PHASE I LIMITED SITE ASSESSMENT REPORT

FOR THE

WETSIG YACHTS FACILITY
4022 MARKET STREET
WILMINGTON, NORTH CAROLINA
NEW HANOVER COUNTY

CES PROJECT NO. 02106

JULY 31, 2003

INCIDENT NUMBER: PENDING
LATITUDE: 34°14' 16" NORTH
LONGITUDE: 77°53' 41" WEST

UST OWNER/OPERATOR AND CURRENT PROPERTY OWNER:
PAUL J. WETSIG
621 HADLEY COURT
WILMINGTON, NC 28405
(910) 392-7158

CONSULTANT:
CLARK ENVIRONMENTAL SERVICES, P.C.
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WILMINGTON, NORTH CAROLINA 28404
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RELEASE INFORMATION:
A RELEASE WAS DISCOVERED AT THE SITE IN NOVEMBER 2002 DURING A PHASE II REAL ESTATE ASSESSMENT. THE RELEASE IS PRESUMED TO BE ASSOCIATED WITH THE FORMER DIESEL UNDERGROUND STORAGE TANK, WHICH WAS REMOVED CIRCA 1984-1985.

PREPARED BY:
CLARK ENVIRONMENTAL SERVICES, P.C.
WILMINGTON, NORTH CAROLINA

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CES PROJECT NO. 02106

JULY 31, 2003

1.0 SITE HISTORY AND SOURCE CHARACTERIZATION:

1.1 UNDERGROUND STORAGE TANK DATA:

TANK	GALLONS	DATE INSTALLED	DATE CLOSED	CONTENTS
1	200	UNKNOWN	mid-1980s	DIESEL

1.2 UNDERGROUND STORAGE TANK OWNERSHIP:

Mr. Paul Wetsig
621 Hadley Court
Wilmington, NC 28405

1.3 SUMMARY OF SITE HISTORY:

The Wetsig Yacht Facility is hereinafter referred to as the site. A *Phase I Environmental Site Assessment* (*ESA*) (Clark Environmental Services, P.C. (CES), August 21, 2002) and a *Phase II ESA* (CES, December 2, 2002) have been prepared for this site. Based on the findings of the *Phase II ESA*, NCDENR, Division of Waste Management, Underground Storage Tank Section (UST Section) issued a Notice of Regulatory Requirements (NORR) on March 13, 2003, requesting a *Limited Site Assessment* (*LSA*) in accordance with 15A NCAC 2L, Section .0115(c)(4). This document was prepared to meet the requirements of the NORR.

Figure 1 is a topographic vicinity map, **Figure 2** is a site map depicting soil boring and monitoring well locations in the former UST area, and **Figure 3** is a tax map depicting nearby property usages and water supply well location.

2.0 LIMITED SITE ASSESSMENT RISK CLASSIFICATION AND LAND USE FORM:

Part 1 - Groundwater/Surface Water/Vapor Impacts

High Risk

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

   There are no immediately nearby water supply wells, and no wells were sampled for this investigation. Given that no 15A NCAC 2L Groundwater Standards are exceeded, and the very low levels of detected contamination, it is considered unlikely that any supply well may be impacted.

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

   There is one irrigation well approximately 500 feet northeast of the source area; however, it is reportedly not used for drinking water and is reportedly 100 feet deep.

3. *Is a water supply well used for any purpose (e.g. irrigation, washing cars, industrial cooling water, filling swimming pools) located within 250 feet of the source area of the release or discharge?* NO

   The nearest supply well, used for irrigation, is approximately 500 feet northeast of the source area.

4. *Does groundwater within 500 feet of the source area of the discharge or release have the potential for future use in that there is no other source of water supply other than the groundwater?* NO

   The public water system is available and utilized at the site and surrounding properties. The groundwater within 500 feet of the release or discharge could have the potential for future use as there are no restrictions; however, it is unlikely that any water supply well would be constructed for drinking water supplies.

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

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

7. *Is a surface water body located within 500 feet of the source area of the discharge or release?* YES

There is a stormwater retention pond approximately 200 feet north of the site.

8. *Is the source area of the discharge or release located within a designated wellhead protection area as defined in 42 USC 300h-7(e)?* NO

9. *Is the discharge or release located in the Coastal Plain Physiographic Region as designated on a map entitled "Geology of North Carolina" published by the Department in 1985?* YES

The site is located within the Coastal Plain.

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

10. *Do the levels of groundwater contamination for any contaminant exceed the gross contamination levels established (see Table 7) by the Department?* NO

There was no detection of any target compounds in excess of 15A NCAC 2L Groundwater Standards.

Part II - Land Use

Property Containing Source Area of Discharge or Release

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

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

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

3. *Does the property contain a commercial (e.g. retail, warehouse, office/business space, etc.) or industrial (e.g. manufacturing, utilities, industrial research and development, chemical/petroleum bulk storage, etc.) enterprise, an inactive commercial or industrial enterprise, or is the land undeveloped?* YES

The site is utilized for boat construction and boat motor repair.

4. *Do children visit the property?* NO

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

Access to the property is restricted to the general public by a fence; however, during business hours, customers and workers have access to the property.

6. *Do pavement, building, or other structures cap the contaminated soil?* NO

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

According to the City of Wilmington Zoning Department, the site is zoned HM, for heavy manufacturing.

8. *Is the use of the property likely to change in the next 20 years?* YES

Yes, the property may undergo a change in usage in the event that it is sold to a new owner; however, it is not known if or when that may occur.

Property Surrounding Source Area of Discharge or Release

The questions below pertain to the area within 1,500 feet of the source area of the discharge or release (excludes property containing source area of the release):

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

The nearest residence is located approximately 1,400 feet from the source area.

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

The nearest place of public assembly is a daycare center, located approximately 1,100 feet north of the site.

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

The properties in the immediate area of the site are characterized primarily as HM for heavy manufacturing, CS for commercial services, and RB for regional business.

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

The site is located in an established commercial area in Wilmington, North Carolina.

The area immediately surrounding the site primarily consists of undeveloped woods to the west, a stormwater retention pond to the north, and additional undeveloped woods to the east and south. Overall, beyond the immediate area of the site, the land use varies and is predominantly commercial. A shopping center, a church, a few residences, and several small commercial establishments all exist within 1,500 feet of the site property.

3.0 RECEPTOR INFORMATION:

3.1 WATER SUPPLIES:

All potable water for the site and surrounding properties is supplied by the city of Wilmington Public Utilities Department. Water is derived from the Cape Fear River, at a surface water intake located at Kings Bluff, approximately 20 miles upstream from Wilmington. A supply well survey of the area surrounding the site did not reveal any water supply wells within 500 feet of the site. The nearest supply well, utilized for irrigation purposes, is located 500 feet from the source area.

3.2 SURFACE WATER:

The nearest surface water to the site was identified as a retention pond, located approximately 200 feet to the north.

3.3 WELLHEAD PROTECTION AREAS:

According to Mr. Mike Richardson, superintendent of the City of Wilmington Sweeney Water Treatment Plant, the city is intending to switch completely to surface water for supply. Therefore, no plans to establish a Wellhead Protection Area Program presently exist.

3.4 DEEP AQUIFERS IN THE COASTAL PLAIN PHYSIOGRAPHIC REGION:

The three primary fresh water aquifers in New Hanover County are the indurated calcareous sand and sandy clay of the Cretaceous Peedee Formation, the sandy fossiliferous limestone of the Tertiary Castle Hayne Formation, and the surficial aquifer of recent surficial sands and coquina (Bain, 1970).

The upper part of the Peedee Formation contains a fresh water aquifer, consisting chiefly of a quartz sand layer, indurated with calcareous cement, which has an average thickness of 35 feet throughout New Hanover County. In some areas of the county, this sand layer was eroded prior to deposition of the Castle Hayne Formation, and is, therefore, much thinner. The sand layer is underlain by an aquaclude that is typically 150 feet thick. The water in this zone is under artesian pressure throughout most of New Hanover County. The quality of water in this zone makes it acceptable for most uses (Bain, 1970).

Unconformably overlying the Peedee Formation is the Castle Hayne Formation, which consists mostly of limestone, and is productive throughout most of New Hanover County. In areas west and northwest of Wilmington, the limestone is absent, but in most of the County, the limestone is present and thickens in a southeasterly direction. Predominantly, the Castle Hayne Limestone is a sandy, shelly, fossiliferous limestone with a generally light color. In general, the limestone of the Castle Hayne Formation is permeable; however, it does contain beds of highly impermeable marl and dense limestone. In the southern part of the county, the Castle Hayne Limestone is overlain by a porous coquina sandstone that is probably of Miocene age. Some wells draw fresh water from within this sandstone layer (Bain, 1970).

The thickness of the Castle Hayne Limestone is variable and typically less than 50 feet thick; however, in some areas of southern New Hanover County, the limestone is more than 100 feet thick. The interstream areas of the limestone show the highest water level elevations, and the lowest water level elevations are found in discharge areas along major stream valleys. This indicates that the aquifer is probably recharged locally. The surficial sands that overlie most of the limestone readily allow the infiltration of precipitation, and recharge to this aquifer is typically very shallow. The water from the Castle Hayne Formation is generally acceptable for most uses (Bain, 1970).

The surficial sands that cover most of New Hanover County typically contain water of a high enough quality to be used in many domestic applications. Many driven wells of less than 25 feet in depth exist throughout the county. Water from these sands is typically soft and low in mineral content.

3.5 SUBSURFACE STRUCTURES:

Currently, the site utilizes municipal water and sanitary sewer service. Reportedly, there is a 6-inch water line in front of the building, on the south side of the railroad track that connects the site to a water main along Kerr Avenue. In addition, reportedly, the site's main water line extends from Market Street, along Wetsig's entrance road and bifurcates onto the site from near the entrance to the property. Other small, on-site lines are known to be present.

It is known that subsurface power and telephone lines extend along the site's entrance road and are present in various locations at the site, particularly between the buildings.

A drain pipe was observed to extend under the northern railroad track near the northwest corner of the subject site, and to drain in a southeastward direction. In addition, a storm drain pipe was observed to extend under the northern railroad track in front of the main building. Reportedly, the pipe extends under the east edge of the Wetsig building, and drains southeastwardly under the southern railroad track.

3.6 LAND USE:

The area within 1,500 feet of the source area includes undeveloped property, commercial properties, and a few residences.

3.7 ADJACENT PROPERTY OWNERS AND OCCUPANTS:

Table 1 lists the names and addresses of property owners and occupants adjacent to the site where contamination, if present, could be expected to migrate, and nearby properties with known supply wells (**Figure 3**).

4.0 SITE GEOLOGY AND HYDROGEOLOGY:

4.1 PROJECT-SPECIFIC SUBSURFACE CHARACTERISTICS:

4.1.1 Description of Shallow Subsurface Geology:

According to the boring log for MW1, the shallow subsurface of the site can be generalized as brown sandy clay from 0 to 8 feet below ground surface (BGS), and gray silty sand from 8 to 12 feet BGS.

4.1.2 Groundwater Occurrence:

Groundwater measurements obtained at MW1 on several occasions document that groundwater exists between 5 and 7 feet BGS (**Table 2**).

5.0 SOIL SAMPLING RESULTS:

One soil sample was collected adjacent to MW1, at a depth of approximately 4.0 to 4.5 feet BGS. **Table 3** is a summary of soil analytical data and laboratory results and the chain of custody form are included in **Appendix II**. The analyses did not detect the presence of target compounds; thus, there are no exceedences of NC DENR, UST Section Soil-to-Groundwater Maximum Soil Contaminant Concentrations (MSCCs).

6.0 GROUNDWATER SAMPLING RESULTS:

6.1 FREE PRODUCT:

Free product was not encountered during this investigation.

6.2 GROUNDWATER RESULTS:

Groundwater analytical results are summarized in **Table 4** and the sampling record

and laboratory data for MW1, along with the chain-of-custody form, are provided in **Appendix III.** The analyses detected trace levels of MTBE (7.8 μg/L) and bis (2-ethylenehexyl) phthalate (3.6 μg/L) (a common laboratory contaminant). Neither of these two detections exceed the 15A NCAC 2L Groundwater Standards for either compound.

7.0 CONCLUSIONS AND RECOMMENDATIONS:

Based on the information collected during this investigation, no target compounds were detected above Soil-To-Groundwater MSCCs or 15A NCAC 2L Groundwater Standards.

It is recommended that a copy of this report be submitted to the UST Section of the NCDENR, Wilmington Regional Office, for review and determination of further requirements, if any.

8.0 LIMITATIONS:

Information obtained and presented as part of this investigation is based on available data in an effort to understand and/or correct an existing or potential problem. The validity of any resulting conclusions is limited by methodological constraints and by the lack of a statistically significant number of data points. There is no warranty, expressed or implied, that additional or new information and/or additional measures will not be required to ultimately solve the problem. Additionally, Clark Environmental Services, P.C. assumes no responsibility for the validity of subjective or interpolated interpretations, whether or not implied or indicated, although an attempt is made to qualify such.

TABLES

TABLE 1
ADJACENT PROPERTY AND WATER SUPPLY WELL DATA
WETSIG YACHTS FACILITY
INCIDENT NO. PENDING, CES PROJECT NO. 02106

TAX MAP NO.	OWNER'S NAME	PHYSICAL ADDRESS	MAILING ADDRESS	ADJACENT TO SITE (Y/N)	WELL ON SITE (Y/N)	USE OF WELL	WELL DEPTH (FT)	CASING DEPTH (FT)	SCREEN INTERVAL (FT)	APPROXIMATE DISTANCE FROM SOURCE
0376	PAUL J. WETSIG	4022 MARKET ST. WILMINGTON, NC	621 HADLEY CT. WILMINGTON, NC 28405	NA (site)	N	NA	NA	NA	NA	NA
6933	CAMERON AND BARKLEY COMPANY	4151 EMERSON ST. WILMINGTON, NC	P.O. BOX 118007 CHARLESTON, SC 29423	Y	N	NA	NA	NA	NA	NA
8869	LONGLEY SUPPLY COMPANY	316 MARLBORO ST. WILMINGTON, NC	2018 OLEANDER DR. WILMINGTON, NC 28403	Y	N	NA	NA	NA	NA	NA
2196	ABINTO CORPORATION	77 DARLINGTON AVE. WILMINGTON, NC	3205 RANDALL PKWY, #103 WILMINGTON, NC 28403	Y	N	NA	NA	NA	NA	NA
1790	SEAGATE INVESTMENTS, INC.	227 S. KERR AVE. WILMINGTON, NC	223 GREENVILLE AVE. WILMINGTON, NC 28403	Y	N	NA	NA	NA	NA	NA
0239	JOHN S. HUFFSTELLAR	3804 MARKET ST. WILMINGTON, NC	711 SANDRIDGE RD. CHARLOTTE, NC 28210	Y	N	NA	NA	NA	NA	NA
6148	JOHN S. HUFFSTELLAR	3804 MARKET ST. WILMINGTON, NC	711 SANDRIDGE RD. CHARLOTTE, NC 28210	Y	N	NA	NA	NA	NA	NA
2781	STORMWATER OWNERS ASSOCIATION, INC.	118 CINEMA DR. WILMINGTON, NC	c/o R. J. ANTHONY 12770 COIT RD., #1170 DALLAS, TX 75251	Y	N	NA	NA	NA	NA	NA
5751	SEA COMM, INC.	122 CINEMA DR. WILMINGTON, NC	122 CINEMA DR. WILMINGTON, NC 28403	Y	Y	Irrigation	100	UK	UK	500 FT. NORTHEAST

Notes:

1. Keyed to Figure 3
2. UK represent unknown
3. NA represents not applicable

TABLE 2
MONITORING WELL CONSTRUCTION AND GROUNDWATER ELEVATION DATA
WETSIG YACHTS FACILITY
INCIDENT NO. PENDING, CES PROJECT NO. 02106

WELL ID	DATE INSTALLED	DATE WATER LEVEL MEASURED	WELL CASING DEPTH (ft)	SCREENED INTERVAL (ft BGS)	BOTTOM OF WELL (ft BGS)	TOP OF CASING ELEVATION (ft)	DEPTH TO WATER FROM TOP OF CASING (ft)	FREE PRODUCT THICKNESS (ft)	GROUNDWATER ELEVATION (ft)
MW1	09/25/02	10/02/02	1.5	1.5 - 11.5	11.5	97.87	5.97	0	91.90
MW1	09/25/02	10/31/02	1.5	1.5 - 11.5	11.5	97.87	6.98	0	90.89
MW1	09/25/02	04/30/03	1.5	1.5 - 11.5	11.5	97.87	5.42	0	92.45

Note:
1) BGS indicates a depth in feet below ground surface.
2) Elevations based on an assumed 100 foot datum
3) Measurements taken from top of casing

TABLE 3
SUMMARY OF SOIL SAMPLING RESULTS
WETSIG YACHTS FACILITY
INCIDENT NO. PENDING, CES PROJECT NO. 02106

			CONTAMINANTS OF CONCERN													
ANALYTICAL METHOD			8260B							8270					3550	5030
SAMPLING INFORMATION																
SAMPLE ID	DATE COLLECTED	SAMPLE DEPTH (ft BGS)	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	MTBE	DIPE	NAPHTHALENE	NAPHTHALENE	C5-C8 ALIPHATICS	C9-C18 ALIPHATICS	C19-C36 ALIPHATICS	C9-C22 AROMATICS	HIGH BOILING POINT TPH	LOW BOILING POINT TPH
SOIL-TO-GROUNDWATER MSCC			0.0056	7	0.24	5	0.92	0.37	0.58	0.58	72	3,255	*	34	ACTION	ACTION
RESIDENTIAL MSCC			22	3,200	1,560	32,000	156	156	63	63	939	9,386	93,860	469	LEVEL	LEVEL
INDUSTRIAL/COMMERCIAL MSCC			200	82,000	40,000	200,000	4,088	4,088	1,635	1,635	24,528	245,280	**	12,264	10	10
SB10	09/11/02	4-5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	**13**	BQL
SB/MW1	04/30/03	4-4.5	<0.005	<0.005	<0.005	<0.015	<0.005	<0.005	<0.005	<0.33	<10	<20	<10	<20	NT	NT

Notes:

1. Results reported in milligrams per kilogram (mg/kg)
2. ft BGS represents feet below ground surface
3. MSCC represents maximum soil contamination concentration
4. Bold represents concentrations in excess of applicable standards
5. NT represents not tested
6. TPH represents total petroleum hydrocarbons
7. C_9-C_{18} concentration represents the total of C_9-C_{12} and C_9-C_{18} aliphatics from the VPH and EPH analyses, respectively
8. C_9-C_{22} concentration represents the total of C_9-C_{10} and C_{11}-C_{22} aromatics from the VPH and EPH analyses, respectively
9. * indicates that the contaminant is considered immobile
10. ** represents that the health based level > 100% concentration

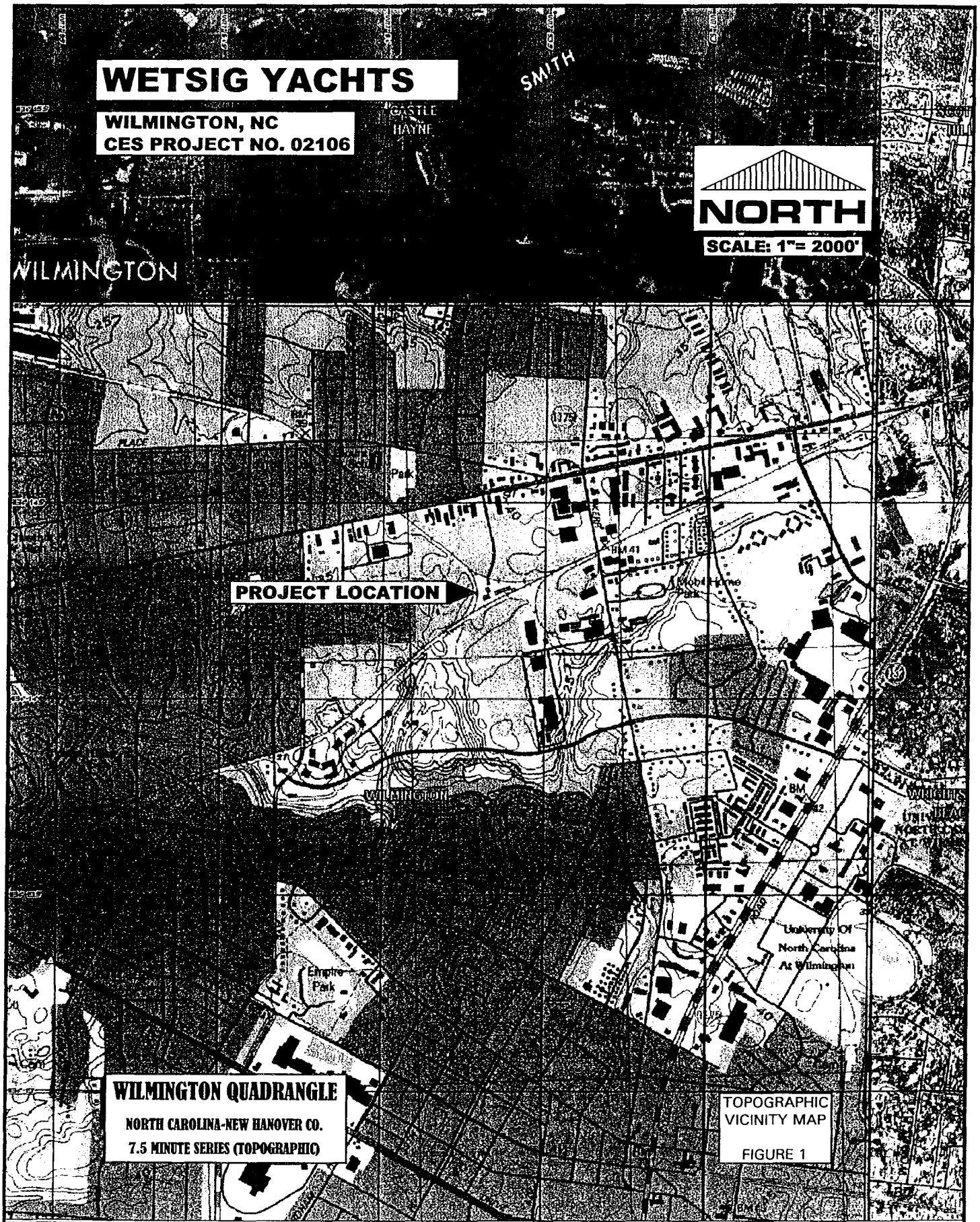
TABLE 4
SUMMARY OF GROUNDWATER SAMPLING RESULTS
WETSIG YACHTS FACILITY
INCIDENT NO. PENDING, CES PROJECT NO. 02106

		CONTAMINANTS OF CONCERN																	
ANALYTICAL METHOD		6210D							610	625			MADEP VPH AND EPH				6010B		6010B & 6020
SAMPLING INFORMATION																			
WELL ID	DATE COLLECTED	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	MTBE	DIPE	NAPHTHALENE	NAPHTHALENE	BIS(2-ETHYLHEXYL)PHTHALAT	TENTATIVELY IDENTIFIED COMPOUNDS (Y#, N)	UNKNOWN COMPOUNDS (Y#, N)	C5-C8 ALIPHATICS	C9-C18 ALIPHATICS	C19-C36 ALIPHATICS	C9-C22 AROMATICS	ARSENIC	CHROMIUM	LEAD
15A NCAC 2L STANDARD		1	1,000	29	530	200	70	21	21	3	NA	NA	420	4,200	42,000	210	10	50	15
GROSS CONTAMINATION LEVEL		5,000	257,500	29,000	87,500	200,000	70,000	15,500	15,500	3,000	NA	NA	NE	NE	NE	NE	NE	50,000	15,000
MW1-unf	10/02/02	<1	<1	<1	<3	69	<1	<1	<10	NT	NT	NT	NT	NT	NT	NT	**11.1**	<10	<10
MW1-unf	10/31/02	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<10	NT	NT
MW1-f	10/31/02	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	<10	NT	NT
MW1-unf	04/30/03	<1.0	<1.0	<1.0	<4.0	7.8	<1.0	NT	NT	**3.6J**	NO	NO	<100	<200	<100	<200	NT	NT	<5.00

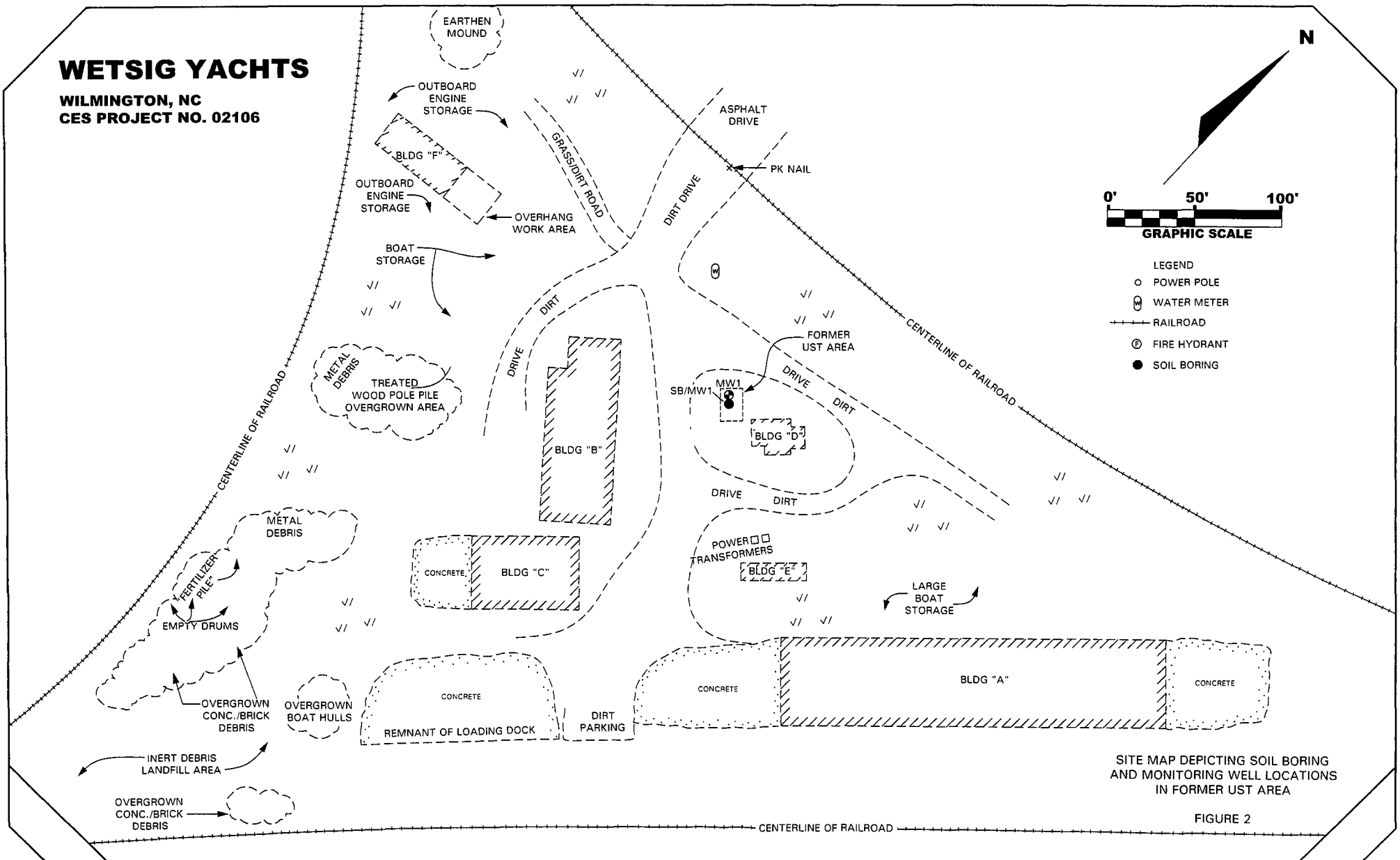
Notes:

1. Results reported in micrograms per liter (µg/L)
2. MTBE represents methyl tertiary butyl ether
3. DIPE represents diisopropyl ether
4. 15A NCAC 2L standards represent 15A NCAC 2L Groundwater Standards and include interim groundwater standards
5. NT represents not tested/not analyzed
6. < represents below laboratory detection limit
7. Unf/f represents unfiltered and filtered samples
8. J represents that the concentration was detected below the quantitation limit

FIGURES



Clark Environmental Services, P.C.



SITE MAP DEPICTING SOIL BORING AND MONITORING WELL LOCATIONS IN FORMER UST AREA

FIGURE 2

Clark Environmental Services, P.C.

TAX MAP DEPICTING NEARBY PROPERTIES AND WATER SUPPLY WELL LOCATION

FIGURE 3

Clark Environmental Services, P.C.

APPENDICES

APPENDIX I

STANDARD METHODS

STANDARD METHODS FOR CONDUCTING

SUBSURFACE ENVIRONMENTAL INVESTIGATIONS

STANDARD METHODS FOR CONDUCTING

SUBSURFACE ENVIRONMENTAL INVESTIGATIONS

1.0 DATA COLLECTION:

1.1 PROJECT BACKGROUND:

Historical information relevant to comprehensive subsurface investigation is generated through a wide spectrum of potential sources. Those most often utilized as credible sources include, but are not limited to, the following:

1.1.1 Correspondence and/or conversations with clients, regulatory officials and attorneys;

1.1.2 Regulatory mandates;

1.1.3 Pre-existing reports and other technical data;

1.1.4 Public records;

1.1.5 Documented eyewitness accounts;

1.1.6 Site reconnaissance.

1.2 POTENTIAL RECEPTOR SURVEYS:

Potential plume receptor data is generated on a site-specific basis. The scope of information is based upon the intended level of investigation. The availability of data is dependent, to differing degrees, upon the existence and accuracy of public and private record keeping, and on property ingress and egress. Generally, an attempt is made to facilitate a reasonable determination of possible environmental impacts in the context of the investigation being conducted, with the goal of adequate and appropriate site assessment and corrective action planning. Potential receptors are identified and surveyed/evaluated in the context of individual relevance and/or regulatory mandate or guidance.

1.3 SITE SURVEYS:

Physical surveys are utilized in the development of a horizontal and vertical project database. The data is often used to construct maps, to assist in making hydrogeologic determinations, and to aid in corrective action planning.

1.3.1 Horizontal Control:

Horizontal survey data is compiled using a possible combination of methods. Usually standard field and computational methods are employed. However, existing survey maps and/or photogrammetric techniques may be utilized, or a combination of existing data and field generated information may be used.

1.3.2 Vertical Control:

Vertical survey data is utilized primarily for establishing hydrogeologic control, and for evaluating topographic characteristics when necessary. The datum plane is generally assumed, except as otherwise noted. Assumed benchmarks are generally chosen to correspond with the approximate ground level, and vertical control is generally carried to an accuracy of +/- 0.01'.

1.4 DRILLING/HAND AUGERING AND MONITORING WELL/RECOVERY WELL/PIEZOMETER INSTALLATION:

Drilling, hand augering and subsurface installations are accomplished in accordance with site-specific requirements, regulatory requirements and feasibility considerations. The method employed at a specific site is tailored to the situation. Prior to any drilling or well construction activities, all necessary permits are obtained in accordance with federal, state and local requirements. All applicable licensing and bonding requirements are also fulfilled prior to beginning any work. Any boreholes purposely conducted at off-site locations are previously permitted through ingress/egress agreements with affected property owners or their agents.

1.4.1 Drilling Methods:

The following drilling methods are utilized:

1.4.1.1 Hand Augering:

Hand augering is commonly employed where economically, scientifically and/or situationally feasible. Hand augers typically produce 3" to 5" holes.

1.4.1.2 Auger Drilling:

Auger drilling is most often utilized in subsurface investigations. A truck or trailer mounted rig is usually employed and continuous five foot auger

flights of varying configurations are used to produce the borehole. Sampling is often accomplished through hollow stem type augers. Auger selection is based on site-specific requirements.

1.4.1.3 Rotary Drilling:

Air or mud rotary drilling may be utilized for special applications where necessary or appropriate. Rotary drilling is usually preferred and often utilized for telescoping well installations.

1.4.1.4 Other Drilling Methods:

Other methods such as coring, cable tool, truck mounted bucket augering, hammer drilling, and reverse rotary are not commonly utilized except under special circumstances.

1.4.2 Decontamination:

Drilling tools are thoroughly cleaned between boreholes to prevent cross-contamination. Depending upon site-specific circumstances, cleaning methods may include steam cleaning, detergent wash, nitric acid rinsing and deionized water or analyte free water rinsing.

1.4.3 Soil Sample Collection/Borehole Monitoring:

Typically, soil samples are retrieved using a split-spoon device at five foot intervals. Cuttings and penetration rates are continuously monitored and additional samples are taken when appropriate. Grab samples may be obtained utilizing clean sampling equipment, new latex gloves, and are containerized in sealable plastic bags. The samples are then allowed to volatilize for approximately ten minutes prior to field screening. Composite samples may be obtained and a complete description of the collection procedure is recorded in the field book.

1.4.4 Well Installation:

Wells/piezometers are typically constructed utilizing threaded PVC casing and screen. Glues and cements are not used. Stainless steel or Teflon materials may also be used if site-specific conditions dictate.

Filter packs are selected to be compatible with screen slot characteristics. Bentonite is utilized to seal the borehole above the filter pack and grout is used to fill the remaining annulus. Well diameter and protective covers are chosen specific to site conditions. Well construction records are prepared from field notes. A well tag is affixed to the well head and includes the project name, driller's license number, borehole number, date of installation, total depth, casing depth, well diameter, screened-, sand-, bentonite-, and grout-interval and static water level. The well is secured with a locking cap.

1.4.5 Well Development:

Under appropriate circumstances, wells are developed by overpumping, surging or bailing. Any contaminated development water is temporarily stored on-site for proper disposal. For large volumes of contaminated water, other site-specific arrangements may be made. Sampling is conducted a minimum of 24 hours following well installation and development.

1.4.6 Boring Logs:

All boreholes are logged for geological properties. Boring logs include the project name, hole number, date of boring and on-site geologist's name. Soil classification, soil description, relative wetness and photoionization detection readings are recorded for all split-spoon and grab samples obtained to total depth.

1.5 HYDROGEOLOGIC DATA:

Many methods are utilized for obtaining hydrogeologic data. Those methods most commonly utilized are as generally described below:

1.5.1 Regional Framework:

Information relating to the regional geological scope are generally compiled from existing published literature; however, previous technical reports, unpublished reports and personal communications with qualified Geologists may also be utilized.

1.5.2 Site Characteristics:

Most site information is generated through investigations on-site, although previous work proximal to the area of investigation may also be utilized. Borehole descriptions are important for making

interpretations with respect to contacts, lithostratigraphic gradations, facies changes, fractures, faults, cleavage and diagenetic porosity and permeability modifications. Geophysical methods may also be employed.

1.5.3 Groundwater Measurements:

Groundwater measurements include physical and chemical qualitative and quantitative parameters. There are many procedures for making groundwater determinations in the field, including, but not limited to, those listed below:

1.5.3.1 Water Well Levels:

Water levels are primarily measured using pre-cleaned probes or tapes in conjunction with water and gas finding pastes. Measurements are usually made to an accuracy of +/- 0.01'. Floating products are measured and a specific gravity determination is made for each product type. A specific gravity adjustment is then used to calculate true hydraulic grade. Well measurements are combined with vertical survey data to calculate relative groundwater elevations. Transducers, bubbler lines or other methods may also be used under special circumstances to make water level measurements. All water level measuring equipment is decontaminated prior to measuring subsequent wells.

1.5.3.2 Aquifer Tests:

Various aquifer tests may be utilized to characterize aquifer parameters. These tests may include, but are not limited to, pumping tests, slug tests, recovery tests, tracer tests, specific capacity tests, laboratory permeability tests, sieve and pipette analyses and drawdown tests. Vertical gradients are usually characterized through nested well configurations. Other methods, including fracture tracing, geophysical logging and resistivity surveys may be utilized on a site-specific basis.

1.5.3.3 Chemical Data:

Chemical data may be field measured using organic analyzers, pH meters or litmus paper, specific conductance meters, thermometers or other equipment.

1.6 CONTAMINATION DATA:

1.6.1 Collection Methods:

Depending upon the nature of contamination, many methods are utilized to collect information. The following are the most commonly utilized methods; however, the list is not inclusive:

1.6.1.1 Direct thickness measurements of phase (gravity) separated components.

1.6.1.2 Laboratory analyses of free phase products.

1.6.1.3 Specific gravity measurements of free phase products.

1.6.1.4 Field vapor or headspace analysis.

1.6.1.5 Laboratory analysis of vapor, soil and groundwater.

1.6.1.6 Visual observations.

1.6.1.7 Field analytical procedures including: temperature, conductance, pH, etc.

1.6.1.8 Geophysical methods.

1.6.2 Field Screening:

Field screening of soil samples is performed to determine the extent of soil contamination and to help direct the placement of permanent monitoring wells by providing relative contamination levels. Freshly retrieved samples are containerized, sealed and allowed to volatilize for a brief period prior to monitoring. Vapor readings are obtained from headspace within the container. All field measurements are recorded and reported in relevant reports.

A photoionization detector (PID) is utilized to conduct field screening. The instrument is routinely calibrated for measuring the suspected contaminant by following the manufacturer's instructions to insure proper functioning of the PID. The calibration procedure involves utilizing a pressurized tank of a sample gas (benzene equivalent) of known concentration which should produce a projected reading at a given intake pressure. At the recommended pressure, the PID is adjusted to the manufacturer's specified reading.

1.6.3 Field Sampling for Laboratory Analyses:

Field sampling methods are generally in accordance with the 1986 EPA SOP and QA Manual and state guidance documents. Duplicate samples are obtained during all major site investigations. Rigorous cleaning procedures are adhered to and quality control blanks are utilized. All sampling equipment is thoroughly cleaned and rinsed between boreholes. Sample containers are new, laboratory-prepared and are never reused by field personnel. Chain of custody is documented throughout the sample handling process and included with all laboratory reports. State licensed laboratories will be utilized. Generally, sampling procedures are as follows:

1.6.3.1 Products:

Pure product samples are refrigerated and shipped to the analytical laboratory.

1.6.3.2 Soil:

Soil samples are obtained utilizing pre-cleaned equipment, and quickly containerized. Samples are then immediately refrigerated and shipped to the analytical laboratory.

1.6.3.3 Surface Water:

Grab samples are obtained with the sampler facing the upstream direction, if in a flowing body of water. Samples are refrigerated and shipped to the analytical laboratory.

1.6.3.4 Vapor:

Vapor samples are obtained utilizing either carbon tubes in conjunction with a calibrated pump, Tedlar

bags, or by using a glass syringe. Samples are refrigerated and shipped to an analytical laboratory.

1.6.3.5 Water Supply Wells:

Water supply wells are difficult to properly purge and sample due to several factors including:

A) availability of accurate construction records;

B) inaccessibility;

C) attached appurtenances such as tanks, treatment systems, etc.;

D) agitation from pumping; and/or

E) analyte-incompatible construction materials.

Generally, an attempt is made to obtain samples from as close to the wellhead as possible, and to completely purge the well and any attached equipment such as holding or pressure tanks. Also, prior to actual sample collection, flow is slowed to a trickle to minimize agitation. If possible, the sample is taken directly from the well using a bailer.

1.6.3.6 Monitoring Wells:

Monitoring wells are sampled according to a standard procedure, as follows:

A) A total storage volume is calculated for each well.

B) Three volumes are removed using a bailer or purging pump. If the well dries up during bailing, a minimum of one volume is removed.

C) Samples are labeled.

D) Samples are refrigerated and immediately preserved and/or containerized in accordance with protocol.

E) Sampling records are completed.

F) Chain of custody records are completed.

G) A travel blank will be utilized. It will originate at the laboratory and will remain with all samples until returning to the laboratory.

H) Samples are promptly shipped to the analytical laboratory.

1.7 CONSTRUCTION DATA:

Site conditions may warrant additional intrusions, excavations or construction to evaluate or remediate known or potential hazards at the site. All construction work will be conducted under the direct supervision of a senior technician or project manager. An as-built system survey will depict site constructions.

1.7.1 Excavations:

Access to excavations will be limited by use of traffic cones, lighted barricades, caution tape or some other apparatus. Open excavations will be backfilled promptly.

1.7.2 Electrical Equipment:

Choice of electrical equipment will be dependent on intended use and site-specific characteristics. Access to such equipment will be limited by the construction of a barricade or fenced enclosure.

1.7.3 Health and Safety Plan:

Personnel will carry a site-specific Health and Safety Plan to the site during every site visit.

2.0 DATA COMPILATION/EVALUATION:

Data is compiled and evaluated in accordance with generally accepted industry standards, which are summarized as follows:

2.1 BACKGROUND DATA:

Background information is utilized to develop an historical perspective relating to the identification of all potential sources or contributors.

2.2 RECEPTOR DATA:

Receptor information is evaluated with regard to the potential for past, current and future environmental impact.

2.3 SURVEY DATA:

Horizontal survey data is reduced and utilized in the development of site maps for use as a framework to provide a spacial context. Vertical survey data is utilized to provide a vertical datum for hydrogeologic and topographic characterizations. A licensed surveyor may be utilized to conduct the initial comprehensive survey and subsequent surveys may be conducted by the contractor.

2.4 DRILLING DATA:

Drilling information is compiled and presented in boring logs. The information is utilized for hydrogeologic characterizations.

2.5 WELL CONSTRUCTION:

Well construction information is utilized in the development of as-built well details and/or other well construction records and evaluated in terms of depths and screen settings as they relate to hydrogeologic and contaminant characteristics.

2.6 CONTAMINATION/LABORATORY ANALYSES DATA:

Laboratory and other analyses data are utilized in the development of maps, calculations, models and other constructions and are used in developing and monitoring corrective actions.

2.7 GEOLOGICAL/HYDROGEOLOGICAL DATA:

Geological and hydrogeological data are used for developing maps, calculations and other constructions as they relate to making characterizations and developing and monitoring corrective actions.

APPENDIX II

SOIL BORING LOG, SOIL SAMPLE RESULTS AND CHAIN OF CUSTODY FORM AND AS-BUILT WELL DETAIL

CLARK ENVIRONMENTAL SERVICES, P.C.
BORING LOG

PROJECT NAME: Wetsig Yachts Facility
LOCATION: Wilmington, NC
CES PROJECT NO: 02106

WELL NO: SB/MW1
DATE: 04/30/03
LOGGED BY: J. Shadroui

DEPTH		DESCRIPTION	PID VAPOR SURVEY	
FROM (ft BGS)	TO (ft BGS)		ODOR	READING (ppm)
0	1	Grass; then moderate yellowish brown (10YR 5/4) silty very fine SAND	No	NM
1	2	Dark yellowish brown (10YR 4/2) silty very fine SAND	No	NM
2	3	Dark yellowish brown (10YR 4/2), then dusky yellowish brown (10YR 2/2) silty very fine SAND, slightly moist	No	NM
3	3.5	Dark yellowish brown (10YR 4/2) silty clayey fine SAND	No	NM
3.5	4	Dusky yellowish brown (10YR 2/2) SAND, wet	No	NM
4	4.5	Dusky yellowish brown (10YR 2/2) SAND, moist	No	NM

NOTES:
1) ppm represents parts per million
2) ft BGS represents feet below ground surface
3) PID denotes photoionization detection

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B/5035

Client Sample ID: MW 1 Soil Boring
Client Project ID: Wetsig
Lab Sample ID: 71249
Lab Project ID: G211-1556
Matrix: Soil %Solids: 85.9

Date Analyzed: 5/10/03
Analyzed By: EKR
Date Collected: 4/30/03
Date Received: 4/30/03
Dilution: 1

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Acetone	0.05	BQL
Acrolein	0.1	BQL
Acrylonitrile	0.1	BQL
Benzene	0.005	BQL
Bromobenzene	0.005	BQL
Bromochloromethane	0.005	BQL
Bromodichloromethane	0.005	BQL
Bromoform	0.005	BQL
Bromomethane	0.005	BQL
2-Butanone	0.025	BQL
n-Butylbenzene	0.005	BQL
sec-Butylbenzene	0.005	BQL
tert-Butylbenzene	0.005	BQL
Carbon disulfide	0.005	BQL
Carbon tetrachloride	0.005	BQL
Chlorobenzene	0.005	BQL
Chloroethane	0.005	BQL
2-Chloroethyl vinyl ether	0.005	BQL
Chloroform	0.005	BQL
Chloromethane	0.005	BQL
2-Chlorotoluene	0.005	BQL
4-Chlorotoluene	0.005	BQL
Dibromochloromethane	0.005	BQL
1,2-Dibromo-3-chloropropane	0.005	BQL
Dibromomethane	0.005	BQL
1,2-Dibromoethane (EDB)	0.005	BQL
1,2-Dichlorobenzene	0.005	BQL
1,3-Dichlorobenzene	0.005	BQL
1,4-Dichlorobenzene	0.005	BQL
trans-1,4-Dichloro-2-butene	0.005	BQL
1,1-Dichloroethane	0.005	BQL
1,1-Dichloroethene	0.005	BQL
1,2-Dichloroethane	0.005	BQL
cis-1,2-Dichloroethene	0.005	BQL
trans-1,2-dichloroethene	0.005	BQL
1,2-Dichloropropane	0.005	BQL
1,3-Dichloropropane	0.005	BQL
2,2-Dichloropropane	0.005	BQL
1,1-Dichloropropene	0.005	BQL
cis-1,3-Dichloropropene	0.005	BQL
trans-1,3-Dichloropropene	0.005	BQL
Dichlorodifluoromethane	0.005	BQL
Diisopropyl ether (DIPE)	0.005	BQL
Ethylbenzene	0.005	BQL
Hexachlorobutadiene	0.005	BQL

Reviewed by: _____

Flags: BQL = Below Quantitation Limit

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Volatiles

by GCMS 8260B/5035

Client Sample ID: MW 1 Soil Boring
Client Project ID: Wetsig
Lab Sample ID: 71249
Lab Project ID: G211-1556
Matrix: Soil %Solids: 85.9

Date Analyzed: 5/10/03
Analyzed By: EKR
Date Collected: 4/30/03
Date Received: 4/30/03
Dilution: 1

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
2-Hexanone	0.005	BQL
Iodomethane	0.005	BQL
Isopropylbenzene	0.005	BQL
4-Isopropyltoluene	0.005	BQL
Methylene chloride	0.02	BQL
4-Methyl-2-pentanone	0.005	BQL
Methyl-tert-butyl ether (MTBE)	0.005	BQL
Naphthalene	0.005	BQL
n-Propyl benzene	0.005	BQL
Styrene	0.005	BQL
1,1,1,2-Tetrachloroethane	0.005	BQL
1,1,2,2-Tetrachloroethane	0.005	BQL
Tetrachloroethene	0.005	BQL
Toluene	0.005	BQL
1,2,3-Trichlorobenzene	0.005	BQL
1,2,4-Trichlorobenzene	0.005	BQL
Trichloroethene	0.005	BQL
1,1,1-Trichloroethane	0.005	BQL
1,1,2-Trichloroethane	0.005	BQL
Trichlorofluoromethane	0.005	BQL
1,2,3-Trichloropropane	0.005	BQL
1,2,4-Trimethylbenzene	0.005	BQL
1,3,5-Trimethylbenzene	0.005	BQL
Vinyl chloride	0.005	BQL
m-,p-Xylene	0.01	BQL
o-Xylene	0.005	BQL

Surrogate Spike Recoveries Compound	Spike Added (mg/KG)	Surrogate Result (mg/KG)	%Rec
Bromofluorobenzene	0.0500	0.0499	100
1,2-Dichloroethane-d4	0.0500	0.0529	106
Toluene-d8	0.0500	0.0498	100

Comments:

All results are corrected for dilution.

Reviewed by: JW

Flags: BQL = Below Quantitation Limit

N.C. Certification #481 S.C. Certification #99029

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles
by GCMS 8270

Client Sample ID: MW 1 Soil Boring
Client Project ID: Wetsig
Lab Sample ID: 71249
Lab Project ID: G211-1556
Matrix: Soil %Solids: 85.9

Date Collected: 4/30/2003
Date Received: 4/30/2003
Date Analyzed: 5/6/2003
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	0.65	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	1.6	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	0.65	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	1.6	BQL
2,4-Dinitrophenol	1.6	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

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles
by GCMS 8270

Client Sample ID: MW 1 Soil Boring
Client Project ID: Wetsig
Lab Sample ID: 71249
Lab Project ID: G211-1556
Matrix: Soil %Solids: 85.9

Date Collected: 4/30/2003
Date Received: 4/30/2003
Date Analyzed: 5/6/2003
Analyzed By: MRC
Dilution: 1

Compound	Quantitation Limit (mg/KG)	Result (mg/KG)
Hexachlorobutadiene	0.33	BQL
Hexachlorocyclopentadiene	0.65	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	1.6	BQL
4-Nitroaniline	1.6	BQL
Nitrobenzene	0.33	BQL
2-Nitrophenol	0.33	BQL
4-Nitrophenol	1.6	BQL
Pentachlorophenol	1.6	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	10.0	100
2-Fluorophenol	10	9.8	98
Nitrobenzene-d5	10	9.8	98
Phenol-d6	10	9.4	94
2,4,6-Tribromophenol	10	9.4	94
4-Terphenyl-d14	10	10.6	106

Comments:

Results are corrected for %solids and dilution where applicable.

Flags:

BQL = Below Quantitation Limit.

Reviewed By: MRC

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Clark Environmental

Project Name: Wetsig

Sample Information and Analytical Results	
Sample Identification	MW 1 Soil Boring
Sample Matrix	Soil
Collection Option (for Soil)*	2
Date Collected	04/30/03
Date Received	04/30/03
Date Extracted	05/01/03
Date Analyzed	05/08/03
Dry Weight	86
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	87
Surrogate % Recovery - FID	97

* = 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: G211-1556-71249

Reviewed By: MR

PARADIGM ANALYTICAL LABORATORIES, INC.

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Clark Environmental

Project Name: Wetsig

Sample Information and Analytical Results	
Sample Identification	MW 1 Soil Boring
Sample Matrix	Soil
Date Collected	04/30/03
Date Received	04/30/03
Date Extracted	05/05/03
Date Analyzed	05/09/03
Dry Weight	85.9
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	72
Aromatic Surrogate % Recovery	78
Fractionation Surrogate 1 % Recovery	120

Comments:

* = Excludes any surrogates or internal standards.

Lab info: G211-1556-71249

Reviewed By:

N.C. Certification #481 S.C. Certification #99029

Attachment 2

VPH Laboratory Reporting Form

Calibration and QA/QC Information

FID Initial Calibration Date: 05/07/03 PID Initial Calibration Date: 05/07/03

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	11.0	Calibration Factor
	80	8		
	200	20		
	800	80		
	2000	200		
C_9-C_{12} Aliphatics	15	1.5	0.999	Linear Regression
	60	6		
	150	15		
	600	60		
	1500	150		
C_9-C_{10} Aromatics	32.5	3.25	12	Calibration Factor
	130	13		
	325	32.5		
	1300	130		
	3250	325		

Calibration Check Date: 05/08/03

Calibration Check

Range	Levels (µg/L)	Levels (mg/Kg)	RPD
C_5-C_8 Aliphatics	200	20	-0.5
C_9-C_{12} Aliphatics	150	15	14.3
C_9-C_{10} Aromatics	325	32.5	-6.7

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

Reviewed By: MAE

PARADIGM ANALYTICAL LABORATORIES, INC.

Attachment 3

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 05/05/03

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	4.90	Calibration Factor
	0.15	2.5		
	0.3	5		
	0.6	10		
	1.2	20		
C_{19}-C_{36} Aliphatics	0.08	1.33	8.3	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: 05/09/03

Calibration Check

Range	Levels (µg/mL)	Levels (mg/Kg)	RPD
C_9-C_{18} Aliphatics	0.6	10	5.3
C_{19}-C_{36} Aliphatics	0.8	13.3	-1.9
C_{11}-C_{22} Aromatics	1.7	28.3	-0.4

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

ARADIGM ANALYTICAL LABORATORIES, INC.
500 Business Drive, Wilmington, NC 28405
one: (910)-350-1903 FAX: (910)-350-1557

Chain-of Custody Record & Analytical Request

COC#

Page 1 of 2

ient: Clark Environmental Services
ldress: PO Box 10136
ldress: Wilmington NC
uote #:

Project ID: Wetsig
Contact: Joanne
Phone: (910) 602 3900
Fax: (910) 602 3975

Date: 4/30/03
Turnaround: Standard
Job Number: 02106
P.O. Number: 021064300 3008

Report To: CES
Invoice To: CES

Sample ID	Date	Time	Matrix	Preservatives: ICE	Preservatives: Encore			Analyses: 8 RCRA metals	8260	8270	VPH	EPH						Comments: Please specify any special reporting requirements
SB16	4/30/03	8:15	Soil					X										North Carolina Site 621-1556
SB17		9:00						X										
SB18		9:15						X										
SB19		10:00						X										
SB20		10:15						X										
SB21		10:30						X										
SB22		10:45						X										
SB23		11:15						X										
SB24		11:30						X										
MW1 soil boring		12:00							X	X	X	X						

Relinquished By	Date	Time	Received By	Date	Time	Temperature	State Certification Requested
W. M. [illegible]	4/30/03	4:20	[illegible]	4/30/03	8:20	on ice 12.1°C (cooling down to 4°C)	NC X SC ____ Other ____

SEE REVERSE FOR TERMS AND CONDITIONS

APPENDIX III

SAMPLING RECORD, LABORATORY RESULTS AND CHAIN OF CUSTODY FORM

CLARK ENVIRONMENTAL SERVICES, P.C.
GROUNDWATER WELL SAMPLING RECORD

PROJECT NAME: Wetsig Yachts Facility
LOCATION: Wilmington, NC
CES PROJECT No.: 02106
PERSONNEL: J. Shadroui

WELL NO.: MW1
DATE: 04/30/03
TIME: 12:30
WEATHER: Partly cloudy, 70°

A	WELL DIAMETER (INCHES MEASURED)	2
B	GALLONS/FOOT	0.163
C	TOTAL WELL DEPTH (MEASURED FEET/INCHES)	11.5
D	DEPTH TO LIQUID (MEASURED FEET/INCHES)	5.42
E	TOTAL LIQUID FEET IN WELL (C-D)	6.08
F	NO. WELL VOLUMES DESIRED (SITE SPECIFIC, USUALLY 3)	3
G	TOTAL GALLONS TO PURGE (B x E x F)	2.97
H	PURGING METHOD (BAILER OR PUMP TYPE)	Bailer
I	BAILER VOLUME (MEASURED/CALCULATED)	0.24
J	NO. BAILS REQUIRED (G ÷ I, IF BAILED)	12.38
K	NO. BAILS TAKEN (COUNTED)	13
L	GALLONS PURGED (MEASURED/CALCULATED)	3.12

PER FOOT WELL VOLUMES	
WELL DIAMETER (IN INCHES)	GALLONS PER FOOT
1.00	0.041
1.25	0.064
1.50	0.092
2.00	0.163
4.00	0.653
6.00	1.469
8.00	2.611
10.00	4.080
12.00	5.876
18.00	13.220
24.00	23.502
36.00	52.880

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

Ms. JoAnne Shadroui
Clark Environmental Services
PO Box 10136
Wilmington, NC 28405

May 19, 2003

Report Number: G211-1556

Client Project ID: Wetsig

Dear Ms. Shadroui,

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 GC 602

Client Sample ID: MW1
Client Project ID: Wetsig
Lab Sample ID: 71250
Lab Project ID: G211-1556

Analyzed By: JTF
Date Collected: 4/30/03
Date Received: 4/30/03
Matrix: Water

Analyte	Result ug/L	Report Limit ug/L	Dilution Factor	Date Analyzed
Benzene	BQL	1.0	1	5/8/03
Diisopropyl ether (DIPE)	BQL	1.0	1	5/8/03
Ethylbenzene	BQL	1.0	1	5/8/03
Methyl-tert butyl ether (MTBE)	7.8	2.0	1	5/8/03
Toluene	BQL	1.0	1	5/8/03
m/p-Xylene	BQL	2.0	1	5/8/03
o-Xylene	BQL	2.0	1	5/8/03

Surrogate Spike Recoveries	Spike Added	Spike Result	Percent Recovery
Trifluorotoluene	40	37	92.4

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

Reviewed By: mre

Results for Semivolatiles
by GCMS 625

Client Sample ID: MW1
Client Project ID: Wetsig
Lab Sample ID: 71250
Lab Project ID: G211-1556
Matrix: Water

Date Collected: 4/30/2003
Date Received: 4/30/2003
Date Analyzed: 5/7/2003
Analyzed By:
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	3.6	J
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	

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Semivolatiles
by GCMS 625

Client Sample ID: MW1
Client Project ID: Wetsig
Lab Sample ID: 71250
Lab Project ID: G211-1556
Matrix: Water

Date Collected: 4/30/2003
Date Received: 4/30/2003
Date Analyzed: 5/7/2003
Analyzed By:
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	9.1	91
2-Fluorophenol	10	9.0	90
Nitrobenzene-d5	10	9.2	92
Phenol-d6	10	9.0	90
2,4,6-Tribromophenol	10	6.5	65
4-Terphenyl-d14	10	9.5	95

Comments:

Results are corrected for %solids and dilution where applicable.

Flags:

BQL = Below Quantitation Limit.
J = Detected below the quantitation limit.

Reviewed By: _____

PARADIGM ANALYTICAL LABORATORIES, INC.

Results of Library Search for Semivolatile Compounds

by GCMS

Client Sample ID: MW1
Client Project ID: Wetsig
Lab Sample ID: 71250
Lab Project ID: G211-1556
Matrix: Water

Date Collected: 4/30/2003
Date Received: 4/30/2003
Date Analyzed: 5/7/2003
Analyzed By: MRC
Dilution: 1

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:

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: mpo

PARADIGM ANALYTICAL LABORATORIES, INC.

Results for Metals

Client Sample ID:	MW1	Analyzed By:	RML
Client Project ID:	Wetsig	Date Collected:	4/30/03
Lab Sample ID:	71250	Date Received:	4/30/03
Lab Project ID:	G211-1556	Matrix:	Water
Batch ID:	2724		

Metals	Result	Quantitation Limit	DF	Units	Method	Date Analyzed
Lead,Extractable	BQL	5.00	25	UG/L	6020	5/12/03

Comments
BQL = Below Quantitation Limits
DF = Dilution Factor
J = Between MDL and RL

VPH (Aliphatics/Aromatics) Laboratory Reporting Form

Client Name: Clark Environmental

Project Name: Wetsig

Sample Information and Analytical Results	
Sample Identification	MW1
Sample Matrix	Water
Collection Option (for Soil)*	
Date Collected	04/30/03
Date Received	04/30/03
Date Extracted	05/08/03
Date Analyzed	05/08/03
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	75
Surrogate % Recovery - FID	83

* = 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: G211-1556-71250

Reviewed By: mk

PARADIGM ANALYTICAL LABORATORIES, INC.

EPH (Aliphatics/Aromatics) Results

by MDEP-EPH

Client Name: Clark Environmental

Project Name: Wetsig

Sample Information and Analytical Results	
Sample Identification	MW1
Sample Matrix	Water
Date Collected	04/30/03
Date Received	04/30/03
Date Extracted	05/06/03
Date Analyzed	05/06/03
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	75
Aromatic Surrogate % Recovery	83

Comments:

* = Excludes any surrogates or internal standards.

Sample did not require fractionation.

Lab info: G211-1556-71250

Reviewed By: MRC

PARADIGM ANALYTICAL LABORATORIES, INC.

Attachment 3

EPH Laboratory Reporting Form

Calibration and QA/QC Information

Initial Calibration Date: 05/05/03

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	4.90	Calibration Factor
	0.15	2.5		
	0.3	5		
	0.6	10		
	1.2	20		
C_{19}-C_{36} Aliphatics	0.08	1.33	8.3	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: 05/06/03

Calibration Check

Range	Levels (µg/mL)	Levels (mg/Kg)	RPD
C_9-C_{18} Aliphatics	0.6	10	19.3
C_{19}-C_{36} Aliphatics	0.8	13.3	15.2
C_{11}-C_{22} Aromatics	1.7	28.3	8.1

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

ARADIGM ANALYTICAL LABORATORIES, INC.
00 Business Drive, Wilmington, NC 28405
one: (910)-350-1903 FAX: (910)-350-1557

Chain-of Custody Record & Analytical Request

COC#

Page 2 of 2

ient: Clark Environmental Services Project ID: Wetzig Date: 04/30/03 Report To: CES/JS
ldress: PO Box 10136 Contact: JoAnne Turnaround: Standard
ldress: Wilmington Phone: 602-3900 Job Number: 02106
uote #: Fax: 602-3975 P.O. Number: 02106 4 3003008 Invoice To: CES

Sample ID	Date	Time	Matrix	Preservatives: Ice				Analyses: EPA 602 + MTBE/Naph	EPA 625 PD	MADEP VPH	MADEP EPH	Lead 13000 in Dissolved Fe, Mn, Hg	Arsenic					Comments: Please specify any special reporting requirements
MW1	4/30/03	12:30	H_2O					✓	✓	✓	✓	✓						North
MW3	4/30/03	13	H_2O										✓					Carolina
																		Site
																		G211-1556

Relinquished By	Date	Time	Received By	Date	Time	Temperature	State Certification Requested
W. M. [illegible]	4/30/03	4:20p	[illegible]	4/30/03	4:20	on ice 12.1 °C Carry down to temp	NC X SC ____ Other ____

SEE REVERSE FOR TERMS AND CONDITIONS

APPENDIX IV

REFERENCES

REFERENCES

Clark Environmental Services, P.C., *Phase I Environmental Site Assessment* for the Wetsig Yachts Facility, August 21, 2002

Clark Environmental Services, P.C., *Phase II Environmental Site Assessment* for the Wetsig Yachts Facility, December 2, 2002

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Winner, M. D., Jr., and Coble, R. W., 1996, Hydrogeologic Framework of the North Carolina Coastal Plain Regional Aquifer-System Analysis: U.S. Geological Survey Professional Paper 1404-I, 155 pp.

United States Geological Survey, 1998, "Wilmington, NC" 7.5 Minute (Topographic) Quadrangle Map