groundwater quality standards; award 20 points per well — 0
3. Exceedences of Class WS surface water quality standards as a result of groundwater discharge; award 20 points per surface water body impacted — 0
4. Any water supply well identified above that cannot be replaced by connecting to an existing public water supply source; award additional 10 points per irreplaceable well — 0

B. Threat to Uncontaminated Drinking Water Supplies

1. Private, domestic water supply located within 1500 feet down gradient of the discharge or known extent of contamination; award 10 points per well — 0
2. Public or institutional water supply located within 1500 feet down gradient of the discharge or known extent of contamination; award 15 points per well — 0
3. Raw surface water intake for public water supply located within 1/2 mile down gradient of the discharge or known extent of contamination; award 5 points per water supply system — 0
4. Any well or intake identified in items II B. 1 or II B. 2, or II. B. 3 located within 250 feet of the discharge or known extent of contamination; award additional 20 points total (<u>not</u> per well or intake) — 0

C. Vapor Phase Exposure

1. Contaminant vapors detected in inhabitable building(s), but levels are below 20% of the lower explosive limit and health concern levels; award 30 points total. — 0

2. Contaminant vapors detected in other confined areas (uninhabitable buildings, sewer lines, utility vaults, etc.), but levels are below 20% of the lower explosive limit and health concern levels; award 10 points total — 0

III. SOURCE ASSESSMENT

A. Uncontrolled or Unabated Contaminant Source (including dump sites, stockpiles, lagoons, contaminated soil, septic tanks, land fills, above ground storage tanks, etc.)

1. Suspected or confirmed primary source remains in active use and continues to receive raw product, wastewater or solid waste; award 30 points per source — 0

2. Active use of suspected or confirmed primary source has been discontinued or source was caused by a one-time release of product or waste; however, primary or secondary source continues to release product or contaminants into the environment; award 10 points per source — 10

IV. ENVIRONMENTAL VULNERABILITY ASSESSMENT

A. Vertical Contaminant Migration - Literature or well logs indicate that no confining layer is present above bedrock or within twenty feet of land surface; award 10 points total — 10

B. Horizontal Contaminant Migration - Data or observations indicate that no discharge points or aquifer discontinuities exist between the discharge or known extent of contamination and the nearest down gradient drinking water supply; award 10 points total — 0

C. Existing Groundwater Quality – The worst case monitoring or supply well contains contaminant levels:

1. At less than 10 times the 2L groundwater standards; award 5 points. — 0

2. Between 10 and 100 times the 2L groundwater standards; award 20 points. — 0

3. Greater than 100 times the 2L groundwater standards; award 40 points. — 40

V. LETTER RANKING

(Put an X on the line next to all conditions that apply)

CATEGORY A (one or more of the following conditions are present)

1. One or more water supply wells are contaminated and the person using the wells are not served by an existing public water supply. ____

2. Contaminant vapors are present in confined areas at levels that pose a human health concern or an explosion hazard. ____

3. A treated surface water supply is in violation of the drinking water standards set out in rules adopted by the Commission for Health Services under G.S. 130A-315. ____

CATEGORY B (one or more of the following conditions are present)

1. One or more supply wells contaminated but the persons using the wells are served by an existing public water supply. ____

2. One or more supply wells are in use within 1500 feet of the discharge or known extent of contamination, the wells are not contaminated, and the persons using the wells are not served by an existing public water supply. ____

3. Vapors are present in confined areas but do not currently pose a threat to human health or an explosion hazard. _____

CATEGORY C (both of the following conditions are present)

1. One or more water supply wells are present at a distance greater than 1500 feet down gradient from the discharge or known extent of contamination, and the persons using the wells are not served by a public water supply. _____

2. None of the identified wells are contaminated. _____

CATEGORY D (both of the following conditions are present)

1. One or more wells are present within 1500 feet of the discharge or known extent of contamination, but the persons using the wells are served by an existing public water supply _____

2. None of the identified wells are contaminated. _____

CATEGORY E (both of the following conditions are present)

1. Water supply well(s) are not present within 1500 feet of the discharge or known extent of contamination; and no known water supply wells are contaminated. X

2. All persons within 1500' of the discharge or known extent of contamination are served by an existing public water supply. X

SITE PRIORITY RANKING 60/E
#/Letter

I, _____ a Professional Engineer / Licensed Geologist (circle one) for _____ (firm or company of employment) do certify that the information used to determine the site priority ranking is correct and accurate to the best of my knowledge.

(Please Affix Seal and Signature)

APPENDIX C

WELL CONSTRUCTION RECORDS AND BORING LOGS

WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Bobbie Fowler **CERTIFICATION #** 2869

WELL CONTRACTOR COMPANY NAME CATLIN Engineers & Scientists **PHONE #** (910) 452-5861

STATE WELL CONSTRUCTION PERMIT # (if applicable) 2869 **ASSOCIATED WQ PERMIT #** (if applicable) N/A

MW-07

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐
   Monitoring ☒ Recovery ☐ Heat Pump Water Injection ☐ Other ☐ If Other, List Use _____
2. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Camp Lejeune County: Onslow
   _____
   (Road Name and Numbers, Community, Subdivision, Lot No., Zip Code)
3. OWNER: LANTDIV NAVFACENGCOM Commanding General
   Address: AC/S EMD/Marine Corps Base/PSC Box 20004
   (Street or Route No.)
   Camp Lejeune (City or Town) NC (State) 28542-0004 (Zip Code)
   _____
   Area code - Phone number
4. DATE DRILLED: 10/6/2003
5. TOTAL DEPTH: 14
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 0 FT. Above Land Surface*
   * Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118
9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): Surficial Aquifer
    _____
12. DISINFECTION: Type N/A Amount N/A
13. CASING:

	Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From	0 To 4 ft.	2 in.	Sch. 40	PVC
From	To ft.	in.		
From	To ft.	in.		

14. GROUT:

	Depth	Material	Method
From	To ft.		
From	0.5 To 2 ft.	Bent.	Surface Pour

15. SCREEN:

	Depth	Diameter	Slot Size	Material
From	4 To 14 ft.	2 in.	Slot .010 in.	PVC
From	To ft.	in.	in.	

16. SAND/GRAVEL PACK:

	Depth	Size	Material
From	2 To 14 ft.	#2 Medium	Torpedo Sand
From	To ft.		

17. REMARKS: _____

Topographic/Land Setting
☐Ridge ☐Slope ☐Valley ☒Flat
(check appropriate box)

Northing/Easting of well location
352702.764/2471087.778
NCSP NAD 83 (ft)

Latitude/longitude source: ☒GPS ☐Topo. map
(check box)

DEPTH From To — DRILLING LOG Formation Description

SEE ATTACHED

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include road numbers and common road names.

SEE ATTACHED

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Bobbie Fowler — 10-14-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL — DATE

Submit original to Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days.

Modified from: GW-1 REV.07/2001

WELL LOG

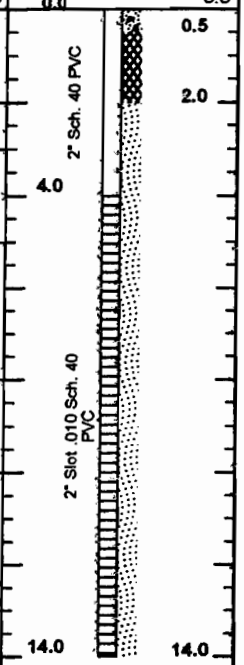
CATLIN ENGINEERS and SCIENTISTS, Wilmington, North Carolina

SHEET 1 OF 1

PROJECT NO.: 203-060	STATE: NC	COUNTY: Onslow	LOCATION: Camp Lejeune
PROJECT NAME: AS-840	LOGGED BY: Charles Ray		WELL ID: MW-07
	DRILLER: Bobbie Fowler		
NORTHING: 352,702.8	EASTING: 2,471,087.8	CREW:	
SYSTEM: NCSP NAD 83 (ft)	BORING LOCATION: See Map		T.O.C. ELEV.: 14.88
DRILL MACHINE: Diedrich D-25	METHOD: HSA	0 HOUR DTW:	BORING DEPTH: 15.0
START DATE: 10/6/03	FINISH DATE: 10/6/03	24 HOUR DTW:	WELL DEPTH: 14.0

DEPTH	BLOW COUNT 6in	6in	6in	6in	OVA (ppm)	LAB.	USCS	LOG	SOIL AND ROCK DESCRIPTION	DEPTH	ELEVATION
										0.0	LAND SURFACE 14.9
0.0	11	15	14	15		sampled 0-2	SM		Dark brown, SILTY, v.f. to f. SAND. Dry. No HCO.	2.0	12.9
2.0										3.0	11.9
3.0	4	5	7	8			CL		Orange, brown, SILTY, v.f. to f., SANDY CLAY with med. plasticity. Moist. Slight HCO.	5.0	9.9
										8.0	6.9
8.0	2	3	7	15			CL		Gray, orange, SILTY, v.f. to f., SANDY CLAY with med. plasticity. Moist to sat. High HCO.	10.0	4.9
										13.0	1.9
13.0	3	9	14	17			SP		Gray, well sorted, v.f. to f. SAND. Sat. High HCO.	15.0	-0.1
									Boring Terminated at Elevation -0.1 ft		

WELL DETAIL



Concrete | Bentonite Pellets | #2 Medium Sand

CATLIN BORING LOG 203-060.GPJ CATLIN.GDT 10/14/03

WELL CONSTRUCTION RECORD

North Carolina - Department of Environment and Natural Resources - Division of Water Quality - Groundwater Section

WELL CONTRACTOR (INDIVIDUAL) NAME (print) Bobbie Fowler **CERTIFICATION #** 2869

WELL CONTRACTOR COMPANY NAME CATLIN Engineers & Scientists **PHONE #** (910) 452-5861

STATE WELL CONSTRUCTION PERMIT # (if applicable) 2869 **ASSOCIATED WQ PERMIT #** (if applicable) N/A

MW-08

1. WELL USE (Check Applicable Box): Residential ☐ Municipal/Public ☐ Industrial ☐ Agricultural ☐
   Monitoring ☒ Recovery ☐ Heat Pump Water Injection ☐ Other ☐ If Other, List Use _____
2. WELL LOCATION: (Show sketch of the location below)
   Nearest Town: Camp Lejeune County: Onslow
   _____
   (Road Name and Numbers, Community, Subdivision, Lot No., Zip Code)
3. OWNER: LANTDIV NAVFACENGCOM Commanding General
   Address: AC/S EMD/Marine Corps Base/PSC Box 20004
   (Street or Route No.)
   Camp Lejeune (City or Town) NC (State) 28542-0004 (Zip Code)
   _____
   Area code - Phone number
4. DATE DRILLED: 10/6/2003
5. TOTAL DEPTH: 14
6. DOES WELL REPLACE EXISTING WELL? YES ☐ NO ☒
7. STATIC WATER LEVEL Below Top of Casing _____ FT.
   (Use "+" if Above Top of Casing)
8. TOP OF CASING IS 0 FT. Above Land Surface*
   * Top of casing terminated at/or below land surface requires a variance in accordance with 15A NCAC 2C.0118
9. YIELD (gpm): N/A METHOD OF TEST N/A
10. WATER ZONES (depth): Surficial Aquifer
    _____
12. DISINFECTION: Type N/A Amount N/A
13. CASING:

	Depth	Diameter	Wall Thickness or Weight/Ft.	Material
From	0 To 4 ft.	2 in.	Sch. 40	PVC
From	To ft.	in.		
From	To ft.	in.		

14. GROUT:

	Depth	Material	Method
From	To ft.		
From	0.5 To 2 ft.	Bent.	Surface Pour

15. SCREEN:

	Depth	Diameter	Slot Size	Material
From	4 To 14 ft.	2 in.	Slot .010 in.	PVC
From	To ft.	in.	in.	

16. SAND/GRAVEL PACK:

	Depth	Size	Material
From	2 To 14 ft.	#2 Medium	Torpedo Sand
From	To ft.		

17. REMARKS: _____

Topographic/Land Setting
☐Ridge ☐Slope ☐Valley ☒Flat
(check appropriate box)

Northing/Easting of well location
352721.168/2471168.488
NCSP NAD 83 (ft)

Latitude/longitude source: ☒GPS ☐Topo. map
(check box)

DEPTH From To — DRILLING LOG Formation Description

SEE ATTACHED

LOCATION SKETCH
Show direction and distance in miles from at least two State Roads or County Roads. Include road numbers and common road names.

SEE ATTACHED

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15A NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

Bobbie Fowler 10-14-03

SIGNATURE OF PERSON CONSTRUCTING THE WELL DATE

Submit original to Division of Water Quality, Groundwater Section, 1636 Mail Service Center - Raleigh, NC 27699-1636 Phone No. (919) 733-3221, within 30 days.

Modified from: GW-1 REV.07/2001

WELL LOG

CATLIN ENGINEERS and SCIENTISTS
Wilmington, North Carolina

SHEET 1 OF 1

PROJECT NO.: 203-060	STATE: NC	COUNTY: Onslow	LOCATION: Camp Lejuene
PROJECT NAME: AS-840		LOGGED BY: Charles Ray	WELL ID: MW-08
		DRILLER: Bobbie Fowler	
NORTHING: 352,721.2	EASTING: 2,471,168.5	CREW:	
SYSTEM: NCSP NAD 83 (ft)	BORING LOCATION: See Map		T.O.C. ELEV.: 14.94
DRILL MACHINE: Diedrich D-25	METHOD: HSA	0 HOUR DTW:	BORING DEPTH: 15.0
START DATE: 10/6/03	FINISH DATE: 10/6/03	24 HOUR DTW:	WELL DEPTH: 14.0

DEPTH	BLOW COUNT 6in	6in	6in	6in	OVA (ppm)	LAB.	USCS	LOG	SOIL AND ROCK DESCRIPTION	DEPTH	ELEVATION	WELL DETAIL
									LAND SURFACE	0.0	14.9	0.0
0.0	7	14	13	12		sampled 0-2	SM		Brown, tan, SILTY, v.f. to f. SAND. Dry. No HCO.	2.0	12.9	0.5
2.0										3.0	11.9	2.0
3.0	3	5	7	8			SC		Dark brown, SILTY, v.f. to f. CLAYEY SAND. Moist. No HCO.	5.0	9.9	4.0
										8.0	6.9	
8.0	1	4	6	16			CL		Gray, orange, SILTY, v.f. to f., SANDY CLAY with med. plasticity. Moist to sat. No HCO.	10.0	4.9	
										13.0	1.9	
13.0	3	10	14	16			SP		Gray, well sorted, v.f.to f. SAND. Sat. No HCO.	15.0	-0.1	14.0
									Boring Terminated at Elevation -0.1 ft			

2" Sch. 40 PVC

2" Slot .010 Sch. 40 PVC

Concrete | Bentonite Pellets | #2 Medium Sand

CATLIN BORING LOG 203-060.GPJ CATLIN.GDT 10/14/03

APPENDIX D

LABORATORY ANALYTICAL REPORTS
AND
CHAIN-OF-CUSTODY RECORDS

PARADIGM ANALYTICAL LABORATORIES, INC.
5500 Business Drive
Wilmington, North Carolina 28405
(910) 350-1903
Fax (910) 350-1557

FILE COPY

Mr. Steve Tyler
Richard Catlin & Associates
P.O. Box 10279
Wilmington, NC 28404-0279

October 23, 2003

Report Number: G128-1203

Client Project ID: AS-840

Dear Mr. Tyler,

Enclosed are the results of the analytical services performed under the referenced project. 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 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 for assistance. 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.

Laboratory Director
J. Patrick Weaver

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B/5035

Client Sample ID: ASTAS840-MW-07(0-2)
Client Project ID: AS-840
Lab Sample ID: 81825
Lab Project ID: G128-1203
Matrix: Soil %Solids: 89.9

Date Analyzed: 10/20/03
Analyzed By: EKR
Date Collected: 10/6/03
Date Received: 10/9/03
Dilution: 1

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Acetone	0.055	BQL
Benzene	0.0055	BQL
Bromobenzene	0.0055	BQL
Bromochloromethane	0.0055	BQL
Bromodichloromethane	0.0055	BQL
Bromoform	0.0055	BQL
Bromomethane	0.0055	BQL
2-Butanone	0.027	BQL
n-Butylbenzene	0.0055	BQL
sec-Butylbenzene	0.0055	BQL
tert-Butylbenzene	0.0055	BQL
Carbon disulfide	0.0055	BQL
Carbon tetrachloride	0.0055	BQL
Chlorobenzene	0.0055	BQL
Chloroethane	0.0055	BQL
2-Chloroethyl vinyl ether	0.0055	BQL
Chloroform	0.0055	BQL
Chloromethane	0.0055	BQL
2-Chlorotoluene	0.0055	BQL
4-Chlorotoluene	0.0055	BQL
Dibromochloromethane	0.0055	BQL
1,2-Dibromo-3-chloropropane	0.0055	BQL
Dibromomethane	0.0055	BQL
1,2-Dibromoethane (EDB)	0.0055	BQL
1,2-Dichlorobenzene	0.0055	BQL
1,3-Dichlorobenzene	0.0055	BQL
1,4-Dichlorobenzene	0.0055	BQL
trans-1,4-Dichloro-2-butene	0.0055	BQL
1,1-Dichloroethane	0.0055	BQL
1,1-Dichloroethene	0.0055	BQL
1,2-Dichloroethane	0.0055	BQL
cis-1,2-Dichloroethene	0.0055	BQL
trans-1,2-dichloroethene	0.0055	BQL
1,2-Dichloropropane	0.0055	BQL
1,3-Dichloropropane	0.0055	BQL
2,2-Dichloropropane	0.0055	BQL
1,1-Dichloropropene	0.0055	BQL
cis-1,3-Dichloropropene	0.0055	BQL
trans-1,3-Dichloropropene	0.0055	BQL
Dichlorodifluoromethane	0.0055	BQL
Diisopropyl ether (DIPE)	0.0055	BQL
Ethylbenzene	0.0055	BQL
Hexachlorobutadiene	0.0055	BQL
2-Hexanone	0.0055	BQL
Iodomethane	0.0055	BQL

Reviewed by: mmc

Flags: BQL = Below Quantitation Limit

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B/5035

Client Sample ID: ASTAS840-MW-07(0-2)
Client Project ID: AS-840
Lab Sample ID: 81825
Lab Project ID: G128-1203
Matrix: Soil %Solids: 89.9

Date Analyzed: 10/20/03
Analyzed By: EKR
Date Collected: 10/6/03
Date Received: 10/9/03
Dilution: 1

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Isopropylbenzene	0.0055	BQL
4-Isopropyltoluene	0.0055	BQL
Methylene chloride	0.022	BQL
4-Methyl-2-pentanone	0.0055	BQL
Methyl-tert-butyl ether (MTBE)	0.0055	BQL
Naphthalene	0.0055	BQL
n-Propyl benzene	0.0055	BQL
Styrene	0.0055	BQL
1,1,1,2-Tetrachloroethane	0.0055	BQL
1,1,2,2-Tetrachloroethane	0.0055	BQL
Tetrachloroethene	0.0055	BQL
Toluene	0.0055	BQL
1,2,3-Trichlorobenzene	0.0055	BQL
1,2,4-Trichlorobenzene	0.0055	BQL
Trichloroethene	0.0055	BQL
1,1,1-Trichloroethane	0.0055	BQL
1,1,2-Trichloroethane	0.0055	BQL
Trichlorofluoromethane	0.0055	BQL
1,2,3-Trichloropropane	0.0055	BQL
1,2,4-Trimethylbenzene	0.0055	BQL
1,3,5-Trimethylbenzene	0.0055	BQL
Vinyl chloride	0.0055	BQL
m-,p-Xylene	0.011	BQL
o-Xylene	0.0055	BQL

Surrogate Spike Recoveries Compound	Spike Added (mg/KG)	Surrogate Result (mg/KG)	%Rec
Bromofluorobenzene	0.0500	0.0470	94
1,2-Dichloroethane-d4	0.0500	0.0546	109
Toluene-d8	0.0500	0.0496	99

Comments:
All results are corrected for dilution.

Reviewed by: _____

Flags: BQL = Below Quantitation Limit

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B/5035

Client Sample ID: ASTAS840-MW-08(0-2)
Client Project ID: AS-840
Lab Sample ID: 81826
Lab Project ID: G128-1203
Matrix: Soil %Solids: 88.3

Date Analyzed: 10/20/03
Analyzed By: EKR
Date Collected: 10/6/03
Date Received: 10/9/03
Dilution: 2

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Acetone	0.072	BQL
Benzene	0.0072	BQL
Bromobenzene	0.0072	BQL
Bromochloromethane	0.0072	BQL
Bromodichloromethane	0.0072	BQL
Bromoform	0.0072	BQL
Bromomethane	0.0072	BQL
2-Butanone	0.036	BQL
n-Butylbenzene	0.0072	BQL
sec-Butylbenzene	0.0072	BQL
tert-Butylbenzene	0.0072	BQL
Carbon disulfide	0.0072	BQL
Carbon tetrachloride	0.0072	BQL
Chlorobenzene	0.0072	BQL
Chloroethane	0.0072	BQL
2-Chloroethyl vinyl ether	0.0072	BQL
Chloroform	0.0072	BQL
Chloromethane	0.0072	BQL
2-Chlorotoluene	0.0072	BQL
4-Chlorotoluene	0.0072	BQL
Dibromochloromethane	0.0072	BQL
1,2-Dibromo-3-chloropropane	0.0072	BQL
Dibromomethane	0.0072	BQL
1,2-Dibromoethane (EDB)	0.0072	BQL
1,2-Dichlorobenzene	0.0072	BQL
1,3-Dichlorobenzene	0.0072	BQL
1,4-Dichlorobenzene	0.0072	BQL
trans-1,4-Dichloro-2-butene	0.0072	BQL
1,1-Dichloroethane	0.0072	BQL
1,1-Dichloroethene	0.0072	BQL
1,2-Dichloroethane	0.0072	BQL
cis-1,2-Dichloroethene	0.0072	BQL
trans-1,2-dichloroethene	0.0072	BQL
1,2-Dichloropropane	0.0072	BQL
1,3-Dichloropropane	0.0072	BQL
2,2-Dichloropropane	0.0072	BQL
1,1-Dichloropropene	0.0072	BQL
cis-1,3-Dichloropropene	0.0072	BQL
trans-1,3-Dichloropropene	0.0072	BQL
Dichlorodifluoromethane	0.0072	BQL
Diisopropyl ether (DIPE)	0.0072	BQL
Ethylbenzene	0.0072	BQL
Hexachlorobutadiene	0.0072	BQL
2-Hexanone	0.0072	BQL
Iodomethane	0.0072	BQL

Reviewed by: MMC

Flags: BQL = Below Quantitation Limit

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B/5035

Client Sample ID: ASTAS840-MW-08(0-2)
Client Project ID: AS-840
Lab Sample ID: 81826
Lab Project ID: G128-1203
Matrix: Soil %Solids: 88.3

Date Analyzed: 10/20/03
Analyzed By: EKR
Date Collected: 10/6/03
Date Received: 10/9/03
Dilution: 2

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Isopropylbenzene	0.0072	BQL
4-Isopropyltoluene	0.0072	BQL
Methylene chloride	0.029	BQL
4-Methyl-2-pentanone	0.0072	BQL
Methyl-tert-butyl ether (MTBE)	0.0072	BQL
Naphthalene	0.0072	BQL
n-Propyl benzene	0.0072	BQL
Styrene	0.0072	BQL
1,1,1,2-Tetrachloroethane	0.0072	BQL
1,1,2,2-Tetrachloroethane	0.0072	BQL
Tetrachloroethene	0.0072	BQL
Toluene	0.0072	**0.018**
1,2,3-Trichlorobenzene	0.0072	BQL
1,2,4-Trichlorobenzene	0.0072	BQL
Trichloroethene	0.0072	BQL
1,1,1-Trichloroethane	0.0072	BQL
1,1,2-Trichloroethane	0.0072	BQL
Trichlorofluoromethane	0.0072	BQL
1,2,3-Trichloropropane	0.0072	BQL
1,2,4-Trimethylbenzene	0.0072	BQL
1,3,5-Trimethylbenzene	0.0072	BQL
Vinyl chloride	0.0072	BQL
m-,p-Xylene	0.014	BQL
o-Xylene	0.0072	BQL

Surrogate Spike Recoveries Compound	Spike Added (mg/KG)	Surrogate Result (mg/KG)	%Rec
Bromofluorobenzene	0.0500	0.0484	97
1,2-Dichloroethane-d4	0.0500	0.0553	111
Toluene-d8	0.0500	0.0492	98

Comments:
All results are corrected for dilution.

Reviewed by: _____

Flags: BQL = Below Quantitation Limit

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B/5035

Client Sample ID: ASTAS840-MW-08(0-2)D
Client Project ID: AS-840
Lab Sample ID: 81827
Lab Project ID: G128-1203
Matrix: Soil %Solids: 88.3

Date Analyzed: 10/20/03
Analyzed By: EKR
Date Collected: 10/6/03
Date Received: 10/9/03
Dilution: 2

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Acetone	0.075	BQL
Benzene	0.0075	BQL
Bromobenzene	0.0075	BQL
Bromochloromethane	0.0075	BQL
Bromodichloromethane	0.0075	BQL
Bromoform	0.0075	BQL
Bromomethane	0.0075	BQL
2-Butanone	0.038	BQL
n-Butylbenzene	0.0075	BQL
sec-Butylbenzene	0.0075	BQL
tert-Butylbenzene	0.0075	BQL
Carbon disulfide	0.0075	BQL
Carbon tetrachloride	0.0075	BQL
Chlorobenzene	0.0075	BQL
Chloroethane	0.0075	BQL
2-Chloroethyl vinyl ether	0.0075	BQL
Chloroform	0.0075	BQL
Chloromethane	0.0075	BQL
2-Chlorotoluene	0.0075	BQL
4-Chlorotoluene	0.0075	BQL
Dibromochloromethane	0.0075	BQL
1,2-Dibromo-3-chloropropane	0.0075	BQL
Dibromomethane	0.0075	BQL
1,2-Dibromoethane (EDB)	0.0075	BQL
1,2-Dichlorobenzene	0.0075	BQL
1,3-Dichlorobenzene	0.0075	BQL
1,4-Dichlorobenzene	0.0075	BQL
trans-1,4-Dichloro-2-butene	0.0075	BQL
1,1-Dichloroethane	0.0075	BQL
1,1-Dichloroethene	0.0075	BQL
1,2-Dichloroethane	0.0075	BQL
cis-1,2-Dichloroethene	0.0075	BQL
trans-1,2-dichloroethene	0.0075	BQL
1,2-Dichloropropane	0.0075	BQL
1,3-Dichloropropane	0.0075	BQL
2,2-Dichloropropane	0.0075	BQL
1,1-Dichloropropene	0.0075	BQL
cis-1,3-Dichloropropene	0.0075	BQL
trans-1,3-Dichloropropene	0.0075	BQL
Dichlorodifluoromethane	0.0075	BQL
Diisopropyl ether (DIPE)	0.0075	BQL
Ethylbenzene	0.0075	BQL
Hexachlorobutadiene	0.0075	BQL
2-Hexanone	0.0075	BQL
Iodomethane	0.0075	BQL

Reviewed by: MML

Flags: BQL = Below Quantitation Limit

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GCMS 8260B/5035

Client Sample ID:	ASTAS840-MW-08(0-2)D	Date Analyzed:	10/20/03
Client Project ID:	AS-840	Analyzed By:	EKR
Lab Sample ID:	81827	Date Collected:	10/6/03
Lab Project ID:	G128-1203	Date Received:	10/9/03
Matrix:	Soil %Solids: 88.3	Dilution:	2

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Isopropylbenzene	0.0075	BQL
4-Isopropyltoluene	0.0075	BQL
Methylene chloride	0.03	BQL
4-Methyl-2-pentanone	0.0075	BQL
Methyl-tert-butyl ether (MTBE)	0.0075	BQL
Naphthalene	0.0075	BQL
n-Propyl benzene	0.0075	BQL
Styrene	0.0075	BQL
1,1,1,2-Tetrachloroethane	0.0075	BQL
1,1,2,2-Tetrachloroethane	0.0075	BQL
Tetrachloroethene	0.0075	BQL
Toluene	0.0075	**0.01**
1,2,3-Trichlorobenzene	0.0075	BQL
1,2,4-Trichlorobenzene	0.0075	BQL
Trichloroethene	0.0075	BQL
1,1,1-Trichloroethane	0.0075	BQL
1,1,2-Trichloroethane	0.0075	BQL
Trichlorofluoromethane	0.0075	BQL
1,2,3-Trichloropropane	0.0075	BQL
1,2,4-Trimethylbenzene	0.0075	BQL
1,3,5-Trimethylbenzene	0.0075	BQL
Vinyl chloride	0.0075	BQL
m-,p-Xylene	0.015	BQL
o-Xylene	0.0075	BQL

Surrogate Spike Recoveries	Spike Added	Surrogate Result	%Rec
Compound	(mg/KG)	(mg/KG)	
Bromofluorobenzene	0.0500	0.0486	97
1,2-Dichloroethane-d4	0.0500	0.0559	112
Toluene-d8	0.0500	0.0497	99

Comments:
All results are corrected for dilution.

Reviewed by: _____

Flags: BQL = Below Quantitation Limit

Results for Semivolatiles
by GCMS 8270

Client Sample ID: ASTAS840-MW-07(0-2)
Client Project ID: AS-840
Lab Sample ID: 81825
Lab Project ID: G128-1203
Matrix: Soil %Solids: 89.9

Date Collected: 10/6/03
Date Received: 10/9/03
Date Analyzed: 10/15/03
Analyzed By: MRC
Dilution: 1

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Acenaphthene	0.33	BQL
Acenaphthylene	0.33	BQL
Anthracene	0.33	BQL
Benzo[a]anthracene	0.33	BQL
Benzo[a]pyrene	0.33	BQL
Benzo[b]fluoranthene	0.33	BQL
Benzo[g,h,i]perylene	0.33	BQL
Benzo[k]fluoranthene	0.33	BQL
Benzoic Acid	0.67	BQL
Bis(2-chloroethoxy)methane	0.33	BQL
Bis(2-chloroethyl)ether	0.33	BQL
Bis(2-chloroisopropyl)ether	0.33	BQL
Bis(2-ethylhexyl)phthalate	0.33	BQL
4-bromophenyl phenyl ether	0.33	BQL
Butylbenzylphthalate	0.33	BQL
4-Chloroaniline	1.7	BQL
4-Chloro-3-methylphenol	0.33	BQL
2-Chloronaphthalene	0.33	BQL
2-Chlorophenol	0.33	BQL
4-Chlorophenyl phenyl ether	0.33	BQL
Chrysene	0.33	BQL
Di-n-Butylphthalate	0.33	BQL
Di-n-octylphthalate	0.33	BQL
Dibenzo[a,h]anthracene	0.33	BQL
Dibenzofuran	0.33	BQL
1,2-Dichlorobenzene	0.33	BQL
1,3-Dichlorobenzene	0.33	BQL
1,4-Dichlorobenzene	0.33	BQL
3,3'-Dichlorobenzidine	0.67	BQL
2,4-Dichlorophenol	0.33	BQL
Diethylphthalate	0.33	BQL
2,4-Dimethylphenol	0.33	BQL
Dimethylphthalate	0.33	BQL
4,6-Dinitro-2-methylphenol	1.7	BQL
2,4-Dinitrophenol	1.7	BQL
2,4-Dinitrotoluene	0.33	BQL
2,6-Dinitrotoluene	0.33	BQL
Fluoranthene	0.33	BQL
Fluorene	0.33	BQL
Hexachlorobenzene	0.33	BQL

Results for Semivolatiles
by GCMS 8270

Client Sample ID: ASTAS840-MW-07(0-2)
Client Project ID: AS-840
Lab Sample ID: 81825
Lab Project ID: G128-1203
Matrix: Soil %Solids: 89.9

Date Collected: 10/6/03
Date Received: 10/9/03
Date Analyzed: 10/15/03
Analyzed By: MRC
Dilution: 1

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Hexachlorobutadiene	0.33	BQL
Hexachlorocyclopentadiene	0.67	BQL
Hexachloroethane	0.33	BQL
Indeno(1,2,3-c,d)pyrene	0.33	BQL
Isophorone	0.33	BQL
2-Methylnaphthalene	0.33	BQL
2-Methylphenol	0.33	BQL
3- & 4-Methylphenol	0.33	BQL
N-Nitrosodi-n-propylamine	0.33	BQL
N-Nitrosodiphenylamine	0.33	BQL
Naphthalene	0.33	BQL
2-Nitroaniline	0.33	BQL
3-Nitroaniline	1.7	BQL
4-Nitroaniline	1.7	BQL
Nitrobenzene	0.33	BQL
2-Nitrophenol	0.33	BQL
4-Nitrophenol	1.7	BQL
Pentachlorophenol	1.7	BQL
Phenanthrene	0.33	BQL
Phenol	0.33	BQL
Pyrene	0.33	BQL
1,2,4-Trichlorobenzene	0.33	BQL
2,4,5-Trichlorophenol	0.33	BQL
2,4,6-Trichlorophenol	0.33	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	10.4	104
2-Fluorophenol	10	10.1	101
Nitrobenzene-d5	10	9.6	96
Phenol-d6	10	10.7	107
2,4,6-Tribromophenol	10	9.0	90
4-Terphenyl-d14	10	12.3	123

Comments:

Results are corrected for %solids and dilution where applicable.

Flags:

BQL = Below Quantitation Limit.

Reviewed By: _____

Results for Semivolatiles
by GCMS 8270

Client Sample ID: ASTAS840-MW-08(0-2)
Client Project ID: AS-840
Lab Sample ID: 81826
Lab Project ID: G128-1203
Matrix: Soil %Solids: 88.3

Date Collected: 10/6/03
Date Received: 10/9/03
Date Analyzed: 10/20/03
Analyzed By: MRC
Dilution: 1

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Acenaphthene	0.35	BQL
Acenaphthylene	0.35	BQL
Anthracene	0.35	BQL
Benzo[a]anthracene	0.35	BQL
Benzo[a]pyrene	0.35	BQL
Benzo[b]fluoranthene	0.35	BQL
Benzo[g,h,i]perylene	0.35	BQL
Benzo[k]fluoranthene	0.35	BQL
Benzoic Acid	0.7	BQL
Bis(2-chloroethoxy)methane	0.35	BQL
Bis(2-chloroethyl)ether	0.35	BQL
Bis(2-chloroisopropyl)ether	0.35	BQL
Bis(2-ethylhexyl)phthalate	0.35	BQL
4-bromophenyl phenyl ether	0.35	BQL
Butylbenzylphthalate	0.35	BQL
4-Chloroaniline	1.7	BQL
4-Chloro-3-methylphenol	0.35	BQL
2-Chloronaphthalene	0.35	BQL
2-Chlorophenol	0.35	BQL
4-Chlorophenyl phenyl ether	0.35	BQL
Chrysene	0.35	BQL
Di-n-Butylphthalate	0.35	BQL
Di-n-octylphthalate	0.35	BQL
Dibenzo[a,h]anthracene	0.35	BQL
Dibenzofuran	0.35	BQL
1,2-Dichlorobenzene	0.35	BQL
1,3-Dichlorobenzene	0.35	BQL
1,4-Dichlorobenzene	0.35	BQL
3,3'-Dichlorobenzidine	0.7	BQL
2,4-Dichlorophenol	0.35	BQL
Diethylphthalate	0.35	BQL
2,4-Dimethylphenol	0.35	BQL
Dimethylphthalate	0.35	BQL
4,6-Dinitro-2-methylphenol	1.7	BQL
2,4-Dinitrophenol	1.7	BQL
2,4-Dinitrotoluene	0.35	BQL
2,6-Dinitrotoluene	0.35	BQL
Fluoranthene	0.35	BQL
Fluorene	0.35	BQL
Hexachlorobenzene	0.35	BQL

Results for Semivolatiles
by GCMS 8270

Client Sample ID: ASTAS840-MW-08(0-2)
Client Project ID: AS-840
Lab Sample ID: 81826
Lab Project ID: G128-1203
Matrix: Soil %Solids: 88.3

Date Collected: 10/6/03
Date Received: 10/9/03
Date Analyzed: 10/20/03
Analyzed By: MRC
Dilution: 1

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Hexachlorobutadiene	0.35	BQL
Hexachlorocyclopentadiene	0.7	BQL
Hexachloroethane	0.35	BQL
Indeno(1,2,3-c,d)pyrene	0.35	BQL
Isophorone	0.35	BQL
2-Methylnaphthalene	0.35	BQL
2-Methylphenol	0.35	BQL
3- & 4-Methylphenol	0.35	BQL
N-Nitrosodi-n-propylamine	0.35	BQL
N-Nitrosodiphenylamine	0.35	BQL
Naphthalene	0.35	BQL
2-Nitroaniline	0.35	BQL
3-Nitroaniline	1.7	BQL
4-Nitroaniline	1.7	BQL
Nitrobenzene	0.35	BQL
2-Nitrophenol	0.35	BQL
4-Nitrophenol	1.7	BQL
Pentachlorophenol	1.7	BQL
Phenanthrene	0.35	BQL
Phenol	0.35	BQL
Pyrene	0.35	BQL
1,2,4-Trichlorobenzene	0.35	BQL
2,4,5-Trichlorophenol	0.35	BQL
2,4,6-Trichlorophenol	0.35	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	9.3	93
2-Fluorophenol	10	8.3	83
Nitrobenzene-d5	10	8.7	87
Phenol-d6	10	8.8	88
2,4,6-Tribromophenol	10	8.3	83
4-Terphenyl-d14	10	9.5	95

Comments:

Results are corrected for %solids and dilution where applicable.

Flags:

BQL = Below Quantitation Limit.

Reviewed By: WMC

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: AS-840

Sample Information and Analytical Results	
Sample Identification	ASTAS840-MW-07(0-2)
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	10/06/03
Date Received	10/09/03
Date Extracted	10/06/03
Date Analyzed	10/16/03
Dry Weight	90
Dilution Factor	1
C_5-C_8 Aliphatics**	< 10 (mg/Kg)
C_9-C_{12} Aliphatics**	< 10 (mg/Kg)
C_9-C_{10} Aromatics**	< 10 (mg/Kg)
Surrogate % Recovery - PID	83
Surrogate % Recovery - FID	87

* = 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: G128-1203-81825

Reviewed By: MMC

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: AS-840

Sample Information and Analytical Results	
Sample Identification	ASTAS840-MW-08(0-2)
Sample Matrix	Soil
Collection Option (for Soil)*	3
Date Collected	10/06/03
Date Received	10/09/03
Date Extracted	10/06/03
Date Analyzed	10/16/03
Dry Weight	88
Dilution Factor	1
C_5-C_8 Aliphatics**	< 10 (mg/Kg)
C_9-C_{12} Aliphatics**	< 10 (mg/Kg)
C_9-C_{10} Aromatics**	< 10 (mg/Kg)
Surrogate % Recovery - PID	83
Surrogate % Recovery - FID	87

* = 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: G128-1203-81826

Reviewed By: mpc

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: AS-840

Sample Information and Analytical Results	
Sample Identification	ASTAS840-MW-7
Sample Matrix	Water
Collection Option (for Soil)*	
Date Collected	10/09/03
Date Received	10/09/03
Date Extracted	10/13/03
Date Analyzed	10/13/03
Dry Weight	
Dilution Factor	1
C_5-C_8 Aliphatics**	< 100 (µg/L)
C_9-C_{12} Aliphatics**	190 (µg/L)
C_9-C_{10} Aromatics**	< 100 (µg/L)
Surrogate % Recovery - PID	79
Surrogate % Recovery - FID	91

* = 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: G128-1203-81828

Reviewed By: MLC

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Richard Catlin & Associates

Project Name: AS-840

Sample Information and Analytical Results	
Sample Identification	ASTAS840-MW-8
Sample Matrix	Water
Collection Option (for Soil)*	
Date Collected	10/09/03
Date Received	10/09/03
Date Extracted	10/13/03
Date Analyzed	10/13/03
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	81
Surrogate % Recovery - FID	89

* = 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: G128-1203-81829

Reviewed By: mwc

Attachment 2

VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 09/29/03 PID Initial Calibration Date: 09/29/03

Calibration Ranges and Limits

Range	MDL (µg/L)	MDL (mg/Kg)	ML (µg/L)	ML (mg/Kg)	RL (µg/L)	RL (mg/Kg)
C_5-C_8 Aliphatics	9.3	0.41	29.4	1.3	100	10
C_9-C_{12} Aliphatics	7.9	0.3	25.2	0.97	100	10
C_9-C_{10} Aromatics	0.5	0.04	1.5	0.14	100	10

Calibration Concentration Levels

Range	Levels (µg/L)	Levels (mg/Kg)	%RSD or CCC	Method of Quantitation
C_5-C_8 Aliphatics	20	2	10.2	Calibration Factor
	80	8		
	200	20		
	800	80		
	2000	200		
C_9-C_{12} Aliphatics	15	1.5	23.7	Calibration Factor
	60	6		
	150	15		
	600	60		
	1500	150		
C_9-C_{10} Aromatics	32.5	3.25	20.7	Calibration Factor
	130	13		
	325	32.5		
	1300	130		
	3250	325		

Calibration Check Date: 10/13/03

Calibration Check

Range	Levels (µg/L)	Levels (mg/Kg)	RPD
C_5-C_8 Aliphatics	200	20	3.5
C_9-C_{12} Aliphatics	150	15	-8.8
C_9-C_{10} Aromatics	325	32.5	-4.8

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

Attachment 2

VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 09/29/03 PID Initial Calibration Date: 09/29/03

Calibration Ranges and Limits

Range	MDL		ML		RL	
	(µg/L)	(mg/Kg)	(µg/L)	(mg/Kg)	(µg/L)	(mg/Kg)
C_5-C_8 Aliphatics	9.3	0.41	29.4	1.3	100	10
C_9-C_{12} Aliphatics	7.9	0.3	25.2	0.97	100	10
C_9-C_{10} Aromatics	0.5	0.04	1.5	0.14	100	10

Calibration Concentration Levels

Range	Levels (µg/L)	Levels (mg/Kg)	%RSD or CCC	Method of Quantitation
C_5-C_8 Aliphatics	20	2	10.2	Calibration Factor
	80	8		
	200	20		
	800	80		
	2000	200		
C_9-C_{12} Aliphatics	15	1.5	23.7	Calibration Factor
	60	6		
	150	15		
	600	60		
	1500	150		
C_9-C_{10} Aromatics	32.5	3.25	20.7	Calibration Factor
	130	13		
	325	32.5		
	1300	130		
	3250	325		

Calibration Check Date: 10/16/03

Calibration Check

Range	Levels (µg/L)	Levels (mg/Kg)	RPD
C_5-C_8 Aliphatics	200	20	19.2
C_9-C_{12} Aliphatics	150	15	5.4
C_9-C_{10} Aromatics	325	32.5	3.6

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: Richard Catlin & Associates

Project Name: AS-840

Sample Information and Analytical Results	
Sample Identification	ASTAS840-MW-07(0-2)
Sample Matrix	Soil
Date Collected	10/06/03
Date Received	10/09/03
Date Extracted	10/12/03
Date Analyzed	10/15/03
Dry Weight	89.9
Dilution Factor	1
C_9-C_{18} Aliphatics*	< 10 (mg/Kg)
C_{19}-C_{36} Aliphatics*	< 10 (mg/Kg)
C_{11}-C_{22} Aromatics*	< 10 (mg/Kg)
Aliphatic Surrogate % Recovery	85
Aromatic Surrogate % Recovery	81
Fractionation Surrogate 1 % Recovery	91

Comments:

* = Excludes any surrogates or internal standards.

Lab info: G128-1203-81825

Reviewed By: MMC

PARADIGM ANALYTICAL LABORATORIES, INC.

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: AS-840

Sample Information and Analytical Results	
Sample Identification	ASTAS840-MW-08(0-2)
Sample Matrix	Soil
Date Collected	10/06/03
Date Received	10/09/03
Date Extracted	10/12/03
Date Analyzed	10/15/03
Dry Weight	88.3
Dilution Factor	1
C_9-C_{18} Aliphatics*	< 10 (mg/Kg)
C_{19}-C_{36} Aliphatics*	< 10 (mg/Kg)
C_{11}-C_{22} Aromatics*	< 10 (mg/Kg)
Aliphatic Surrogate % Recovery	87
Aromatic Surrogate % Recovery	81
Fractionation Surrogate 1 % Recovery	93

Comments:

* = Excludes any surrogates or internal standards.

Lab info: G128-1203-81826

Reviewed By: _____

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: AS-840

Sample Information and Analytical Results	
Sample Identification	ASTAS840-MW-7
Sample Matrix	Water
Date Collected	10/09/03
Date Received	10/09/03
Date Extracted	10/16/03
Date Analyzed	10/16/03
Dry Weight	
Dilution Factor	1
C_9-C_{18} Aliphatics*	780 (µg/L)
C_{19}-C_{36} Aliphatics*	280 (µg/L)
C_{11}-C_{22} Aromatics*	3000 (µg/L)
Aliphatic Surrogate % Recovery	52
Aromatic Surrogate % Recovery	66
Fractionation Surrogate 1 % Recovery	96

Comments:

* = Excludes any surrogates or internal standards.

Lab info: G128-1203-81828

Reviewed By: MMC

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Richard Catlin & Associates

Project Name: AS-840

Sample Information and Analytical Results	
Sample Identification	ASTAS840-MW-8
Sample Matrix	Water
Date Collected	10/09/03
Date Received	10/09/03
Date Extracted	10/15/03
Date Analyzed	10/15/03
Dry Weight	
Dilution Factor	1
C_9-C_{18} Aliphatics*	< 100 (µg/L)
C_{19}-C_{36} Aliphatics*	< 100 (µg/L)
C_{11}-C_{22} Aromatics*	< 100 (µg/L)
Aliphatic Surrogate % Recovery	78
Aromatic Surrogate % Recovery	90

Comments:

* = Excludes any surrogates or internal standards.
Sample did not require fractionation.

Lab info: G128-1203-81829

Reviewed By: MMC

PARADIGM ANALYTICAL LABORATORIES, INC.

Attachment 3

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 10/06/03

Calibration Ranges and Limits

Range	MDL (µg/L)	MDL (mg/Kg)	ML (µg/L)	ML (mg/Kg)	RL (µg/L)	RL (mg/Kg)
C_9-C_{18} Aliphatics	0.1	0.8	0.3	2.6	100	10
C_{19}-C_{36} Aliphatics	0.1	1.6	0.3	5	100	10
C_{11}-C_{22} Aromatics	0.2	2.1	0.6	6.7	100	10

Calibration Concentration Levels

Range	Levels (µg/L)	Levels (mg/Kg)	%RSD or CCC	Method of Quantitation
C_9-C_{18} Aliphatics	0.06	1	1.70	Calibration Factor
	0.15	2.5		
	0.3	5		
	0.6	10		
	1.2	20		
C_{19}-C_{36} Aliphatics	0.08	1.33	16.6	Calibration Factor
	0.2	3.33		
	0.4	6.67		
	0.8	13.3		
	1.6	26.7		
C_{11}-C_{22} Aromatics	0.17	2.83	10.8	Calibration Factor
	0.425	7.08		
	0.85	14.2		
	1.7	28.3		
	3.4	56.7		

Calibration Check Date: 10/15/03

Calibration Check

Range	Levels (µg/mL)	Levels (mg/Kg)	RPD
C_9-C_{18} Aliphatics	0.6	10	-7.6
C_{19}-C_{36} Aliphatics	0.8	13.3	7.1
C_{11}-C_{22} Aromatics	1.7	28.3	15.2

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

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GC 602

Client Sample ID: ASTAS840-MW-7
Client Project ID: AS-840
Lab Sample ID: 81828
Lab Project ID: G128-1203

Analyzed By: DCS
Date Collected: 10/9/03
Date Received: 10/9/03
Matrix: Water

Analyte	Result ug/L	RL ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.0	1	10/16/03
Diisopropyl ether (DIPE)	BQL	1.0	1	10/16/03
Ethylbenzene	**5.2**	1.0	1	10/16/03
Methyl-tert butyl ether (MTBE)	BQL	2.0	1	10/16/03
Toluene	BQL	1.0	1	10/16/03
m/p-Xylene	BQL	2.0	1	10/16/03
o-Xylene	BQL	2.0	1	10/16/03

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovery
Trifluorotoluene	40	40.1	100

Comments:
All values corrected for dilution.
BQL = Below quantitation limit.

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GC 602

Client Sample ID: ASTAS840-MW-8
Client Project ID: AS-840
Lab Sample ID: 81829
Lab Project ID: G128-1203

Analyzed By: DCS
Date Collected: 10/9/03
Date Received: 10/9/03
Matrix: Water

Analyte	Result ug/L	RL ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.0	1	10/16/03
Diisopropyl ether (DIPE)	BQL	1.0	1	10/16/03
Ethylbenzene	BQL	1.0	1	10/16/03
Methyl-tert butyl ether (MTBE)	BQL	2.0	1	10/16/03
Toluene	BQL	1.0	1	10/16/03
m/p-Xylene	BQL	2.0	1	10/16/03
o-Xylene	BQL	2.0	1	10/16/03

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovery
Trifluorotoluene	40	39.7	99.2

Comments:
All values corrected for dilution.
BQL = Below quantitation limit.

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GC 602

Client Sample ID: ASTAS840-MW-8D
Client Project ID: AS-840
Lab Sample ID: 81830
Lab Project ID: G128-1203

Analyzed By: DCS
Date Collected: 10/9/03
Date Received: 10/9/03
Matrix: Water

Analyte	Result ug/L	RL ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.0	1	10/16/03
Diisopropyl ether (DIPE)	BQL	1.0	1	10/16/03
Ethylbenzene	BQL	1.0	1	10/16/03
Methyl-tert butyl ether (MTBE)	BQL	2.0	1	10/16/03
Toluene	BQL	1.0	1	10/16/03
m/p-Xylene	BQL	2.0	1	10/16/03
o-Xylene	BQL	2.0	1	10/16/03

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovery
Trifluorotoluene	40	39.8	99.4

Comments:
All values corrected for dilution.
BQL = Below quantitation limit.

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles
by GC 602

Client Sample ID: Trip Blank
Client Project ID: AS-840
Lab Sample ID: 81831
Lab Project ID: G128-1203

Analyzed By: DCS
Date Collected: 10/9/03
Date Received: 10/9/03
Matrix: Water

Analyte	Result ug/L	RL ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.0	1	10/16/03
Diisopropyl ether (DIPE)	BQL	1.0	1	10/16/03
Ethylbenzene	BQL	1.0	1	10/16/03
Methyl-tert butyl ether (MTBE)	BQL	2.0	1	10/16/03
Toluene	BQL	1.0	1	10/16/03
m/p-Xylene	BQL	2.0	1	10/16/03
o-Xylene	BQL	2.0	1	10/16/03

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovery
Trifluorotoluene	40	39.8	99.6

Comments:
All values corrected for dilution.
BQL = Below quantitation limit.

Results for Semivolatiles
by GCMS 625

Client Sample ID: ASTAS840-MW-7
Client Project ID: AS-840
Lab Sample ID: 81828
Lab Project ID: G128-1203
Matrix: Water

Date Collected: 10/9/03
Date Received: 10/9/03
Date Analyzed: 10/16/03
Analyzed By: MRC
Dilution: 1

Compound	Quantitation Limit (ug/L)	Result (ug/L)
Acenaphthene	10	**18**
Acenaphthylene	10	BQL
Anthracene	10	BQL
Benzo[a]anthracene	10	BQL
Benzo[a]pyrene	10	BQL
Benzo[b]fluoranthene	10	BQL
Benzo[g,h,i]perylene	10	BQL
Benzo[k]fluoranthene	10	BQL
Bis(2-chloroethoxy)methane	10	BQL
Bis(2-chloroethyl)ether	10	BQL
Bis(2-chloroisopropyl)ether	10	BQL
Bis(2-ethylhexyl)phthalate	10	BQL
4-bromophenyl phenyl ether	10	BQL
Butylbenzylphthalate	10	BQL
4-Chloro-3-methylphenol	10	BQL
2-Chloronaphthalene	10	BQL
2-Chlorophenol	10	BQL
4-Chlorophenyl phenyl ether	10	BQL
Chrysene	10	BQL
Di-n-Butylphthalate	10	BQL
Di-n-octylphthalate	10	BQL
Dibenzo[a,h]anthracene	10	BQL
1,2-Dichlorobenzene	10	BQL
1,3-Dichlorobenzene	10	BQL
1,4-Dichlorobenzene	10	BQL
3,3'-Dichlorobenzidine	20	BQL
2,4-Dichlorophenol	10	BQL
Diethylphthalate	10	BQL
2,4-Dimethylphenol	10	BQL
Dimethylphthalate	10	BQL
4,6-Dinitro-2-methylphenol	50	BQL
2,4-Dinitrophenol	50	BQL
2,4-Dinitrotoluene	10	BQL
2,6-Dinitrotoluene	10	BQL
Fluoranthene	10	BQL
Fluorene	10	**20**
Hexachlorobenzene	10	BQL
Hexachlorobutadiene	10	BQL
Hexachlorocyclopentadiene	20	BQL
Hexachloroethane	10	BQL

Results for Semivolatiles
by GCMS 625

Client Sample ID: ASTAS840-MW-7
Client Project ID: AS-840
Lab Sample ID: 81828
Lab Project ID: G128-1203
Matrix: Water

Date Collected: 10/9/03
Date Received: 10/9/03
Date Analyzed: 10/16/03
Analyzed By: MRC
Dilution: 1

Compound	Quantitation Limit (ug/L)	Result (ug/L)
Indeno(1,2,3-c,d)pyrene	10	BQL
Isophorone	10	BQL
N-Nitrosodi-n-propylamine	10	BQL
N-Nitrosodiphenylamine	10	BQL
Naphthalene	10	BQL
Nitrobenzene	10	BQL
2-Nitrophenol	10	BQL
4-Nitrophenol	50	BQL
Pentachlorophenol	50	BQL
Phenanthrene	10	**48**
Phenol	10	BQL
Pyrene	10	**12**
1,2,4-Trichlorobenzene	10	BQL
2,4,6-Trichlorophenol	10	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	9.5	95
2-Fluorophenol	10	9.9	99
Nitrobenzene-d5	10	10.9	109
Phenol-d6	10	10.9	109
2,4,6-Tribromophenol	10	9.8	98
4-Terphenyl-d14	10	11.4	114

Comments:

Results are corrected for %solids and dilution where applicable.

Flags:

BQL = Below Quantitation Limit.

Reviewed By: MRC

Results of Library Search for Semivolatile Compounds

by GCMS

Client Sample ID: ASTAS840-MW-7
Client Project ID: AS-840
Lab Sample ID: 81828
Lab Project ID: G128-1203

Analyzed By: MRC
Date Collected: 10-09-2003 00:00
Date Received: 10-09-2003 00:00
Matrix: Water

Dilution: 1

Date Analyzed: 10-16-2003

No.	Compound	Retention Time	CAS#	Match Probability	Result (ug/L)
1	Alkane, Unknown	14.55	000629-78-7	97	520
2	Alkane, Unknown	15.28	000544-76-3	96	380
3	Alkane, Unknown	15.98	000629-92-5	96	340
4	Alkane, Unknown	16.64	000629-62-9	96	280
5	Alkane, Unknown	15.32	000629-62-9	87	210
6	Alkane, Unknown	17.88	000629-97-0	98	200
7	Alkane, Unknown	17.27	000629-94-7	98	180
8	Alkane, Unknown	12.95	000629-62-9	98	150
9	Alkane, Unknown	12.08	000629-59-4	98	140
10	Aromatic, Unknown	14.86	001430-97-3	89	140

Comment:

Tentatively Identified Compound (TIC) refers to substances which are not present in the list of target compounds. Therefore, not all TICs are identified and quantitated using individual standards. TIC listings are prepared utilizing a computerized library search of electron impact mass spectral data and evaluation of the relevant data by a mass spectral data specialist.

Quantitation is accomplished by relative peak area of the compound compared to that of the nearest internal standard from the total ion chromatogram. TICs are identified and quantitated only if the peak area is equal to or greater than 10% of that of the nearest internal standard. Quantitation provided is an estimate.

Reviewed by: MRC

Results for Semivolatiles
by GCMS 625

Client Sample ID: ASTAS840-MW-8
Client Project ID: AS-840
Lab Sample ID: 81829
Lab Project ID: G128-1203
Matrix: Water

Date Collected: 10/9/03
Date Received: 10/9/03
Date Analyzed: 10/16/03
Analyzed By: MRC
Dilution: 1

Compound	Quantitation Limit (ug/L)	Result (ug/L)
Acenaphthene	10	BQL
Acenaphthylene	10	BQL
Anthracene	10	BQL
Benzo[a]anthracene	10	BQL
Benzo[a]pyrene	10	BQL
Benzo[b]fluoranthene	10	BQL
Benzo[g,h,i]perylene	10	BQL
Benzo[k]fluoranthene	10	BQL
Bis(2-chloroethoxy)methane	10	BQL
Bis(2-chloroethyl)ether	10	BQL
Bis(2-chloroisopropyl)ether	10	BQL
Bis(2-ethylhexyl)phthalate	10	BQL
4-bromophenyl phenyl ether	10	BQL
Butylbenzylphthalate	10	BQL
4-Chloro-3-methylphenol	10	BQL
2-Chloronaphthalene	10	BQL
2-Chlorophenol	10	BQL
4-Chlorophenyl phenyl ether	10	BQL
Chrysene	10	BQL
Di-n-Butylphthalate	10	BQL
Di-n-octylphthalate	10	BQL
Dibenzo[a,h]anthracene	10	BQL
1,2-Dichlorobenzene	10	BQL
1,3-Dichlorobenzene	10	BQL
1,4-Dichlorobenzene	10	BQL
3,3'-Dichlorobenzidine	20	BQL
2,4-Dichlorophenol	10	BQL
Diethylphthalate	10	BQL
2,4-Dimethylphenol	10	BQL
Dimethylphthalate	10	BQL
4,6-Dinitro-2-methylphenol	50	BQL
2,4-Dinitrophenol	50	BQL
2,4-Dinitrotoluene	10	BQL
2,6-Dinitrotoluene	10	BQL
Fluoranthene	10	BQL
Fluorene	10	BQL
Hexachlorobenzene	10	BQL
Hexachlorobutadiene	10	BQL
Hexachlorocyclopentadiene	20	BQL
Hexachloroethane	10	BQL

Results for Semivolatiles
by GCMS 625

Client Sample ID: ASTAS840-MW-8
Client Project ID: AS-840
Lab Sample ID: 81829
Lab Project ID: G128-1203
Matrix: Water

Date Collected: 10/9/03
Date Received: 10/9/03
Date Analyzed: 10/16/03
Analyzed By: MRC
Dilution: 1

Compound	Quantitation Limit (ug/L)	Result (ug/L)
Indeno(1,2,3-c,d)pyrene	10	BQL
Isophorone	10	BQL
N-Nitrosodi-n-propylamine	10	BQL
N-Nitrosodiphenylamine	10	BQL
Naphthalene	10	BQL
Nitrobenzene	10	BQL
2-Nitrophenol	10	BQL
4-Nitrophenol	50	BQL
Pentachlorophenol	50	BQL
Phenanthrene	10	BQL
Phenol	10	BQL
Pyrene	10	BQL
1,2,4-Trichlorobenzene	10	BQL
2,4,6-Trichlorophenol	10	BQL

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovered
2-Fluorobiphenyl	10	9.5	95
2-Fluorophenol	10	8.7	87
Nitrobenzene-d5	10	8.6	86
Phenol-d6	10	9.6	96
2,4,6-Tribromophenol	10	8.4	84
4-Terphenyl-d14	10	12.9	129

Comments:

Results are corrected for %solids and dilution where applicable.

Flags:

BQL = Below Quantitation Limit.

Reviewed By: MMC

Results of Library Search for Semivolatile Compounds

by GCMS

Client Sample ID: ASTAS840-MW-8
Client Project ID: AS-840
Lab Sample ID: 81829
Lab Project ID: G128-1203

Analyzed By: MRC
Date Collected: 10-09-2003 00:00
Date Received: 10-09-2003 00:00
Matrix: Water

Dilution: 1

Date Analyzed: 10-16-2003 01:05

No.	Compound	Retention Time	CAS#	Match Probability	Result (ug/L)
1	No library search compounds detected.				
2					
3					
4					
5					
6					
7					
8					
9					
10					

Comment:

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Reviewed by: MRC

PARADIGM ANALYTICAL LABORATORIES, INC.

5500 Business Drive, Wilmington, NC 28405

Phone: (910)-350-1903 FAX: (910)-350-1557

Chain-of Custody Record & Analytical Request

COC# 34280

Page 1 **of** 1

Client: Catlin Eng + Sci **Project ID:** AS-840 **Date:** 10-9-03 **Report To:** Steve Tyler

Address: 220 Old Dairy Rd. **Contact:** Charles Ray **Turnaround:** Standard

Address: Wilmington NC 28405 **Phone:** 452-5861 **Job Number:** 203-060

Quote #: **Fax:** **P.O. Number:** **Invoice To:** Sheila

Sample ID	Date	Time	Matrix	Preservatives: MeOH	HCl	Sod. Bi.		Analyses: 8260/5035	8270	VPH	EPH	602+MTBE	625+TICs	VPH/EPH				Comments: Please specify any special reporting requirements
ASTAS840-MW-07(0-2)	10/6/03	1330	S	✓		✓		✓	✓	✓	✓							Summary EDD Format
ASTAS840-MW-08(0-2)	10/6/03	1130	S	✓		✓		✓	✓	✓	✓							Camp Lejeune EDD Format
MW-08(0-2)D	10/6/03	1130	S	✓		✓		✓										
ASTAS840-MW-7	10/9/03	1100	W		✓							✓	✓	✓				G128-1203
ASTAS840-MW-8	10/9/03	1130	W		✓							✓	✓	✓				
ASTAS840-MW-8D	10/9/03	1130	W		✓							✓						
Trip Blank	—	—	W		✓							✓						

Relinquished By	Date	Time	Received By	Date	Time	Temperature	State Certification Requested
[signature]	10/9/03	1315	[signature]	10-9-03	13:15	1.7°C on ice	NC ___ SC ___ Other ___
							SEE REVERSE FOR TERMS AND CONDITIONS