N61331.AR.001601
NSA PANAMA CITY
5090.3a

SITE ASSESSMENT PLAN FOR SITE 98, SITE 307, SITE 363 AND SOLID WASTE MANAGEMENT UNIT 1 WITH TRANSMITTAL CSS PANAMA CITY FL

4/1/1998

BROWN AND ROOT ENVIRONMENTAL

Brown & Root *Services*

1311 Executive Center Drive / Ellis Bldg., Suite 220 / Tallahassee, FL 32301-5067 / (850) 656-5458 / Fax: (850) 656-7403 / CG CA06998 / CG C015768

BRE/TLH-98-799/7766/3.2

7766-3.2-11

April 2, 1998

Project Number 7766

REC'D APR 6 1998

Commanding Officer
Department of the Navy
Southern Division
Naval Facilities Engineering Command
ATTN: Mr. Nick Ugolini (Code 1843)
Remedial Project Manager
2155 Eagle Drive
North Charleston, South Carolina 29406

Reference: Clean Contract No. N62467-94-D0888
Contract Task Order No. 0027

Subject: Site Assessment Plan for
Sites 98, 307, 363, and AOC2/SWMU1 at Coastal Systems Station
Panama City, Florida

Dear Mr. Ugolini:

Brown & Root Environmental is pleased to submit for your review and approval the Site Assessment Plan for the subject sites at Coastal Systems Station in Panama City.

Subcontracts to initiate Phase I field activities are currently being prepared. Upon your approval, It is anticipated that field investigation activities will be able to be initiated in late April.

If you have any questions regarding this plan or require further information, please contact me at (850) 656-5458.

Very truly yours,

Gerald F. Goode

Gerald F. Goode, P.G.
Task Order Manager

GG/gg

Enclosures (1)

c: Mr. Arturo McDonald, CSS
Ms. D. Evans-Ripley, SOUTHDIV (w/o enclosure)
Ms. D Wroblewski
Mr. A. Kendrick (w/o enclosure)
Mr. Sam Patterson (w/o enclosure)

0008

7766-3.2-11

Rev. 0
04/2/98

Site Assessment Plan
FOR
Sites 98, 307, 363, and AOC2/SWMU1

Naval Coastal Systems Station
Panama City, Florida

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0047

April 1998

SITE ASSESSMENT PLAN
FOR SITE ASSESSMENT INVESTIGATIONS
(SITES 98, 307, 363, AND AOC2/SWMU1)

NAVAL COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
Brown & Root Environmental
661 Anderson Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0047

April 1998

PREPARED BY:

GERALD F. GOODE, P.G.
TASK ORDER MANAGER
BROWN & ROOT ENVIRONMENTAL
TALLAHASSEE, FLORIDA

APPROVED FOR SUBMITTAL BY:

DEBBIE WROBLEWSKI
PROGRAM MANAGER
BROWN & ROOT ENVIRONMENTAL
PITTSBURGH, PENNSYLVANIA

Brown & Root *Services*

1311 Executive Center Drive / Ellis Bldg., Suite 220 / Tallahassee, FL 32301-5067 / (850) 656-5458 / Fax: (850) 656-7403 / CG CA06998 / CG C015768

BRE/TLH-98-799/7766/3.2

April 2, 1998

Project Number 7766

Commanding Officer
Department of the Navy
Southern Division
Naval Facilities Engineering Command
ATTN: Mr. Nick Ugolini (Code 1843)
Remedial Project Manager
2155 Eagle Drive
North Charleston, South Carolina 29406

Reference: Clean Contract No. N62467-94-D0888
Contract Task Order No. 0047

Subject: Site Assessment Plan for
Sites 98, 307, 363, and AOC2/SWMU1 at Coastal Systems Station
Panama City, Florida

Dear Mr. Ugolini:

Brown & Root Environmental is pleased to submit for your review and approval the Site Assessment Plan for the subject sites at Coastal Systems Station in Panama City.

Subcontracts to initiate Phase I field activities are currently being prepared. Upon your approval, It is anticipated that field investigation activities will be able to be initiated in late April.

If you have any questions regarding this plan or require further information, please contact me at (850) 656-5458.

Very truly yours,

Gerald F. Goode

Gerald F. Goode, P.G.
Task Order Manager

GG/gg

Enclosures (1)

c: Mr. Arturo McDonald, CSS
Ms. D. Evans-Ripley, SOUTHDIV (w/o enclosure)
Ms. D Wroblewski
Mr. A. Kendrick (w/o enclosure)
Mr. Sam Patterson (w/o enclosure)

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

Brown & Root Environmental (B&R Environmental) has prepared this Site Assessment Plan (SAP) for Sites 98, 307, 363, and AOC2/SWMU1 at the Naval Coastal Systems Station (CSS) in Panama City, Florida. This SAP was prepared for the U.S. Navy (Navy) Southern Division (SouthDiv) Naval Facilities Engineering Command (NAVFAC) under Contract Task Order (CTO) 0047, for the Comprehensive Long-term Environmental Action Navy (CLEAN III) Contract Number N62467-94-D-0888.

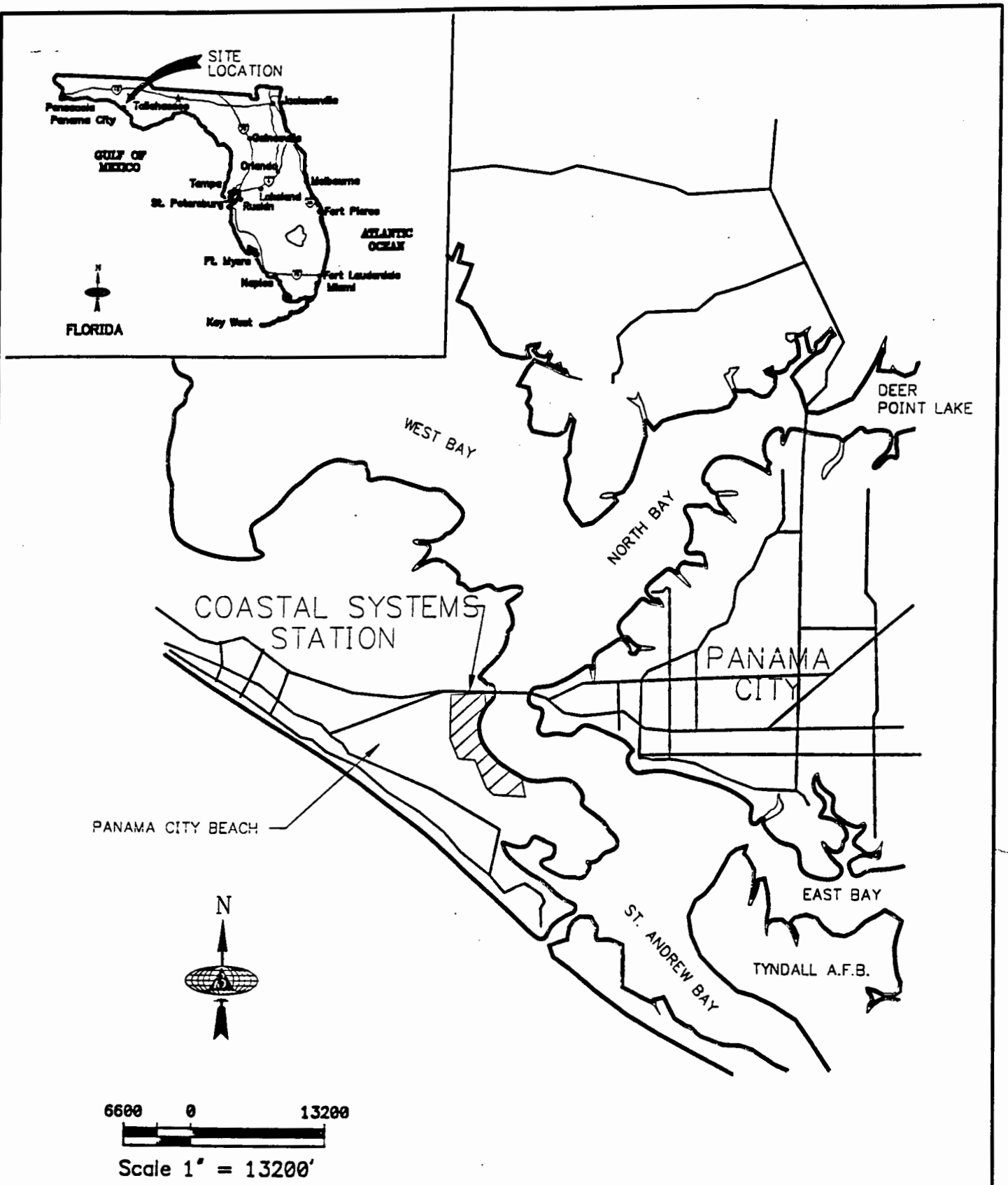
The SAP provides the rationale for performing field activities associated with collecting data to evaluate petroleum hydrocarbons in the subsurface at the referenced sites. Data collected during the investigations at Sites 98 and 307 will be used to prepare Site Assessment Reports (SARs) in accordance with Chapter 62-770 of the Florida Administrative Code (F.A.C.). A groundwater quality report will be prepared for Site 363 and a preliminary assessment report will be completed for study area Area of Concern 2/Solid Waste Management Unit 1(AOC2/SWMU1).

1.1 GENERAL SITE DESCRIPTION

The CSS is located on the western shore of St. Andrews Bay in Bay County Florida. Bay County is situated on the Gulf of Mexico in Florida's Panhandle, approximately 100 miles southwest of Tallahassee. The Naval Base is bounded by U.S. Highway 98 to the north, St. Andrews Bay to the east, State Road 392B (Magnolia Beach Road) to the south, and State Road 392 (Thomas Drive) to the west as shown on Figure 1-1.

The CSS consists of two operational areas, the laboratory area and ordnance area, which comprise approximately 657 acres. The laboratory area is situated north of Alligator Bayou and has research facilities and various support activities. The ordnance area is south of Alligator Bayou and is used primarily for ordnance storage and for limited research. The sites being investigated under this CTO are located in the laboratory operational area of the Naval Base, as shown on Figure 1-2.

The CSS facility is one of seven major research, test, and evaluation laboratories of the Space and Naval Warfare Systems Command. The site was first established in 1942 as a harbor for World War II convoy ships and as a liaison for a nearby shipyard. It later became an amphibious landing craft operations school. Research and development began in 1945 when the facility was renamed the U.S. Navy Mine Countermeasures Station. In 1952 a research and development program for the use of



MODIFIED RCRA FACILITY INVESTIGATION REPORT
(ABB ENVIRONMENTAL SERVICES, INC. 1995)

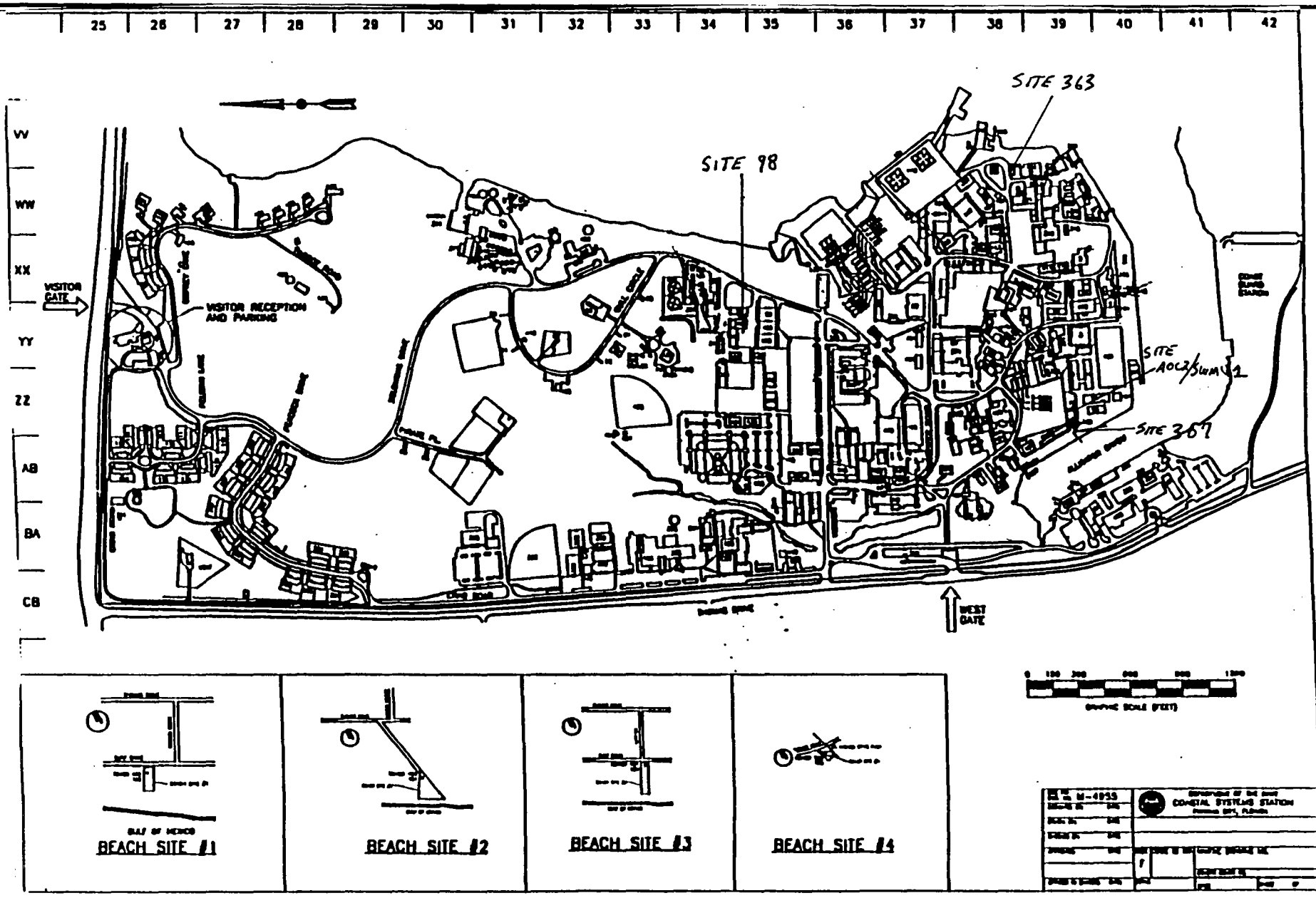
SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/25/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: AS SHOWN	
CAD DWG. NO.: 7766CM02	PROJ. NO.: 7766

Brown & Root Environmental

FIGURE 1-1

SITE VICINITY MAP

COASTAL SYSTMES STATION
PANAMA CITY, FLORIDA



SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/25/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: AS SHOWN	
CAD DWG. NO.: 7766CM01	PROJ. NO.: 7766

Brown & Root Environmental

FIGURE 1-2

SITE LOCATION MAP

COASTAL SYSTMES STATION
PANAMA CITY, FLORIDA

helicopters for mine countermeasure operations was established. In November 1967 the facility became an activity of the Naval Ship Research and Development center based in Carderock, Maryland. The facility was redesignated as the Naval Coastal Systems Center in 1978 and again as the Coastal Systems Station in January 1992. It continues to provide mine and undersea countermeasures technology and to support special and amphibious warfare, diving, and other naval coastal missions (Resource Conservation and Recovery Act Facility Investigation, 1995).

1.2 OBJECTIVE

The objective of the proposed field investigations for Sites 98 and 307 is to collect additional data to evaluate the extent of petroleum hydrocarbons in subsurface soils and groundwater as identified from the Tank Closure Assessments. The data collected during the investigations will be used to prepare SARs as required by Chapter 62-770.630, F.A.C., and to evaluate the need for future monitoring or remedial activities. The objective of the proposed field investigation for Site 363 is to collect additional groundwater samples to evaluate groundwater quality. The objective of the proposed field activities for Site AOC2/SWMU1 is to complete a preliminary assessment to evaluate the source for a fuel release associated with a storm water outfall located within the sea wall on Alligator Bayou.

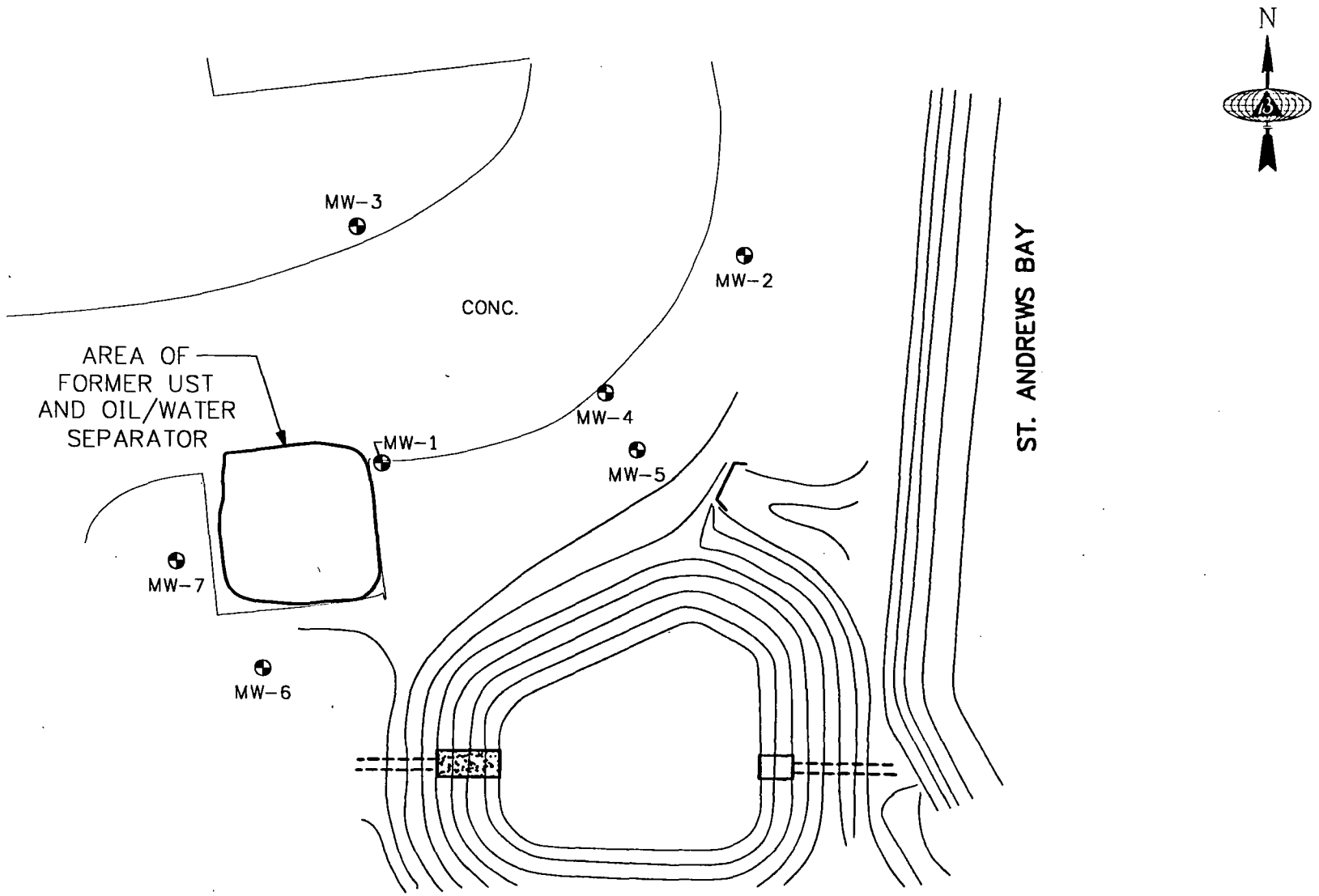
2.0 SITE DESCRIPTION

Site 363: This site consisted of a closed oil/water separator connected to a 6,000 gallon underground storage tank (UST) used to store waste oil for Facility 363. The location of the former UST is identified on Figure 2-1. Site 363 is included in the Remedial Investigation (RI) program at CSS, since chlorinated hydrocarbons were detected in the groundwater during past groundwater sampling events. As part of the RI program, a monitoring well at the site is periodically pumped to remove chlorinated hydrocarbons. According to the Activity for CSS Panama City, groundwater quality from past sampling events conducted for the RI investigation have indicated dissolved chlorinated hydrocarbons have decreased to non-hazardous levels. .

Overflows at an oil/water separator is suspected to be the cause for the chlorinated hydrocarbon release. In August 1997, the 6000 gallon UST was excavated and removed from the subsurface. Prior to excavation, the contents of the tank were emptied by CSS. During removal of the UST, the UST was ruptured spilling some residual tank contents into the excavation, which was partially submerged in the groundwater. Since the UST was constructed of fiberglass, the condition of the UST could not be assessed prior to the tank being removed. Analysis of a groundwater sample collected from a temporary monitoring well installed during the Tank Closure Assessment, reported dissolved petroleum hydrocarbons in the groundwater at the location of the former waste oil tank. The Discharge Reporting Form (DRF) reported the type of regulated substance discharged as used/waste oil. The DRF is included in the Closure Assessment Report included in Appendix A.

Site 98: This site consisted of a closed 560 gallon steel UST located on the west side of Building 98. The UST was used to store diesel for on-site heating. In August 1997, the UST was excavated and removed. The location of the former UST is shown on Figure 2-2. The Tank Closure Assessment Report indicated contaminated soil was encountered above the water table and removed during the tank excavation. Groundwater analyses from a groundwater sample collected from a temporary monitoring well installed at the tank excavation reported volatile organics and petroleum hydrocarbon constituents. The Petroleum or Petroleum Product Contamination Report Form reported indicated the discharge occurred from overfill and holes in the tank. Findings from the removal of the UST are summarized in the Tank Closure Assessment included in Appendix A.

Site 307 Product Line Leak: Tank 307 is an UST that provides diesel fuel to a dispenser located on the west dock of Alligator Bayou. The UST system consists of a 6,000 gallon Ownes-Corning double-walled



LEGEND

● MONITORING WELL LOCATION
MW-1

0 30 60
APPROXIMATE SCALE IN FEET

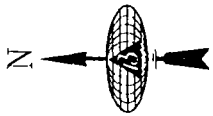
SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/31/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: AS SHOWN	
CAD DWG. NO.: 7766CM11	PROJ. NO.: 7766

Brown & Root Environmental

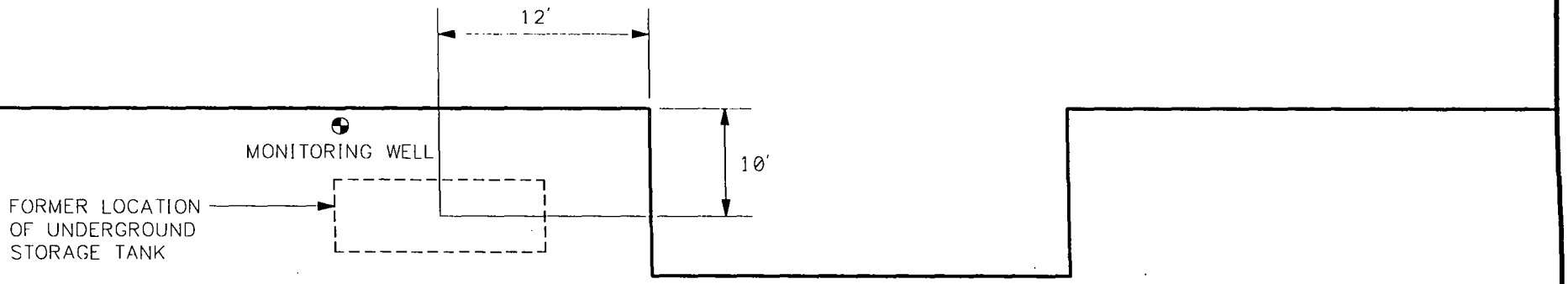
FIGURE 2-1

SITE PLAN – SITE 363

COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA



BUILDING 98



NOTE:
FIGURE MODIFIED FROM CLOSURE, ASSESSMENT REPORT, BUILDING 98
DECEMBER 1997, NAVY PUBLIC WORK CENTER ENVIRONMENTAL DEPARTMENT

SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/25/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: NTS	
CAD DWG. NO.: 7766CM04	PROJ. NO.: 7766

Brown & Root Environmental

FIGURE 2-2

SITE PLAN – SITE 98

COASTAL SYSTEM STATION
PANAMA CITY, FLORIDA

fiberglass UST, buried under an earthen mound with two feet of cover, such that the bottom of the tank is about eight feet below the elevation of the surrounding grade. The product line for the UST system consists of double-walled fiberglass. An above ground suction pump is located on a concrete pad in a fenced compound adjacent to the mounded area. The compound includes the pump controls and the leak detection alarm system. Tightness test conducted on the UST system in January 1998, identified the product pipeline had failed to test tight in a section of product line located in concrete lined trenches just before the dispenser. The study area associated with the failed product line is identified on Figure 2-3.

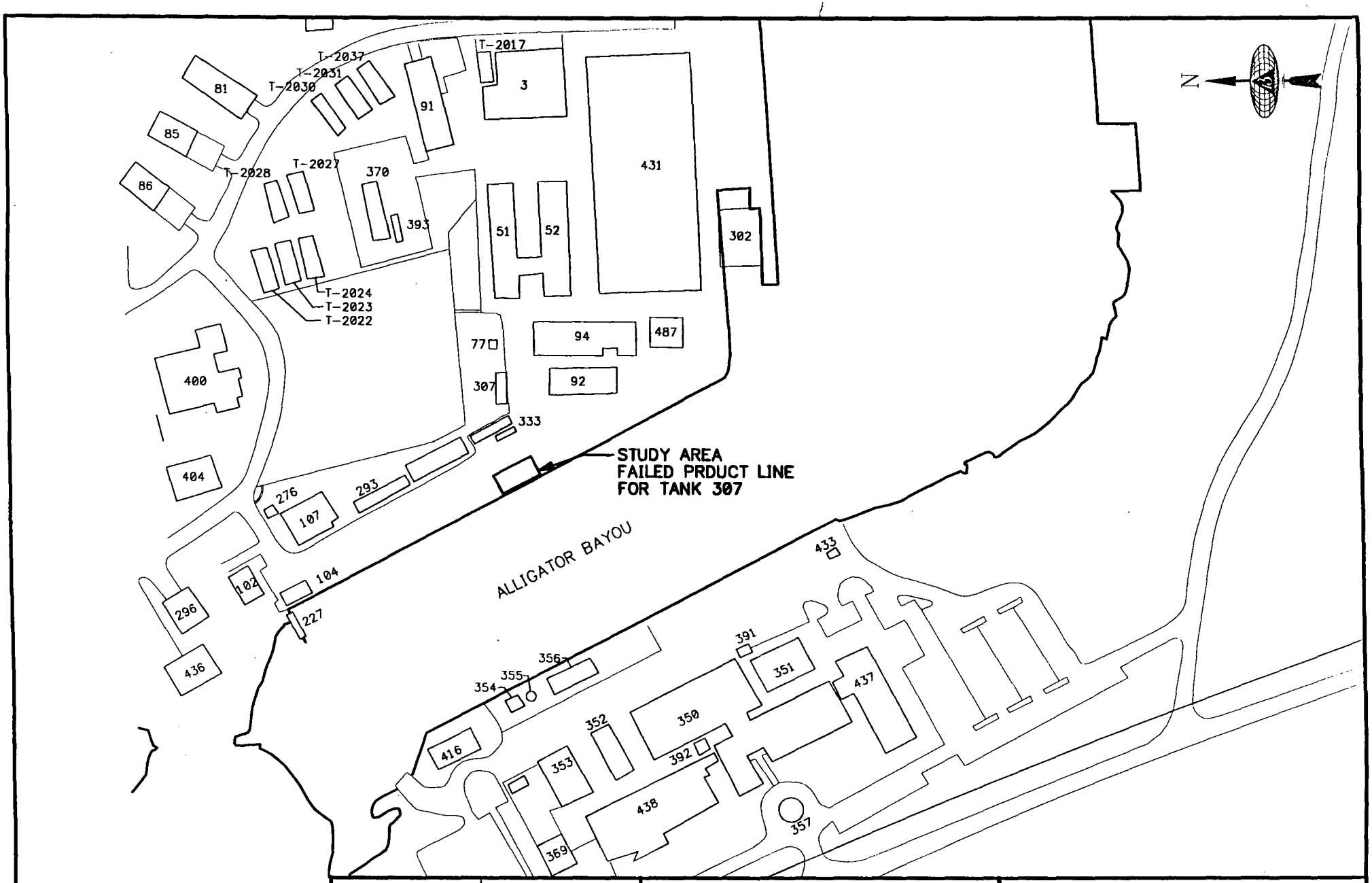
Site AOC2/SWMU1: Site AOC2/SWMU1 is a study area which includes Site 333 and Site 307 and a storm drain pipe located in the parking lot north of Site 333 and Site 307. The location of the study area is provided on Figure 2-4. The storm drain pipe is located down gradient of a former above ground diesel tank system and within an area identified as AOC2, as designated from the RI program conducted at CSS. The storm drain pipe, located within AOC2, runs beneath Site 333 and adjacent to the 6,000 diesel UST at Site 333. The outfall for the storm pipe is within the sea wall located on the west dock of Alligator Bayou. During July 1997, Navy personnel identified a fuel release entering Alligator Bayou at the storm drain outfall.

Site 333 is the boom containment wash area and is primarily used as a containment area for cleaning of booms used in the containment of diesel spills. An above ground 100 gallon per minute capacity oil/water separator and an underground 550-gallon fiberglass waste oil tank (above ground holding tank) are used to collect and process rinse water from the cleaning of the booms. Rinse water from the containment area is drained into sumps then pumped to the oil/water separator. Any oils collected in the separator are gravity drained into the waste oil tank. Water in the oil/water separator drains into the sanitary sewer system.

SWMU1 is reported to extend beneath the boom wash area. SWMU1 was a marshy depression which was used as a disposal area from 1945 to 1953. This disposal area received general house hold wastes, food scraps, scrap metal, scarp lumber, and small quantities of paint, paint thinner, battery acids, solvents and photographic chemicals. Waste oil and bilge water were also poured on the ground and burned.

Site 307 consists of a 6,000 gallon double-walled fiberglass diesel fuel UST and double walled product piping equipped with leak detection sensors. This UST system provides diesel fuel to a dispenser located east of the boom containment wash area. The 6,000 gallon diesel UST was installed in the late

1980's as a system upgrade to replace a 5,000 gallon diesel UST. The 6,000 gallon UST is located adjacent to the southeast end of the containment boom wash area for Site 333.



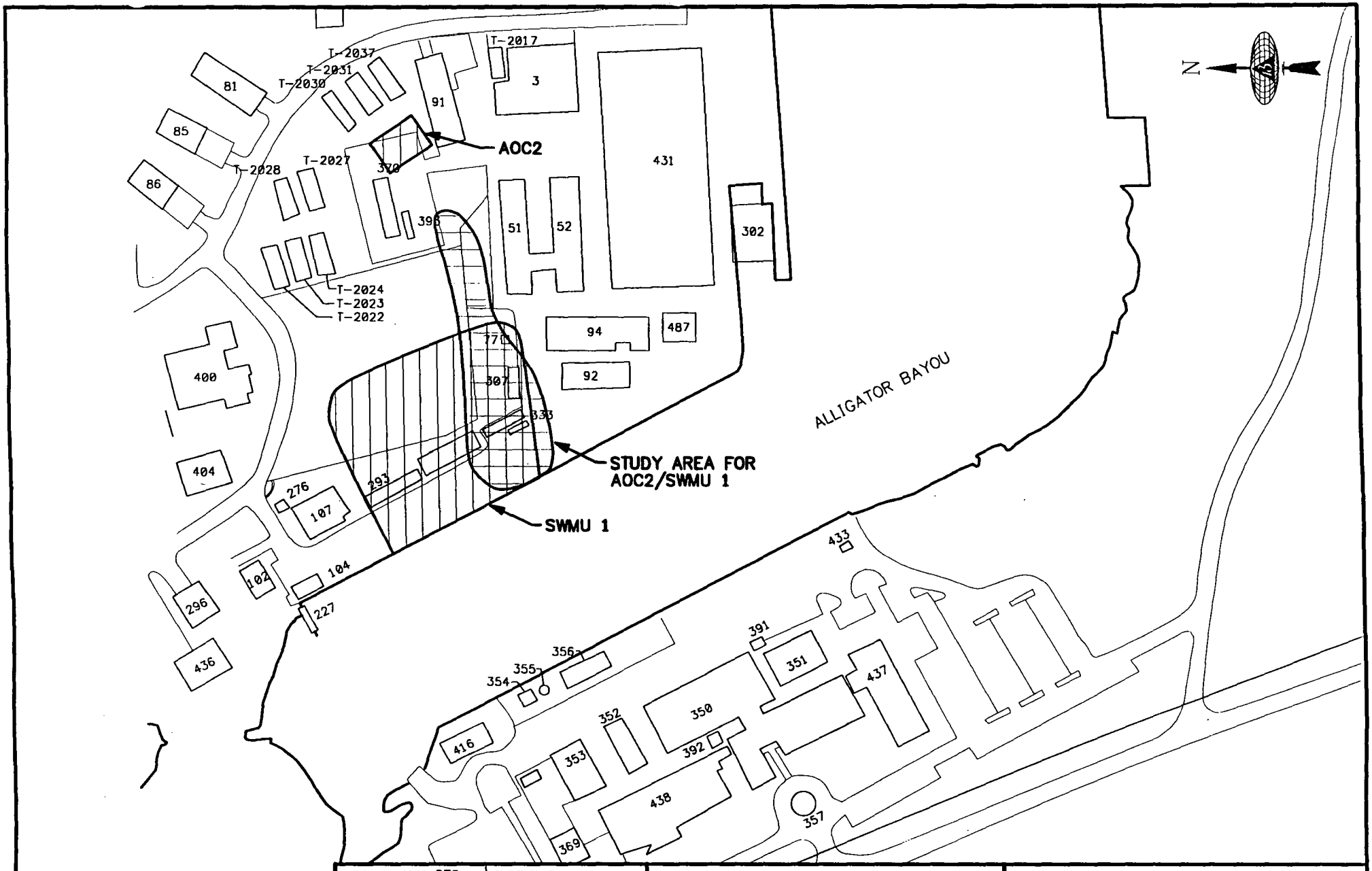
SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/31/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: 1" = 200'	
CAD DWG. NO.: 7766CM07	PROJ. NO.: 7766

Brown & Root Environmental

FIGURE 2-3

STUDY AREA – SITE 307

COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA



SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/31/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: 1" = 200'	
CAD DWG. NO.: 7766CM08	PROJ. NO.: 7766

Brown & Root Environmental

FIGURE 2-4

STUDY AREA – SITE AOC2/SWMU1

COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

3.0 INTERIM REMEDIAL ACTIONS/TANK CLOSURE RESULTS

Site 363: Results of a Tank Closure Assessment performed by Navy Public Works Center during August 1997, indicated an UST used to store waste oil at the site, was damaged during the excavation process. The ruptured tank was partially submerged in the groundwater and the groundwater entered the UST and forced residual product out of the UST and into the excavation. The product was removed from the excavation and properly disposed. The UST excavation was approximately 12 feet wide, 20 feet long and 7 feet deep. The excavation was filled with clean fill, compacted to grade, and seeded. Four soil borings were installed around the UST and soil samples were collected for organic vapor concentrations using the headspace screening technique. The soil samples were collected at depths of 7 feet below land surface (bottom of tank excavation). Results of the soil vapor screening reported total hydrocarbon vapor concentrations to range from below detection limits to 13 parts per million (ppm). A shallow temporary monitoring well was installed and a groundwater sample was collected during November 1997. The groundwater sample was analyzed for volatile content in accordance with Environmental Protection Agency (EPA) Method 8260, for poly aromatic hydrocarbons (PAHs) in accordance with EPA Method 8270, for ethylene dibromide content in accordance with EPA Method 504, for lead content in accordance with EPA Method 239.3, and for total petroleum hydrocarbons by Petroleum Range Organics (FL-PRO) method. Results of the groundwater analysis reported concentrations of volatile aromatics (benzene, ethylbenzene, toluene, and xylenes), volatile organics (methylene chloride), PAHs (fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and phenanthrene), TPH, and lead constituents. The Tank Closure Assessment is provided in Appendix A.

Site 98: Results of a Tank Closure Assessment performed at the site by Navy Public Works Center during August 1997, indicated the UST had holes in the tank. Contaminated soil within the UST excavation was removed down to the water table. The UST excavation was approximately eight feet wide, 10 feet long and 5 feet deep. The excavation was filled with clean fill, compacted to grade, and paved with concrete. Six soil borings were installed around the UST and soil samples were collected for organic vapor concentrations using the headspace screening technique. The soil samples were collected at depths of 5 feet below land surface (bottom of tank excavation). Results of the soil vapor screening reported total hydrocarbon vapor concentrations to range from below detection limits to 45 parts per million (ppm). A shallow temporary monitoring well was installed and a groundwater sample was collected during November 1997. The groundwater sample was analyzed for volatile content in accordance with Environmental Protection Agency (EPA) Method 8260, for poly aromatic hydrocarbons

(PAHs) in accordance with EPA Method 8270, for ethylene dibromide content in accordance with EPA Method 504, for lead content in accordance with EPA Method 239.3, and for total petroleum hydrocarbons by Petroleum Range Organics (FL-PRO) method. Results of the groundwater analysis reported concentrations of volatile aromatics (benzene, ethylbenzene, toluene, and xylenes), volatile organics (1,1,1-trichloroethane, 1,1,2-trichloroethene, and trichloroethane), PAHs (acenaphthene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and phenanthrene), TPH constituents and 1,2-dibromoethane. The Tank Closure Assessment is provided in Appendix A.

Site 307: Interim remedial actions were performed by Bechtel Environmental Inc. in response to a fuel release identified in Alligator Bayou during July 1997. As part of the interim remedial action to investigate potential source(s) for the fuel release, a tank and line tightness test was performed on Tank 307R in January 1998. Results of the tightness tests indicated the UST tested tight, but the product line had failed the test in a section of product line located in the concrete lined trench along the edge of the dock, just before the dispenser. Tightness tests performed on the UST system also indicated the UST leak detection system (tightness test on the interstices of the double walled tank) had failed. Tank 307R has currently been taken off line and the dispenser island has been removed. The tank and line tightness test results are included in Appendix A.

Site AOC2/SWMU1: Emergency Response Actions were performed by Bechtel Environmental Inc. in response to a fuel release entering Alligator Bayou from a storm water drain outfall in July 1998. The Emergency Response Actions included: investigating the storm water drain inverts upgradient to the storm water outfall; operating surveillance cameras inside the storm water system to identify cracks within the drainage pipe where fuel could enter the storm water system, performing soil borings to assess soil hydrocarbon concentrations in the area where fuel was identified to have entered the storm water system; and installing protective casing (sleeves) around sections of storm water drain pipe where fuel was observed entering the storm water system. Bechtel Environmental Inc. also, performed a tightness test on the UST system for Tank 307R as part of an interim remedial action to investigate potential sources for the release of fuel into Alligator Bayou (tank tightness discussed above).

Results of the Emergency Response Actions identified fuel entering a storm water junction box located upgradient to Site 333. The location where fuel had entered the junction box was subsequently cased (sleeved) to prevent fuel from entering the storm drain. From August 11 through August 15, 1997, Bechtel Environmental Inc., advanced 97 soil borings and collected soil samples to evaluate soil hydrocarbon vapor concentrations in the area surrounding the storm water junction box and storm water drain pipe. Soil borings were also advanced in the area near an abandoned fuel line which serviced a former above ground diesel tank system associated with AOC2. The soil samples were collected from

the borings at approximately 5 to 7 feet bls and screened for hydrocarbon vapors using headspace analysis. Results of the soil screening indicated hydrocarbon vapors are present in soils in the area of the storm water junction box and within the parking lot north of Site 307 and Site 333. The soil hydrocarbon vapor concentrations generally increased in concentration in samples collected to the northwest of the storm water junction box. Soil assessment data provided by Bechtel Environmental Inc. during Emergency Response Actions are provided in Appendix A.

4.0 SCOPE OF PROPOSED ASSESSMENTS

The proposed scope of work for assessment activities will take place in three phases. The first phase (Phase 1) will consist of performing groundwater sampling at Site 363. During this phase of field activities, utility clearance, potable water source, and decontamination areas and investigative derived waste staging areas for drilling activities associated with Sites 98, 307, and AOC2/SWMU1 will be established with the Activity for CSS, Panama City. The layout of soil borings will also be marked at each site.

The second phase (Phase 2) will consist of performing a soil hydrocarbon vapor assessment at Sites 98, 307, and AOC2/SWMU1. The soil hydrocarbon vapor assessment will be performed using direct push technology (DPT), such as a geoprobe, to install soil borings to delineate the horizontal and vertical extent of vadose zone soil contamination. Soil samples will be collected at each boring location and screened for hydrocarbon vapors using an organic vapor analyzer. Select soil samples will be retained for laboratory analysis for Gasoline and Kerosene Analytical Group parameters as defined in Chapter 62-770, F.A.C. In conjunction with the direct push soil boring installation, a mobile laboratory will be used to screen groundwater samples collected from select boring locations for Diesel Range Organics (DRO) and Gasoline Range Organics (GRO). These groundwater analyses will be used to determine the optimum location and number of permanent monitoring wells. One deep DPT boring will be advanced at Sites 98 and 307, and three DPT borings will be installed at Site AOC2/SWMU1. The deep boring will be used to allow groundwater samples to be collected for DRO and GRO analysis from a deeper zone within the water table. The data collected from the deep borings will be used to assess the vertical extent of dissolved hydrocarbons within the study area. Piezometer wells will be installed at Site AOC2/SWMU1 using DPT to advance borings to facilitate the piezometer well installations. The piezometer wells will be used to evaluate groundwater gradients in the immediate area of the storm water drain pipe which underlies the study area.

The third phase (Phase 3) will involve the mobilization of a drill rig to install shallow monitoring wells at Sites 98, 307, and AOC2/SWMU1. The placement of these wells will be based on soil hydrocarbon vapor concentrations and groundwater quality data collected during the Phase 2 field investigation, and groundwater flow gradients identified from previous environmental investigations conducted at CSS, Panama City. Concurrent with this phase of work, groundwater samples will be collected from the newly installed wells and from existing monitoring wells within the study area, if applicable. Slug tests will also

be performed on three shallow monitoring wells at Sites 98 and 307. The relative top of casing elevation of all permanent monitoring wells installed during the assessment will be surveyed with respect to and arbitrary horizontal datum or bench mark provided by the Activity for CSS, Panama City.

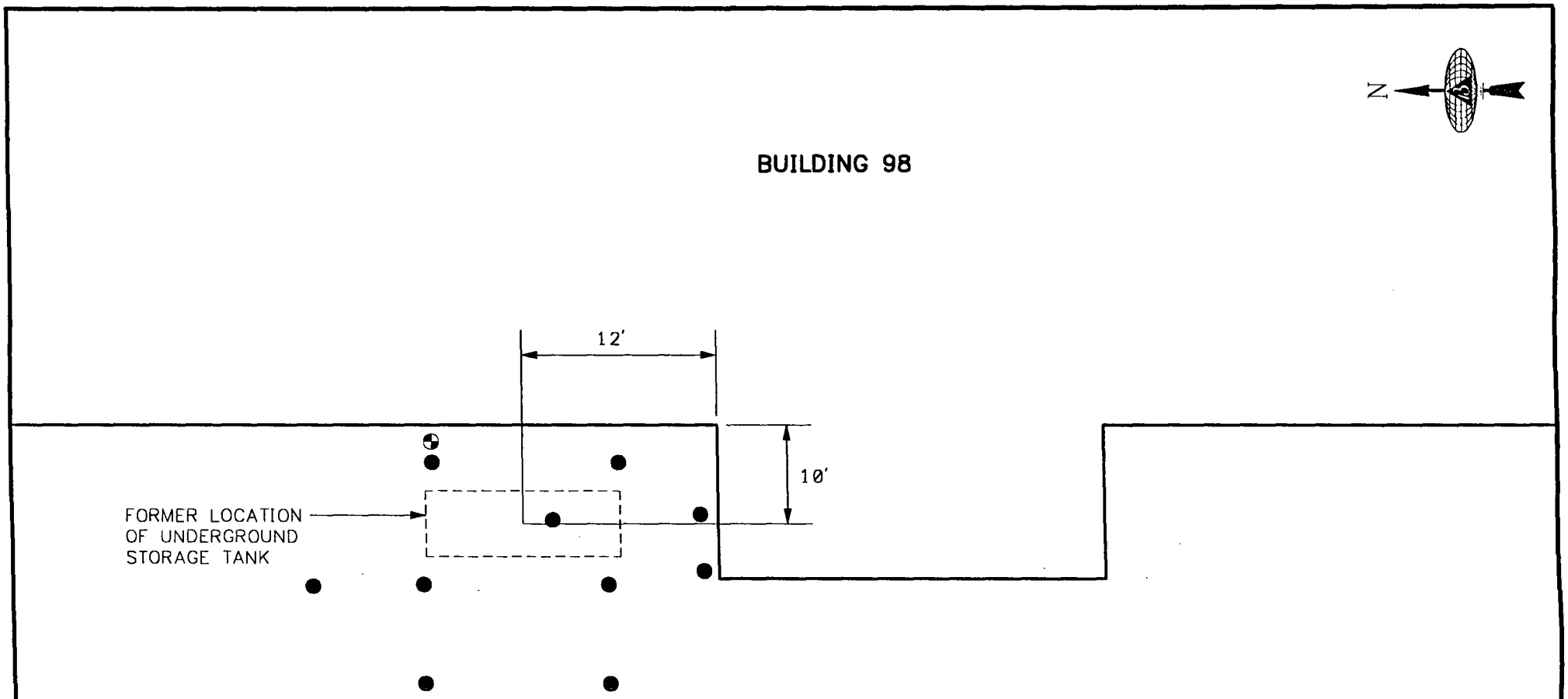
Based on the groundwater and soil quality data collected during the Phase 2 and Phase 3 field investigations for Sites 98, 307, and AOC2/SWMU1, an additional site mobilization maybe required to collect soil samples for analysis by EPA Method 1312 (Synthetic Precipitation Leaching Procedure). If required, borings would be advanced using a hand-auger to facilitate the collection of the samples.

4.1 SOIL INVESTIGATION

The soil hydrocarbon vapor assessment will be conducted using DPT at Sites 98, 307, and AOC2/SWMU1. This method of drilling is preferred due to the subsurface lithology which is predominantly quartz sand, the presence of a shallow water table, and to minimize the amount of soil cuttings generated during boring activities.

During borehole advancement soil samples will be collected continuously until boring completion. Soil samples will be collected using either a two foot or four foot sampler with plastic liners. Each vadose zone soil sample will be screened for hydrocarbon vapors following procedures for headspace analysis as required by Chapter 62-770.200 F.A.C. The soil borings will be advanced until the water table is encountered. It is anticipated that groundwater will be encountered within 6 to 12 feet of the ground surface. Each boring will be either hand augured or preprobed from the surface to 4 feet bls to inspect to the presence of underground utilities. The location of the proposed borings are provided on Figures 4-1 through 4-4.

If soil contamination at Sites 98 and 307 is identified above State Target Levels (soil hydrocarbon vapor readings greater than 10 ppm) at any proposed boring location, additional soil borings would be advanced to assess the areal extent of soil contamination. It is assumed 16 soil borings (10 borings for Site 98 and six borings at Site 307 established on a 10 to 15 foot grid) will provide sufficient areal coverage to delineate the soil contamination at Sites 98 and 307. It is estimated a total of 30 soil borings will be installed to provide sufficient areal coverage to assess the soil for petroleum hydrocarbon vapors and/or evidence of petroleum staining in the area of AOC2/SWMU1. At Sites 98, and 307 , three vadose zone soil grab samples will be collected from the zone of highest, medium, and low organic vapor readings from three of the DPT soil borings. At Site AOC2/SWMU1 six vadose zone soil samples will be collected from the zone of highest, medium, and low organic vapor readings. Laboratory analysis of the Kerosene Analytical Group as defined in Chapter 62-770, F.A.C. will be performed on the soil samples.



LEGNED

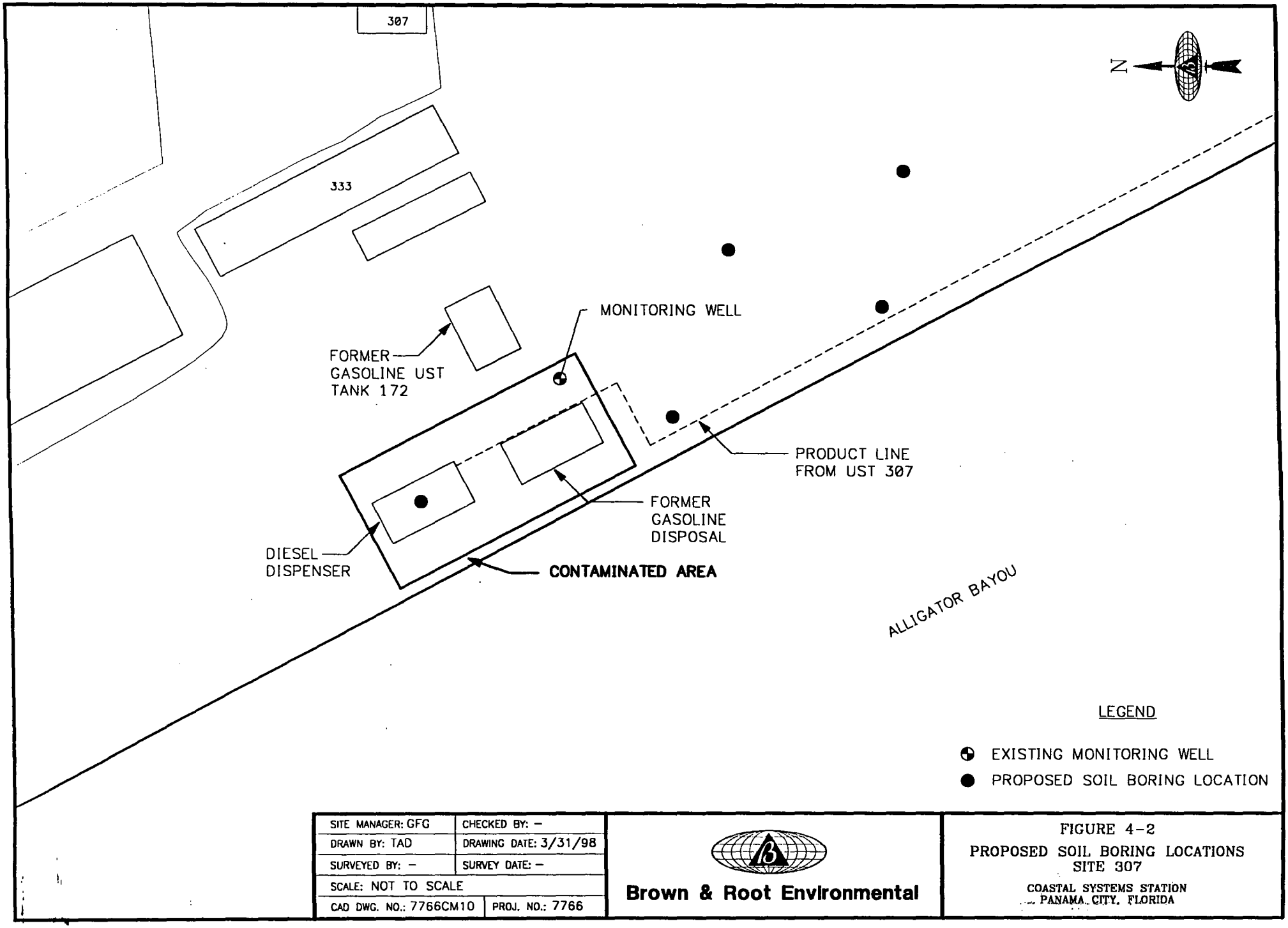
- EXISTING MONITORING WELL LOCATION
- PROPOSED SOIL BORING LOCATION

NOTE:
FIGURE MODIFIED FROM CLOSURE, ASSESSMENT REPORT, BUILDING 98
DECEMBER 1997, NAVY PUBLIC WORK CENTER ENVIRONMENTAL DEPARTMENT.

SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/25/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: NTS	
CAD DWG. NO.: 7766CM05	PROJ. NO.: 7766

Brown & Root Environmental

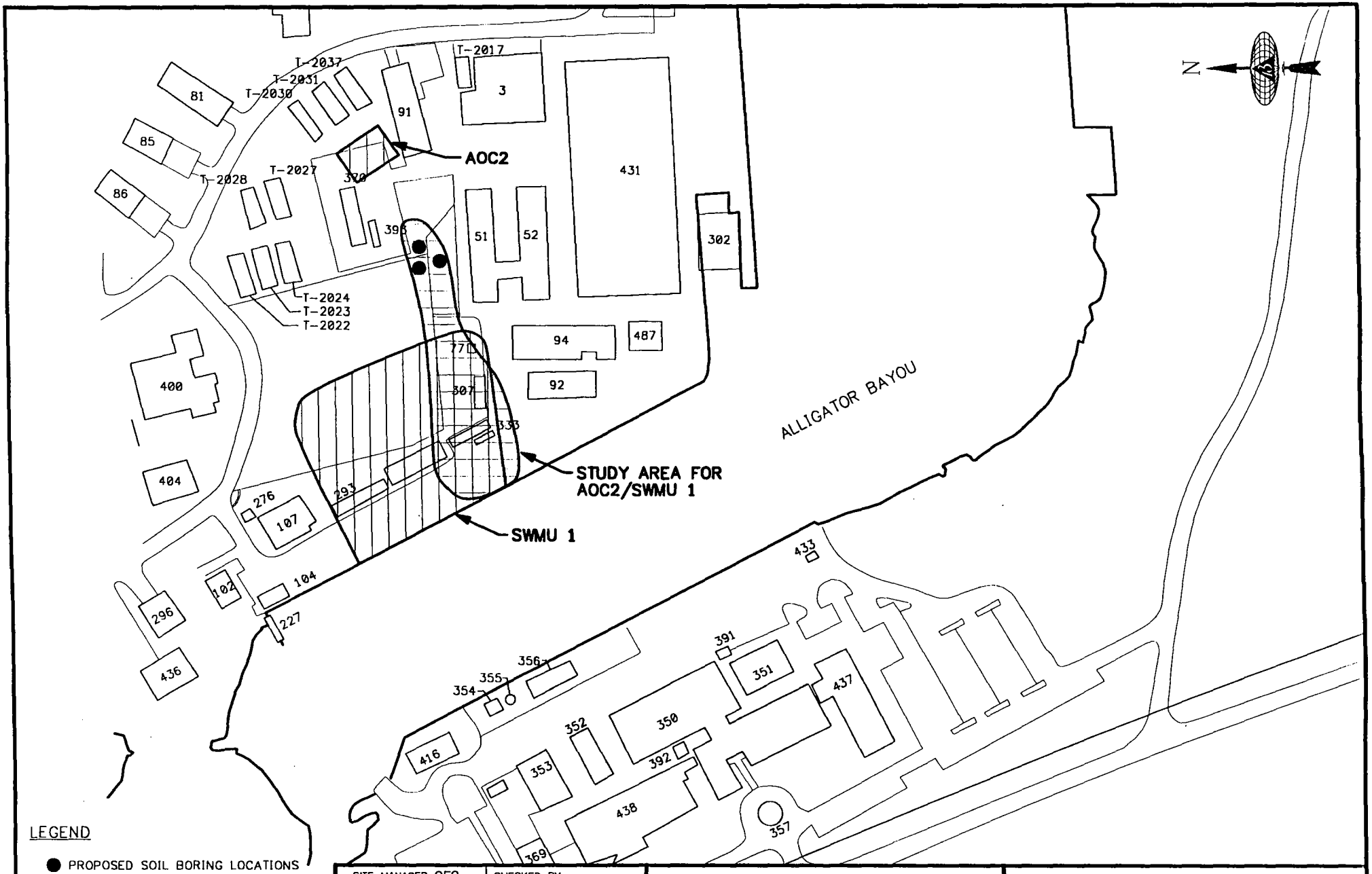
FIGURE 4-1
PROPOSED SOIL BORING LOCATIONS
SITE 98
COASTAL SYSTEM STATION
PANAMA CITY, FLORIDA



SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/31/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: NOT TO SCALE	
CAD DWG. NO.: 7766CM10	PROJ. NO.: 7766

Brown & Root Environmental

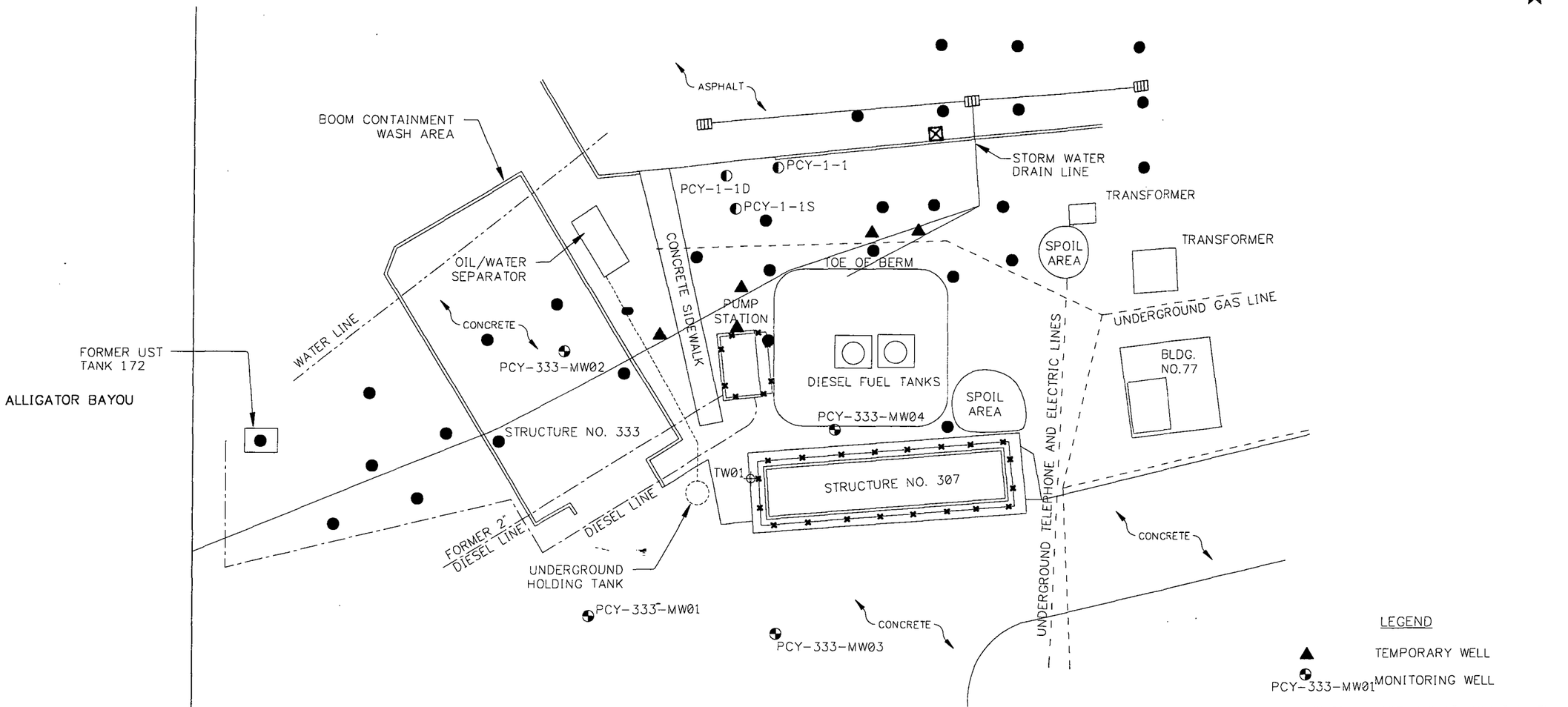
FIGURE 4-2
PROPOSED SOIL BORING LOCATIONS
SITE 307
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA



SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/31/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: 1" = 200'	
CAD DWG. NO.: 7766CM09	PROJ. NO.: 7766

Brown & Root Environmental

FIGURE 4-3
PROPOSED SOIL BORING LOCATIONS
SITE AOC2/SWMU 1
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA



SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/25/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: 1" = 20' (APPROXIMATE)	
CAD DWG. NO.: 7766CM06	PROJ. NO.: 7766

Brown & Root Environmental

FIGURE 4-4
PROPOSED SOIL BORING/PIEZOMETER LOCATIONS – SITE AOC2/SWMU 1
COASTAL SYSTEM STATION
PANAMA CITY, FLORIDA

Vertical delineation borings will be conducted using DPT method to characterize the subsurface lithology at depth. The vertical delineation boring at Site 307 will be completed to a depth of 25 feet bls. The vertical delineation boring at Site 98 will terminate at approximately 30 feet bls. Three vertical delineation borings will be completed to 25 feet bls to characterize the subsurface lithology at Site A0C2/SWMU1. Continuous soil samples will be collected during the advancement of the borings.

Each soil boring will be backfilled with Type 1 Portland Cement. All locations drilled through asphalt or concrete will be completed with similar material and finished flush to existing grade.

A lithologic description will be made of each sampler and/or grab sample collected and a completed log of each boring will be maintained by the on-site geologist in accordance with Standard Operating Procedure (SOP) GH 1.5 included in Appendix B. At a minimum, the boring log will contain the following information:

- Sample Numbers and Types
- Sample Depths
- Sample Recovery/Sample Interval
- Soil Density or Cohesiveness
- Soil Color
- Unified Soil Classification System (USCS) Material Description

In addition, depths of changes in lithology, sample moisture observations, depth to water, organic vapor readings, drilling methods, and total depth of each borehole should be included on each log, as well as any other pertinent observations. An example of the boring log form is attached in Appendix B.

The site's lithology and soil quality will be assessed from soil samples collected during the soil hydrocarbon vapor survey. During drilling of the permanent monitoring wells (see Section 4.3), no split-spoon samples will be collected. Grab samples from the auger flights will be collected during boring advancement and logged.

4.2 GROUNDWATER FIELD SCREENING FOR DIESEL RANGE ORGANICS, GASOLINE RANGE ORGANICS AND PIEZOMETER WELL INSTALLATIONS

During the Phase 2 soil hydrocarbon vapor survey (DPT investigation), a groundwater sample will be collected from select boring locations for on-site analysis of DRO and GRO constituents. Groundwater samples will be collected from boring locations completed into the upper zone (3 to 4 feet) of the water

table. Five groundwater samples will be collected from select boring locations at Site 98 and six groundwater samples will be collected at Sites 307. Groundwater samples at Site AOC2/SWMU1 will be collected from 15 borings. Groundwater samples will be collected from each of the vertical delineation borings at the depth of boring completion. The samples will be collected using tygon tubing and a peristaltic pump. The samples will be placed into appropriate sample bottles and immediately analyzed for DRO and GRO constituents using a mobile lab equipped with a gas chromatograph (GC). The DPT method for conducting field screening of water samples is the preferred method for sampling groundwater due to the amount of groundwater quality samples which can be collected over a short period of time without installing temporary and/or permanent monitoring wells

Five piezometer wells will be installed during the DPT soil hydrocarbon vapor survey at Site AOC2/SWMU1. Each piezometer well will be completed with the well screened placed to intersect the top of the water table. Relative groundwater elevations determined from static water level measurements collected from the piezometer wells, will be used to evaluate the groundwater flow in the area of the storm drain. The proposed locations for the piezometer wells are shown on Figure 4-4.

The preliminary groundwater field screening results from the DPT investigation and available groundwater flow maps generated from previous investigations (i.e., Remedial Investigation) at CSS Panama City will be used to evaluate the location of permanent monitoring wells. Well installation permits will be obtained from the Northwest Florida Water Management District prior to drilling activities.

The sample results from the groundwater field screening investigation will be plotted on a map and permanent monitoring well locations will be selected based on spatial distribution of identified constituents and the local groundwater flow pattern, identified from previous investigations conducted at CSS, Panama City.

4.3 GROUNDWATER INVESTIGATION

The groundwater investigation at Site 363 will include collecting groundwater samples from seven existing site monitoring wells (see Figure 2-2 for monitoring well locations) for analysis of Used Oil Group parameters as identified in Chapter 62-770.600, F.A.C. Results from the sampling event will be used to assess current water quality conditions at Site 363.

It is anticipated four shallow (water table) monitoring wells will be installed at Site 307 and Site 98 to assess the horizontal extent of dissolved hydrocarbons. Six shallow monitoring wells will be installed during the preliminary assessment investigation for Site AOC2/SWMU1. The proposed shallow

monitoring wells will be installed during Phase 3 field investigation. The proposed monitoring well locations will be determined based on groundwater quality data and the flow gradient across the site as determined from groundwater flow maps generated for the Remedial Investigation completed for CSS, Panama City. The Navy's Remedial Project Manager (RPM) will be contacted to discuss the locations of the proposed monitoring wells. Well installation permits will be obtained from the Northwest Florida Water Management District prior to drilling activities.

4.3.1 Monitoring Well Installation

Permanent monitoring wells will be installed using hollow stem auger drilling techniques. These wells will be used to monitor water quality and evaluate the horizontal extent of contamination. Each boring will be hand dug from the surface to four feet bls using a post hole digger to ensure that no underground utilities are present. Monitoring wells will be constructed of 2-inch ID Schedule 40, flush-joint PVC riser and flush-joint factory slotted well screen. Each section of casing and screen shall be National Sanitation Foundation (NSF) approved. Screen slot size shall be 0.01 inch. Unless otherwise specified, the top of the screen interval will be positioned approximately 4 feet above the water table. Screen sections will be 10 feet in length. After the borings are drilled to the desired depth, (6-inch minimum diameter boring for 2-inch ID wells), the well will be installed through the augers.

The lithology has been sufficiently characterized from previous investigations at CSS that a sieve analysis of the soils is not needed in determining the type of sand pack and screen slot size for well completion. Clean silica sand of U.S Standard Sieve Size No. 20/30 will be installed into the boring annulus around the well screen as the augers are withdrawn from the boring. Due to the expected shallow depths of the monitoring wells, (less than 15 feet), it is proposed that the sand pack be poured around the annulus from the top of the hole. The sand pack will be set from the bottom of the hole to approximately 1 foot above the top of the well screen. A minimum 1-foot thick bentonite pellet seal will be installed above the sand pack and allowed to hydrate. The remainder of the boring will be backfilled with a high solids bentonite grout. The depths of all backfill materials will be constantly monitored during the well installation process by means of a weighted stainless steel or fiberglass tape. The position of the top of the screen interval, sand pack and bentonite seal may be adjusted as site conditions warrant (elevated water table, etc.).

Flush mounted steel well covers and manholes will be installed around the 2-inch ID wells. The manhole will consist of flush mounted 22-gauge steel, water resistant, welded box with 3/8-inch steel lid, locking device, and padlock. A 2-foot by 2-foot by 6-inch thick concrete apron will be constructed around the manhole. The manhole shall be completed 2 inches above existing grade and the apron tapered to be

flush with the existing grade at the edges such that water will run off of the apron. A detail of a typical flush-mounted well is shown on Figure 4-5. All locks supplied for the wells will be keyed alike. After installation, the ground surface, and the top of the PVC riser pipe will be surveyed to within 0.01-foot vertical accuracy using datum points as discussed previously in Section 4.0.

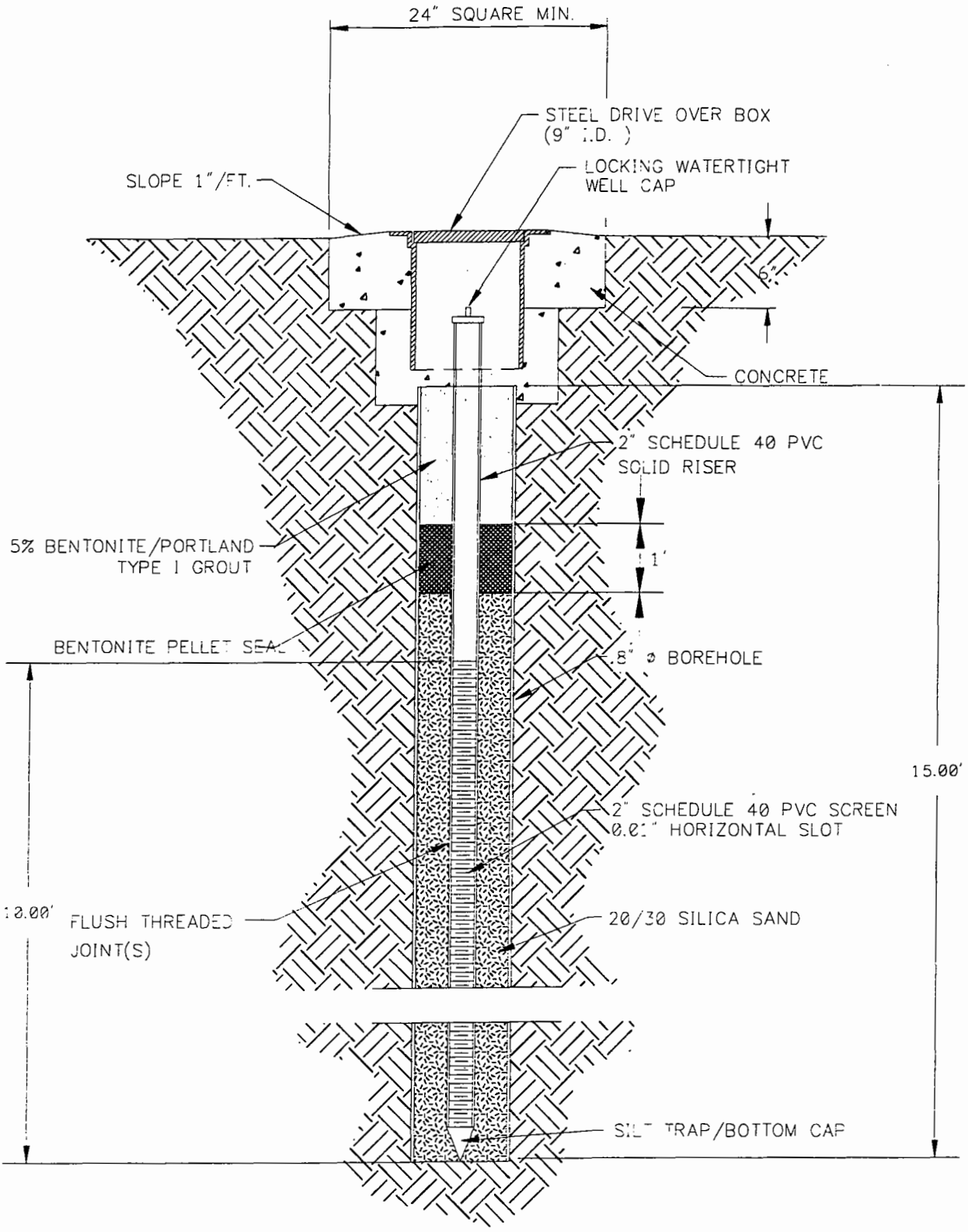
A monitor well construction diagram will be completed for each well installed. A sample of the monitoring well construction form is provided in Appendix B.

Piezometer well construction will be completed in the same manner as the shallow monitoring wells except for the wells will be constructed with 1 1/4-inch diameter schedule 40 PVC screen and casing material. The boring annulus to facilitate the piezometer well will be approximately 3 to 4 inches in diameter.

The monitoring wells will be developed no sooner than 24 hours after installation to remove fine material from around the monitored interval of the well. Wells will be developed by bailing and surging, or by pumping, as determined by the field geologist. The pH, temperature, and specific conductance measurements will be collected from the purge water. Wells will be developed up to a maximum of one hour or until these measurements become stable and the purge water is visibly clear. Water quality stabilization will be determined using the following criteria: temperature +/-0.5^{O}C, pH +/-0.1unit, and specific conductivity +/-10 *u*mhos/cm. Wells will be developed until approved by the field geologist.

4.3.2 Groundwater Sampling

Groundwater samples will be obtained from monitoring wells used in the assessment investigations in accordance with B&R Environmental Comprehensive Quality Assurance Plan (FDEP Comp QA Plan No. 870055). Prior to obtaining samples, water levels and total well depths will be measured and the wells will be purged using a peristaltic pump and a low flow quiescent purging technique. Three to five well volumes will be purged. If wells are purged dry with less than three well volumes removed, the water level in the well will be allowed to recover at least 80 percent, then a sample will be collected. Field measurements of pH, temperature, and specific conductance will be taken after each volume of water is purged. Stabilization of the above parameters is defined in the previous paragraphs. If these parameters do not stabilize after three volumes, up to five volumes will be removed. Before purging, a clear bailer or an oil water interface probe will be used to check for free product. No samples will be collected from a well that exhibits measurable free product. The thickness of the free product will be measured and recorded. Samples will be obtained using a peristaltic pump using a low



SITE MANAGER: GFG	CHECKED BY: –
DRAWN BY: TAD	DRAWING DATE: 3/25/98
SURVEYED BY: –	SURVEY DATE: –
SCALE: NTS	
CAD DWG. NO.: 7766CM03	PROJ. NO.: 7766

Brown & Root Environmental

FIGURE 4-5

TYPICAL SHALLOW MONITORING WELL CONSTRUCTION DETAIL

COASTAL SYSTEM STATION
PANAMA CITY, FLORIDA

flow quiescent sampling technique. The samples will be transferred directly into the appropriate (pre-preserved) sample bottles for analysis. Samples to be analyzed for volatile constituents shall be taken first and immediately sealed in the vial so that no headspace exists. The sample constituents analyzed for each of the Sites are summarized in Table 4-1.

All pertinent field and sampling data shall be recorded using a groundwater sample form, attached in Appendix B.

4.3.3 Groundwater Level Measurements

Synoptic water level measurements will be taken from all monitoring wells at the sites. Static water level measurements will be measured from the north rim of the top of the PVC riser pipe using an electronic water level indicator. The newly installed wells shall be notched and marked so that the same point will be referenced for all measurements. The depth to water will be measured to the nearest 0.01 foot below the top of the PVC riser pipe. Three consecutive water level readings will be measured from the well to the nearest 0.01 foot to assure an accurate water level is recorded. Water level measurements will be recorded to the nearest 0.01 foot in the appropriate field log book.

4.4 AQUIFER TESTS

B&R Environmental will perform a series of duplicate aquifer slug tests on three selected shallow monitoring wells at Site 98 and Site 307. Each of these tests will be performed by removing a volume ("slug") of water from the well and measuring the recharge of the well back to equilibrium. The Bouwer and Rice methodology for partial penetrating wells in unconfined aquifers will be utilized to calculate the hydraulic conductivity values for the three monitoring wells as described by Bouwer, 1989, and Rice, 1976. Calculations will be performed using Aqtesolve™ aquifer characterizations program as described in Duffield and Rumbaugh, 1991.

TABLE 4-1
FIELD INVESTIGATION
ENVIRONMENTAL SAMPLE SUMMARY

SITE 363
Coastal Systems Station, Panama City, Florida

Analyte	Proposed Method (1)	Env. Samples	IDW Samples (2)	Duplicate Samples	Rinsate Blanks (Aqueous)	Field Blank (Aqueous)	Trip Blanks (Aqueous)	Total Samples
GROUNDWATER								
PPL VOH and 1,2- Dichloroethane	SW-846 8021B	7	0	1	1	0	0	10
BTEXs and MTBE	SW-846 8021B	7	0	1	1	0	0	10
PAHs	SW-846 8310	7	0	1	1	0	NA	9
TRPHs	FL-PRO	7	0	1	1	0	NA	9
1-2 Dibromoethane (EDB)	EPA 504	7	0	1	1	0	0	10
PPL Volatile Organic Compounds plus TICs	SW-846 8260B	7	0	1	1	0	0	10
PPL Extractable Organic Compounds plus TICs	SW-846 8270C	7	0	1	1	0	NA	9
Non-PPL Volatile and Extractable Organic Compounds plus TICs for GC/MS peaks greater than 10 ug/L	SW-846 8260B and 8270C	7	0	1	1	0	NA	9
Total arsenic	SW-846 6010B (trace) or 7060A	7	0	1	0	0	0	8
Total lead	SW-846 6010B (trace) or 7421	7	0	1	1	0	0	9
Total barium	SW-846 6010B	7	0	1	1	0	0	9
Total cadmium	SW-846 6010B (trace) or 7131A	7	0	1	1	0	0	9
Total chromium	SW-846 6010B	7	0	1	1	0	0	9
Total selenium	SW-846 6010B (trace) or 7740	7	0	1	1	0	0	9
Total mercury	SW-846 7470	7	0	1	1	0	0	9

TABLE 4-1 (Continued)
FIELD INVESTIGATION
ENVIRONMENTAL SAMPLE SUMMARY

SITE 363
Coastal Systems Station, Panama City, Florida

Analyte	Proposed Method (1)	Env. Samples	IDW Samples (2)	Duplicate Samples	Rinsate Blanks (Aqueous)	Field Blank (Aqueous)	Trip Blanks (Aqueous)	Total Samples
Total silver	SW-846 6010B (trace) or 7761	7	0	1	1	0	0	9
TOTAL		112	0	17	17	0	0	146

Method referenced reflects FDEP requirements.
All analyses are analyzed using standard 14-day laboratory turn around time.
1) For the metals analytes two methods are listed, this is due to the difference in the capabilities of various analytical laboratories. The awarded laboratory will perform the method in which they have the capability. Either Inductively Coupled Plasma (ICP), trace ICP, or graphite furnace will be utilized.
2) IDW sample numbers based upon disposing of five 55-gallon drums (1 composite sample) of soil.
NA not applicable Method referenced reflects FDEP Chapter 62-770 requirements.
VOHs Volatile Organic Halocarbons
PPL Priority Pollutant List
BTEXs Benzene, Toluene, Ethylbenzene, Xylenes
MTBE Methyl-tert-butyl-ether
PAHs Polycyclic Aromatic Hydrocarbons
TRPHs Total Recoverable Petroleum Hydrocarbons
GC/MS Gas Chromatography/Mass Spectroscopy
TICs Tentatively Identified Compounds
SPLP Synthetic Precipitation Leaching Procedure

TABLE 4-1 (Continued)
FIELD INVESTIGATION
ENVIRONMENTAL SAMPLE SUMMARY

SITE 98
Coastal Systems Station, Panama City, Florida

Analyte	Proposed Method (1)	Env. Samples	IDW Samples (2)	Duplicate Samples	Rinsate Blanks (Aqueous)	Field Blank (Aqueous)	Trip Blanks (Aqueous)	Total Samples
GROUNDWATER								
PPL VOHs and 1,2-Dichloroethane	SW-846 8021B	10	0	2	2	0	0	14
BTEXs and MTBE	SW-846 8021B	10	0	2	2	0	0	14
1-2-Dibromoethane (EDB)	EPA 504	10	0	2	2	0	0	14
PAHs	SW-846 8310	10	0	2	2	0	NA	14
TRPHs	FL-PRO	10	0	2	2	0	NA	14
Total lead	SW-846 6010B (trace) or 7421	10	0	2	2	0	NA	14
TOTAL		60	0	12	12	0	0	84
SOIL								
BTEXs and MTBE	SW-846 8021B	3	1	0	1	0	0	5
PAHs	SW-846 8310	3	1	0	1	0	NA	5
TRPHs	FL-PR0	3	1	0	1	0	NA	5
SPLP followed by BTEXs and MTBE, PPL VOHs, PAHs, TRPHs, and RCRA Metals (3)	SW-846 1312 followed by 8021B, 8310, FL-PRO, 6010B/7000A series	1	0	0	1	0	0	2
PPL VOHs	EPA 8021B	0	1	0	0	0	0	1
8 RCRA metals	SW-846 6010B/7000A series	0	1	0	0	0	NA	1
Total Halides	SW-846 5050/9056	0	1	0	0	0	NA	1
TOTAL		10	6	0	4	0	0	20

Method referenced reflects FDEP requirements.
All analyses are analyzed using standard 14-day laboratory turn around time.
1) For the metals analytes two methods are listed, this is due to the difference in the capabilities of various analytical laboratories. The awarded laboratory will perform the method in which they have the capability. Either Inductively Coupled Plasma (ICP), trace ICP, or graphite furnace will be utilized.
2) IDW sample numbers based upon disposing of five 55-gallon drums (1 composite sample) of soil.

TABLE 4-1 (Continued)
FIELD INVESTIGATION
ENVIRONMENTAL SAMPLE SUMMARY

SITE 98
Coastal Systems Station, Panama City, Florida

NA not applicable Method referenced reflects FDEP Chapter 62-770 requirements.
VOHs Volatile Organic Halocarbons
PPL Priority Pollutant List
BTEXs Benzene, Toluene, Ethylbenzene, Xylenes
MTBE Methyl-tert-butyl-ether
PAHs Polycyclic Aromatic Hydrocarbons
TRPHs Total Recoverable Petroleum Hydrocarbons
GC/MS Gas Chromatography/Mass Spectroscopy
TICs Tentatively Identified Compounds
SPLP Synthetic Precipitation Leaching Procedure

TABLE 4-1 (Continued)
FIELD INVESTIGATION
ENVIRONMENTAL SAMPLE SUMMARY

SITE 307 PRODUCT LINE RELEASE
Coastal Systems Station, Panama City, Florida

Analyte	Proposed Method (1)	Env. Samples	IDW Samples (2)	Duplicate Samples	Rinsate Blanks (Aqueous)	Field Blank (Aqueous)	Trip Blanks (Aqueous)	Total Samples
GROUNDWATER								
PPL VOHs and 1,2-Dichloroethane	SW-846 8021B	12	0	2	2	0	0	16
BTEXs and MTBE	SW-846 8021B	12	0	2	2	0	0	16
1-2-Dibromoethane (EDB)	EPA 504	12	0	2	2	0	0	16
PAHs	SW-846 8310	12	0	2	2	0	NA	16
TRPHs	FL-PRO	12	0	2	2	0	NA	16
Total lead	SW-846 6010B (trace) or 7421	12	0	2	2	0	NA	16
TOTAL		72	0	12	12	0	0	96
SOIL								
BTEXs and MTBE	SW-846 8021B	3	1	0	1	0	0	5
PAHs	SW-846 8310	3	1	0	1	0	NA	5
TRPHs	FL-PR0	3	1	0	1	0	NA	5
SPLP followed by BTEXs and MTBE, PPL VOHs, PAHs, TRPHs, and RCRA Metals	SW-846 1312 followed by 8021B, 8310, FL-PRO, 6010B/7000A series	1	0	0	1	0	0	2
PPL VOHs	SW-846 8021B	0	1	0	0	0	0	1
8 RCRA metals	SW-846 6010B/7000A series	0	1	0	0	0	NA	1
Total Halides	SW-846 5050/9056	0	1	0	0	0	NA	1
TOTAL		10	6	0	4	0	0	20

Method referenced reflects FDEP requirements.
1) For the metals analytes two methods are listed, this is due to the difference in the capabilities of various analytical laboratories. The awarded laboratory will perform the method in which they have the capability. Either Inductively Coupled Plasma (ICP), trace ICP, or graphite furnace will be utilized.

TABLE 4-1 (Continued)
FIELD INVESTIGATION
ENVIRONMENTAL SAMPLE SUMMARY

SITE 307 PRODUCT LINE RELEASE
Coastal Systems Station, Panama City, Florida

2) IDW sample numbers based upon disposing of five 55-gallon drums (1 composite sample) of soil.
All analyses are analyzed using standard 14-day laboratory turn around time.
NA not applicable Method referenced reflects FDEP Chapter 62-770 requirements.

VOHs	Volatile Organic Halocarbons
PPL	Priority Pollutant List
BTEXs	Benzene, Toluene, Ethylbenzene, Xylenes
MTBE	Methyl-tert-butyl-ether
PAHs	Polycyclic Aromatic Hydrocarbons
TRPHs	Total Recoverable Petroleum Hydrocarbons
GC/MS	Gas Chromatography/Mass Spectroscopy
TICs	Tentatively Identified Compounds
SPLP	Synthetic Precipitation Leaching Procedure

TABLE 4-1 (Continued)
FIELD INVESTIGATION
ENVIRONMENTAL SAMPLE SUMMARY

SITE AOC2/SWMU1 FIELD INVESTIGATION
Coastal Systems Station, Panama City, Florida

Analyte	Proposed Method(1)	Env. Samples	IDW Samples (2)	Duplicate Samples	Rinsate Blanks (Aqueous)	Field Blank (Aqueous)	Trip Blanks (Aqueous)	Total Samples
GROUNDWATER								
PPL VOHs and 1,2-Dichloroethane	SW-846 8021B	12	0	1	1	0	1	15
BTEXs and MTBE	SW-846 8021B	12	0	1	1	0	1	15
1,2-Dibromoethane (EDB)	EPA 504	12	0	1	1	0	1	15
PAHs	SW-846 310	12	0	1	1	0	NA	14
TRPHs	FL-PRO	12	0	1	1	0	NA	14
Total lead	SW-846 6010B (trace) or 7421	12	0	1	1	0	NA	14
TOTAL		72	0	6	6	0	3	87
SOIL								
BTEXs and MTBE	SW-846 8021B	6	1	1	1	0	0	9
PAHs	SW-846 8310	6	1	1	1	0	NA	9
TRPHs	FL-PR0	6	1	1	1	0	NA	9
SPLP followed by BTEXs and MTBE, PPL VOHs, PAHs, TRPHs, and RCRA Metals (3)	SW-846 1312 followed by 8021B, 8310, FL-PRO, 6010B/7000A series	2	0	0	1	0	0	3
PPL VOHs	SW-846 8021B	0	1	0	0	0	0	1
8 RCRA metals	SW-846 6010B/7000 A series	0	1	0	0	0	NA	1
Total Halides	SW-846 5050/9056	0	1	0	0	0	NA	1
TOTAL		20	6	3	4	0	0	33

All analyses are analyzed using standard 14-day laboratory turn around time.
Method referenced reflects FDEP requirements.
1) For the metals analytes two methods are listed, this is due to the difference in the capabilities of various analytical laboratories. The awarded laboratory will perform the method in which they have the capability. Either Inductively Coupled Plasma (ICP), trace ICP, or graphite furnace will be utilized.

TABLE 4-1 (Continued)
FIELD INVESTIGATION
ENVIRONMENTAL SAMPLE SUMMARY

SITE AOC2/SWMU1 FIELD INVESTIGATION
Coastal Systems Station, Panama City, Florida

2) IDW sample numbers based upon disposing of five 55-gallon drums (1 composite sample) of soil.
NA not applicable Method referenced reflects FDEP Chapter 62-770 requirements.

VOHs	Volatile Organic Halocarbons
PPL	Priority Pollutant List
BTEXs	Benzene, Toluene, Ethylbenzene, Xylenes
MTBE	Methyl-tert-butyl-ether
PAHs	Polycyclic Aromatic Hydrocarbons
TRPHs	Total Recoverable Petroleum Hydrocarbons
GC/MS	Gas Chromatography/Mass Spectroscopy
TICs	Tentatively Identified Compounds
SPLP	Synthetic Precipitation Leaching Procedure

4.5 EQUIPMENT DECONTAMINATION

The equipment involved in field sampling activities will be decontaminated prior to and during drilling and sampling activities. This equipment includes drill rigs, downhole tools, augers, well casing and screens, and soil and water sampling equipment.

4.5.1 Major Equipment

All downhole drilling equipment used in the construction and sampling of permanent monitoring wells, including downhole drill and sampling tools shall be steam cleaned prior to beginning work, between boreholes, any time the drill rig leaves the drill Site prior to completing a boring, and at the conclusion of the drill program.

These decontamination operations will consist of washing equipment using a high-pressure steam wash from a potable water supply. All decontamination activities will take place at a predetermined location. Additional requirements for drilling equipment decontamination can be found in SOP SA-7.1 included in Appendix B.

4.5.2 Sampling Equipment

All equipment such as trowels, bailers, and split spoon samplers used for collecting samples will be decontaminated prior to beginning field sampling and between sample locations. The following decontamination steps will be taken:

- Tap water and Alconox or liquinox detergent rinse.
- Tap water rinse.
- If trace metals are to be sampled rinse with 10-15% reagent grade nitric acid (the nitric acid should not be used on steel sampling equipment).
- Rinse thoroughly with de-ionized, analyte-free water.
- Rinse with isopropanol
- Rinse thoroughly with de-ionized, analyte-free water
- Air dry.
- Wrap equipment in aluminum foil until use.

Field meters such as pH, conductivity and temperature instrument probes will be rinsed first with tap water, then with de-ionized, analyte-free water, and finally with the sample liquid.

4.6 WASTE HANDLING

In all areas, drill cuttings from monitoring well installations, well development water, and purge water will be collected and containerized in DOT approved (Specification 17C) 55-gallon drums. Each drum will be sealed and labeled and left at a drum staging area pending groundwater analytical results and/or composite waste sample results for disposal. Separate waste staging areas will be established for Sites 307 and 98 to keep investigative derived waste separated during field investigation activities. The investigative derived waste generated from field investigation activities for Site 307 and AOC2/SWMU1 will be staged at Site 307 since the study area for AOC2/SWMU1 includes the area of Site 307. Lined decontamination pads will be constructed for Site 98 and Site 307. The decontamination pad constructed for Site 307 will be utilized for steam cleaning of drilling equipment for Site AOC2/SWMU1. All soil cuttings, decontamination rinse fluids, and well purge water generated during the site investigations will be containerized for proper disposal.

4.7 SAMPLE HANDLING

Sample handling includes the field-related consideration concerning the selection of sample containers, preservatives, allowable holding times and analysis requested. In addition, sample identification, packaging, and shipping will be addressed. All sample handling procedures will be in accordance with B&R Environmental's Comprehensive Quality Assurance Plan (CompQAP No. 870055) which has been approved by the Florida Department of Environmental Protection (FDEP).

The CompQAP address the topics of containers and sample preservations. A summary of bottle ware requirements, preservation requirements, and sample holding times are provided in Table 4-2.

Table 4-2
Summary of Analysis, Bottleware Requirements, Preservation Requirements, and Holding Times
Coastal Systems Station, Panama City, Florida

Parameter	Analytical Method	Sample Container	Volume	Preservation	Maximum Holding Time (1)
Aqueous Samples					
PPL VOHs	SW-846 8021B	Glass Volatile Vial	2 x 40 ml	Add HCl to pH < 2; Chill to 4 degrees Celcius	14 days
BTEXs and MTBE	SW-846 8021B	Glass Volatile Vial	2 x 40 ml	Add HCl to pH < 2; Chill to 4 degrees Celcius	14 days
1,2-Dibromomethane (EDB)	EPA 504	Glass Volatile Vial	40 ml	Add HCl to pH < 2; Chill to 4 degrees Celcius	28 days
PAHs	SW-846 8310	Amber Glass	1 L	Add 0.008% Na2S2O3; Chill to 4 degrees Celcius	7 days until extraction; 40 days to analysis
PPL Volatile Organic Compounds	SW-846 8260B	Glass Volatile Vial	2 x 40 ml	Add HCl to pH < 2; Chill to 4 degrees Celcius	14 days
PPL Extractable Organic Compounds	SW-846 8270C	Amber Glass	2 L	Chill to 4 degrees Celcius	7 days until extraction; 40 days to analysis
Non-PPL Volatile Organic Compounds	SW-846 8260B	Glass Volatile Vial	2 x 40 ml	Add HCl to pH < 2; Chill to 4 degrees Celcius	14 days
Non-PPL Extractable Organic Compounds	SW-846 8270C	Amber Glass	2 L	Chill to 4 degrees Celcius	7 days until extraction; 40 days to analysis
Lead (Total and dissolved)	SW-846 6010B (trace) or 7421	High Density Polyethylene	500 ml	Chill to 4 degrees Celcius	180 days
TRPHs	FL-PRO	Glass	1L	Add H2SO4 to pH <2; Chill to 4 degrees Celcius	28 days

VOHs - Volatile Organic Halocarbons
BTEXs - Benzene, Toluene, Ethylbenzene, Xylenes
MTBE - Methyl-tert-butyl-ether
PPL - Priority Pollutants List
PAHs - Polynuclear Aromatic Hydrocarbons
TRPHs - Total Recoverable Petroleum Hydrocarbons
SPLP - Synthetic Precipitation Leaching Procedure
RCRA - Resource Conservation and Recovery Act

H2SO4 - Sulfuric acid
HCl - Hydrochloric acid

(1) - Holding time is measured from date of sample collection to date of sample analysis.

Table 4-2 (Continued)
Summary of Analysis, Bottleware Requirements, Preservation Requirements, and Holding Times
Coastal Systems Station, Panama City, Florida

Parameter	Analytical Method	Sample Container	Volume	Preservation	Maximum Holding Time
Solid Samples					
PPL VOHs	SW-846 8021B	EnCore Sampler	3 x 5g	Chill to 4 degrees Celcius; Lab to preserve within 48 hours of sample collection (2)	14 days
BTEXs and MTBE	SW-846 8021B	EnCore Sampler	3 x 5g	Chill to 4 degrees Celcius; Lab to preserve within 48 hours of sample collection (2)	7 days to extraction; 40 days to analysis
RCRA Metals	SW-846 6010B/7000A series	Clear Wide Mouth Glass	4 ounces	Chill to 4 degrees Celcius	180 days; except mercury 28 days
SPLP followed by BTEXs, MTBE, PPL VOHs, PAHs, TRPHs, and RCRA Metals	SW-846 1312 followed by 8021B, 8310, FL-PRO, and 6010B/7000A series	Clear Wide Mouth Glass	16 ounces	Chill to 4 degrees Celcius	7 days to SPLP extraction; Volatiles: 14 days to anlaysis PAHs: 7 days to extract; 40 days to nalysis TRPHs: 28 days to analysis RCRA Metals: 180 days to analysis except mercury which is 28 days
TRPHs	FL-PRO	Clear Wide Mouth Glass	4 ounces	Chill to 4 degrees Celcius	28 days
PAHs	SW-846 8310	Clear Wide Mouth Glass	8 ounces	Chill to 4 degrees Celcius	14 days to extraction;40 days to analysis
Total Halides	SW-846 5050/9056	Clear Wide Mouth Glass	500 ml	Chill to 4 degrees Celcius	28 days

VOHs - Volatile Organic Halocarbons
BTEXs - Benzene, Toluene, Ethylbenzene, Xylenes
MTBE - Methyl-tert-butyl-ether

PPL - Priority Pollutants List

PAHs - Polynuclear Aromatic Hydrocarbons
TRPHs - Total Recoverable Petroleum Hydrocarbons
RCRA - Resource Conservation and Recovery Act
SPLP - Synthetic Precipitation Leaching Procedure

H_2SO_4 - Sulfuric acid
HCl - Hydrochloric acid
(1) - Holding time is measured from date of sample collection to date of sample analysis.
(2) - The preservation method employed by the laboratory depends on results of field Organic Vapor Analysis screen.

4.8 SAMPLE IDENTIFICATION

Each sample collected will be assigned a unique sample tracking number. The sample tracking number will consist of a three-segment, alpha-numeric code that identifies the building number (the Site), sample medium, location, the sampling event identifier or sample depth (in case of soil samples) and the QC designation, if applicable. Any other pertinent information regarding sample identification will be recorded in the field logbook.

The alpha-numeric coding to be used in the sample system is explained in the subsequent definitions:

NN(N or A)	-	(Building Designation)
AA	-	(Medium)
AANN	-	(Location)
NNN(N)	-	(QC Designation, if applicable)

Character Type:

A = Alpha
N = Numeric

Medium:

GW = Groundwater sample form a monitoring well
SS = Subsurface soil sample taken via soil boring
TW = Temporary well groundwater sample

Sample Location:

Subsurface soil sample locations (SS) will correspond to the boring number (i.e., SB02)

Groundwater sample locations (GW) will correspond to the well number (i.e, 58-1)

Temporary well groundwater sample locations (TW) will correspond to the temporary well number (i.e, 58-TW1)

Sample Identifier:

For soil samples = Sample depth interval, in feet

For groundwater = Sampling round

QA Sample Designation:

D = Duplicate
F = Field Blank
B = Equipment Rinsate Blank
T = Trip Blank

For example, a groundwater sample collected from monitoring well MW-01 at Building 363 UST would be designated as 363-GW-MW01-001.

A duplicate sample from that same well would be 363-GW-MW01-001D.

A subsurface soil sample taken from Monitoring Well Boring 01 at Building 98 UST, at a depth of 4 to 6 feet bls would be 98-SS-MW01-0406.

Information regarding sample labels to be attached before shipment to a laboratory is contained SOP SA-6.3 included in Appendix B. Examples of sample labels, chain of custody seals, and chain-of-custody forms are included in Appendix B.

4.9 SAMPLE PACKAGING AND SHIPPING

Samples will be packaged and shipped in accordance with B&R Environmental's CompQAP (FDEP Comp QA Plan No. 870055). The Field Operations Leader will be responsible for completion of the following forms when samples are collected for shipping.

- Sample labels
- Chain-of-Custody labels
- Appropriate labels applied to shipping coolers
- Chain-of Custody Forms
- Federal Express Air Bills

4.10 SAMPLE CUSTODY

The chain-of-custody begins with the release of the sample bottles from the laboratory and must be documented and maintained from that point forward. To maintain custody of the sample bottles or samples, they must be in someone's physical possession, in a locked room or vehicle, or sealed with an intact custody seal. When the possession of the bottles or samples is transferred from one person to another it will be documented on the field logbook and on the chain-of-custody. An example of a chain-of-custody record is provided in Appendix B.

4.11 QUALITY CONTROL (QC) SAMPLES

In addition to periodic calibration of field equipment and appropriate documentation, quality control samples will be collected or generated during environmental sampling activities. Quality control samples include field blanks, field duplicates, field replicates, and trip blanks. Each type of field quality control sample is defined as follows:

Rinsate Blank - Rinsate blanks are obtained under representative field conditions by running organic free water through sample collection equipment (bailer, split-spoon, etc.) after decontamination and placing it in the appropriate containers for analysis. Rinsate blanks will be used to assess the effectiveness of decontamination procedures. Rinsate blanks will be collected for each type of non-dedicated sampling equipment used and will be submitted as shown in Table 4-1.

Field Duplicate - Field duplicate(s) are two water samples collected independently at a sample location during a single act of sampling under representative field conditions. Field duplicates sample frequencies are provided in Table 4-3. The duplicates shall be analyzed for the same parameters in the laboratory as indicated in Table 4-1.

Trip Blanks - Trip blank(s) will be prepared at the laboratory facility and will accompany the VOA vials to the sampling site and back to the laboratory. Trip blanks are not required by the FDEP unless 10 or more volatiles samples are collected during a given sampling event. Trip blank sample frequency are provided in Table 4-3.

TABLE 4-3

QUALITY CONTROL SAMPLE FREQUENCY
COASTAL SYSTEMS STATION, PANAMA CITY, FLORIDA

# of Samples	Precleaned quipment BLK	Field cleaned quipment BLK	Trip BLK (VOCs)	Duplicate
10+	minimum of one then 5%	minimum of one then 5%	one per cooler	minimum one then 10%
5-9	one*	one*	NR	one
< 5	one*	one*	NR	NR

NR = Not required
BLK = Blank

* Note: For 9 or fewer samples, a precleaned equipment blank or a field cleaned equipment blank is required. A field cleaned equipment blank must be collected if equipment is cleaned in the field.

4.12 FIELD MEASUREMENTS

Certain field measurements will be recorded during sampling activities including groundwater temperature, pH, and specific conductance. Instruments used in the field to record this data and additional instruments will be calibrated according to the procedures described below.

4.12.1 Parameters

- Air monitoring - OVA
- Temperature - Temperature probe
- Specific conductance - Specific conductance meter
- pH - pH meter
- Depth to water table - interface probe

4.12.2 Equipment Calibration

The electronic water-level indicator will be calibrated prior to mobilization and periodically at the discretion of the Field Operations Leader. The remaining instruments will be calibrated daily and/or according to the manufacturer's operation manual.

Calibration will be documented on an Equipment Calibration Log as shown in Appendix B. During calibration, an appropriate maintenance check will be performed on each piece of equipment. If damaged or defective parts are identified during the maintenance check and it is determined that the damage could have an impact on the instrument's performance, the instrument will be removed from service until defective parts are repaired or replaced.

4.12.3 Equipment Maintenance

Measuring equipment used in environmental monitoring or analysis and test equipment used for calibration and maintenance shall be controlled by established procedures. Measuring equipment shall have an initial calibration and shall be recalibrated at scheduled intervals against certified standards. Equipment will be calibrated periodically.

B&R Environmental maintains a large inventory of sampling and measurement equipment. In the event that failed equipment cannot be repaired replacement equipment can be shipped to the site by overnight express carrier to minimize downtime.

4.13 FIELD QA/QC PROGRAM

4.13.1 Control Parameters

Field control parameters and limits, which address various field blanks and duplicate samples, are described in Section 4.10 QC Samples. Control checks and sampling frequency are also presented in Section 4.10.

4.13.2 Control Limits

QA/QC specifications for field measurements are summarized on Table 4-4. This table shows control parameters to be assessed, control limits, and corrective actions to be implemented.

The B&R Environmental representative on site at each well and boring will confirm measurements of total depth of holes, dimensions and placement of well screens and casings, and volume and placement of filter pack and grout materials by independent measurement. The Field Operations Leader will examine field laboratory records and field log books on a weekly basis during field activities.

4.13.3 Corrective Actions

The need for corrective actions may become apparent during surveillance of field activities, procurement of services and supplies, or other operations that may affect the quality of work. The identification of significant conditions adverse to quality, the cause of the conditions, and the corrective actions shall be documented and reported to the appropriate levels of management. The B&R Environmental Project Manager will have overall responsibility for implementing corrective actions, and must identify those from initiating corrective action to remedy immediate effects of the problem.

The corrective action program covers the analysis of the cause of any negative findings and the corrective actions required. This program includes the investigation of the case of significant or repetitious unsatisfactory conditions relating to the quality of sampling service, or the failure to adhere to the required quality assurance practices such as Standard Operating Procedures.

TABLE 4-4

FIELD QA/QC SPECIFICATIONS
COASTAL SYSTEMS STATION, PANAMA CITY, FLORIDA

Analysis	Control Parameter	Control Limit	Corrective Action
Air Monitoring	Check calibration of OVA daily	Calibrate to manufacturers specifications	Recalibrate. If unable to calibrate, replace
Specific Conductance of Water	ontinuing calibration check of standard solution	+1% of standard	Recalibrate
pH of Water	ontinuing calibration heck of pH 7.0 buffer	pH = 7.0 + 0.1	Recalibrate. If unable to calibrate, replace electrode

4.14 RECORD KEEPING

In addition to chain-of-custody records associated with sample handling and packaging and shipping, certain standard forms will be completed for sample description and documentation. These shall include sample log sheets (for groundwater samples), daily record subsurface investigation reports, and logbooks. An example of these forms can be found in Appendix B.

A bound/weatherproof field notebook shall be maintained by each sampling event leader. The field team leader or designee, shall record all information related to sampling or field activities. This information may include sampling time, weather conditions, unusual events (e.g., well tampering), field measurements, descriptions of photographs, etc.

A site logbook shall be maintained by the Field Operations Leader. The requirements of the logbook are referenced in Appendix B. This book will contain the day's activities and will reference field log sheets and sampling forms when applicable.

Each field team leader who is supervising a drilling subcontractor activity must complete a Daily Record Subsurface Investigation Report (DRSIR). The DRSIR documents the activities and progress of the daily drilling activities. The information contained within this report is used for billing verification and progress reports. The driller's signature is required at the end of each working day to verify work accomplished, hours worked, standby time. and material used. An example of this form is provided in Appendix B.

At the completion of field activities, the Field Operations Leader shall submit to the Project Manager all field records, data, field notebooks, logbooks, chain-of-custody receipts, sample log sheets, drilling logs, daily logs, etc.

4.15 SITE MANAGEMENT AND BASE SUPPORT

B&R Environmental will perform this project with support from the Navy. This section of the Work Plan describes the project contacts, support personnel, project milestones and time frames of all major events.

Throughout the duration of the investigation activities, work on the CSS Naval Base will be coordinated through SouthDiv and CSS personnel. The primary contacts are as follows:

1. SouthDiv Engineer in Charge
   Mr. Nick Ugolini
   (803) 820-5596

2. CSS Environmental Engineer
   Arturo McDonald
   (850) 230-3192

4.15.1 Support From CSS

The following support functions will be provided by CSS personnel

- Assist B&R Environmental in locating underground utilities prior to the commencement of drilling operations.
- Provide existing engineering plans, drawings, diagram, files, ect., to facilitate evaluation of the Sites under investigation.
- Provide all historical data, background geological and hydrogeological information, and initial site investigation documents.

4.15.2 Assistance From CSS

CSS personnel will aid in arranging the following:

- Personnel identification badges, vehicle passes, and/or entry permits.
- A secure staging area (approximately 1,000 square feet) for storing equipment and supplies.
- A supply (e.g., fire hydrant, stand pipe, ect.) of large quantities of potable water for equipment cleaning etc.
- As required, provide escorts for contract personnel working in secured areas (all contract personnel working at the Naval Base will be U.S. citizens).

- Establish a decontamination area and waste staging area located adjacent or near the study area.

4.15.3 Support From B&R Environmental

The project will be staffed with personnel from the B&R Environmental Tallahassee, Florida office. During field activities, B&R Environmental will provide a senior level geologist and/or staff geologist, and equipment technician.

Mr. Gerald Goode, P.G., is the Task Order Manager (TOM) for CTO 0047 and will be the primary point of contact. He is responsible for cost and schedule control as well as technical performance. Mr. Goode is a Florida Licensed Professional Geologist and will serve as the TOM and will provide senior level review and oversight during field activities. Mr. Goode will be the primary point of contact for the Field Operations Leader.

4.15.4 Contingency Plan

In the event of problems which may be encountered during site activities, the SouthDiv point of contact will be notified immediately, followed by the B&R Environmental project manager and the CSS point of contact. The project manger will determine a course of action so as to not interfere with the schedule or budget. All contingency plans will be approved through the SouthDiv point of contact before being enacted.

5.0 PROPOSED LABORATORY ANALYSIS

In situ groundwater samples collected using DPT, soil samples, and monitoring well groundwater samples will be collected during the assessment investigation. The in situ well groundwater samples will be screened in the field for DRO and GRO constituents. Groundwater samples (collected from the monitoring wells) and soil samples will be collected for laboratory analyses will be analyzed in accordance with parameters as identified in Chapter 62-770.600 (see Sections 5.2 and Section 5.3 below for specific sampling requirements regarding soil and groundwater).

5.1 GROUNDWATER FIELD SCREENING INVESTIGATION

Approximately 29 groundwater samples will be collected from the borings installed during the hydrocarbon vapor survey and analyzed for DRO and GRO constituents. Additional samples may be collected should the size of the survey expand. No QA/QC samples will be collected since the in situ groundwater samples are to be used for field screening purposes only. Samples will be analyzed in the field using a GC provided by a mobile lab. The samples will be collected in two-40 ml vials.

5.2 SOIL INVESTIGATION

Twelve soil samples will be collected and analyzed for constituents in the Kerosene Analytical Group as defined by Chapter 62-770.600, F.A.C. Parameters within these groups are identified on Table 4-1. The soil samples will be collected from three borings each at Sites 98 and 307, and from six borings at Site AOC2/SWMU1, during the DPT soil hydrocarbon vapor assessment. The samples will be collected from borings located in the area where the highest, medium, and low soil hydrocarbon vapor concentrations as identified from vapor readings from soils collected during the soil hydrocarbon vapor assessment.

5.3 GROUNDWATER INVESTIGATION

Groundwater samples will be collected from each newly installed permanent monitoring well and existing monitoring wells when applicable, and analyzed for parameters in the Kerosene Analytical Group in accordance with Chapter 62-770.600, F.A.C. A groundwater environmental sampling summary and a summary of Investigative Derived Waste sample parameters are summarized in included in Table 4-1.

6.0 PROPOSED SCHEDULE

Phase 1 of the field work is proposed to begin late April, 1998 and take approximately 2 days to complete. The groundwater quality report for Site 363 will be submitted to the Navy approximately 45 days after Phase I activities are completed.

Phase 2 work is anticipated to begin in early to late May, 1998. Phase 3 of the field work will begin immediately upon approval of the permanent monitoring wells by the FDEP following review of Phase 2 soil and groundwater quality data. The SAR for Site 98 will be developed with the completion of Phase 3 field activities and submitted to the Navy for review. The SAR for Site 98 will be completed approximately 30 days after receipt of the groundwater quality data from the Phase 3 field activities. The SAR for Site 307 will be submitted to the Navy for review approximately 60 days after receipt of the groundwater quality data from the Phase 3 field activities. The preliminary assessment report for AOC2/SWMU 1 will be developed and submitted to the Navy approximately 45 days after receipt of the groundwater quality data from the Phase 3 field activities.

7.0 REPORT

Upon completion of all field work and laboratory analysis for Sites 98 and 307, a SAR summarizing the results of the investigation will be submitted to the FDEP. Basic UST system information including site Facility Identification Number, facility name and address, date closed, area, type of system and tank capacity will be provided. Data recorded during tank removal will be included. Also included in the report will be graphical presentations of the groundwater screening results, and complete summaries of the soil and groundwater analytical results. The locations of the soil samples and monitoring wells will be presented on scaled figures. Boring logs, chain-of-custody forms, field forms, field screening results, and analytical reports will be included in Appendices of the report.

The SARs will conclude with either a No Further Action or Monitoring Only for Natural Attenuation, or conclude with the recommendation that a Risk Assessment or Remedial Action Plan be considered for the sites.

The groundwater quality report for Site 363 will be completed and submitted to the Navy. The report will include a summary of groundwater quality. Field data forms used to measure water levels and field parameters, lab data, and chain -of-custody forms will be included as Attachments to the report.

The preliminary assessment report for AOC2/SWMU1 will be completed and submitted to the Navy. The report will summarize the results of soil and groundwater testing and evaluate the potential source area of the fuel release identified at the storm water outfall on Alligator Bayou.. Data included in the report will be graphical presentations of the groundwater screening results, and complete summaries of the soil and groundwater analytical results. The locations of the soil samples and monitoring wells will be presented on scaled figures. Boring logs, chain-of-custody forms, field forms, field screening results, and analytical reports will be included in Appendices of the report.

8.0 REFERENCES

ABB Environmental Services, Inc., January 1995. Resource Conservation And Recovery Act Facility Investigation Coastal Systems Station Panama City, Florida.

Bechtel Environmental Services, Inc., January 1998. Grid Locations and OVA Readings for the Area Near West Dock Tank 307R.

Bechtel Environmental Services, Inc., February, 1998. Emergency Response at West Dock, Tank 307R.

Bouwer, H., 1989. The Bouwer and Rice Slug Test - an Update. Groundwater, v. 27, pp. 304-309.

Bouwer, H. and R. C. Rice, 1976. A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells. Water Resources Research, V. 12, pp. 423-428.

Brown & Root Environmental, 1995 Revision. Comprehensive Quality Assurance Plan, FDEP COMP QA PLAN # 870055.

Chapter 62-770 of the Florida Administrative Code, September 1997.

APPENDIX A

TANK CLOSURE ASSESSMENTS/INTERIM REMEDIAL ACTIONS: SITES 98, 307, 363, AND AOC2/SWMU1

CLOSURE ASSESSMENT REPORT
UNDERGROUND STORAGE TANK
TANK 363

NAVAL SURFACE WARFARE CENTER
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

Unit Identification Code: N61331

Prepared by:

Navy Public Works Center
Environmental Department
310 John Tower Road
Pensacola, Florida, 32508

Prepared for:

Commanding Officer, Coastal Systems Station
Dahlgren Division, Naval Surface Warfare Center
6703 West Highway 98
Panama City, Florida 32407-7001

Mr Mike Clayton, Code CP2S, Environmental Engineer

December 1997

CLOSURE ASSESSMENT REPORT
UNDERGROUND STORAGE TANK
TANK 363

NAVAL SURFACE WARFARE CENTER
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

Unit Identification Code: N61331

Prepared by:

Navy Public Works Center
Environmental Department
310 John Tower Road
Pensacola, Florida, 32508

Prepared for:

Commanding Officer, Coastal Systems Station
Dahlgren Division, Naval Surface Warfare Center
6703 West Highway 98
Panama City, Florida 32407-7001

Mr Mike Clayton, Code CP2S, Environmental Engineer

December 1997

TABLE OF CONTENTS

Closure Assessment Report
Underground Storage Tank, Tank 363
Naval Surface Warfare Center
Coastal Systems Station
Panama City, Florida

GLOSSARY

AST	Aboveground Storage Tank
CSS	Coastal Systems Station, Panama City, Florida
EPA	Environmental Protection Agency
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
OVA	Organic Vapor Analyzer
PWC	US Navy, Public Works Center, Pensacola, Florida
UST	Underground Storage Tank

CLOSURE ASSESSMENT REPORT
UNDERGROUND STORAGE TANK
TANK 363

1.0 Facility

Facility 363, Naval Surface Warfare Center
Coastal Systems Station
Panama City, Bay County, Florida

2.0 Operator

Commanding Officer, Coastal Systems Station
Dahlgren Division, Naval Surface Warfare Center
6703 West Highway 98, Code CP2S
Panama City, Florida 32407-7001

3.0 Site Location

The Coastal Systems Station is located along St Andrew Bay in Panama City, Florida (Figure 1).

4.0 Date of Closure

7 August 1997

5.0 Project Description

The US Navy Public Works Center (PWC), Pensacola, Florida was tasked by the Coastal Systems Station (CSS), Panama City to close a 6000 gallon underground storage tank (UST) system located at Facility 363, CSS Panama City (Figure 2). The UST was removed, cleaned and rendered unuseable by PWC. The UST was properly disposed by Southern Waste Systems, Inc (SWS), Panama City, Florida (Attachment A).

The Storage Tank Registration Form, Application for Closure of Pollutant Storage Tank System, Underground Storage Tank Installation and Removal Form, Closure Assessment Form, and Decontamination Certification are provided in Attachments B, C, D, E, and F.

6.0 Tank Contents

The UST was used to store waste oil and was attached to an oil/water seperator. The contents were emptied by CSS prior to commencement of work.

7.0 Tank Condition

The UST was cylindrically shaped and constructed of fiberglass. The condition of the UST prior to excavation could not be assessed because the UST was damaged during the excavation process.

8.0 Excavation Area

The excavation was made approximately twelve (12) feet wide, twenty (20) feet long and seven (7) feet deep. The excavation was filled with clean fill, compacted to grade, and seeded.

The excavation was contaminated during the removal process (Attachment G). The UST was ruptured and since the UST was partially submerged in the groundwater, the groundwater entered the UST and forced the residual product out of the UST. The product was removed from the excavation and properly disposed (Attachment H).

9.0 Soil Screening

Four (4) soil borings were installed around the UST using a manually operated hollow stem auger. The soil samples were collected and screened for organic vapor concentrations using the headspace screening technique. The soil samples were extracted at each corner of the excavation. The soil samples were extracted above the groundwater level which was approximately seven feet below grade. The soil boring locations and results are provided in Attachment E.

The soil screening was conducted in accordance with the headspace screening criteria in Chapter 62-770 FAC and PWC's Comprehensive Quality Assurance Plan using an organic vapor analyzer (OVA). The OVA was manufactured by Thermo Environmental Instruments, Inc (Model 680 HVM) and equipped with a flame ionization detector (FID).

10.0 Groundwater Analysis

A temporary groundwater monitoring well was installed on 5 November 1997 by GFA International, Inc, Sarasota, Florida. The well was constructed with a 2" diameter by 13 foot long, Schedule 40 polyvinyl chloride (PVC) riser. The riser was equipped with a ten foot long by 0.010 inch slotted screen. The well consisted of a course silica sand filter and a bentonite seal. The top of the well was encased with concrete and equipped with a lock and a steel cover. The well location, well construction diagram, and groundwater laboratory analyses are provided in Attachment E.

The well was sampled by PWC on 12 November 1997. These samples were transported to the PWC Laboratory in Pensacola, Florida and analyzed for volatile content in accordance with Environmental Protection Agency (EPA) Method 8260, for poly aromatic hydrocarbons (PAH's) in accordance with EPA Method 8270, for ethylene dibromide content in accordance with EPA Method 504, for lead content in accordance with EPA Method 239.3, and for total petroleum hydrocarbon content in accordance with the State of Florida, Petroleum Range Organics (FL-PRO) method.

11.0 Findings and Conclusions

The groundwater was contaminated.

12.0 Recommendations

A Contamination Assessment Report should be prepared for this site.

13.0 Closure Assessment

Performed by the US Navy, Public Works Center (PWC) Pensacola, Florida.

14.0 Project Manager

Paul R. Semmes, P.E.

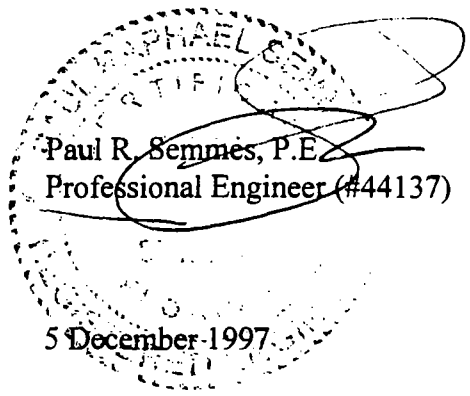
15.0 Project Number

1396004

16.0 Report Date

5 December 1997

The engineering evaluations and professional opinions rendered in this Closure Assessment Report that describes the work associated with the storage tank removal at the Coastal Systems Station, Panama City, Florida were conducted or developed in accordance with the commonly accepted procedures consistent with applicable standards of practice. If conditions are determined to exist differently than those described, the undersigned professional engineer should be notified to evaluate the effects of any additional information on the design described in this report.



Paul R. Semmes, P.E.
Professional Engineer (#44137)

5 December 1997

FIGURES

FIGURE 1
Vicinity Map

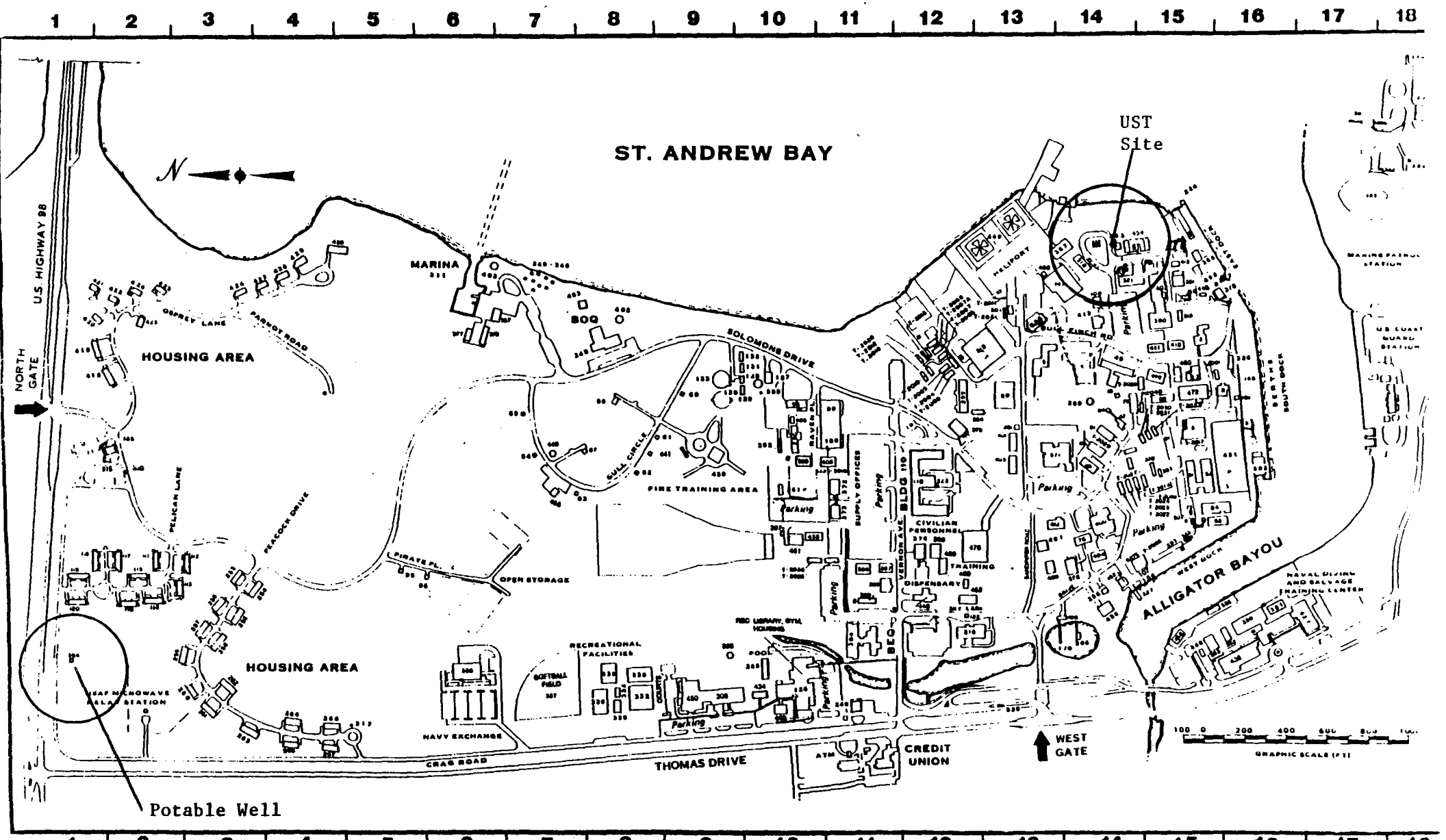
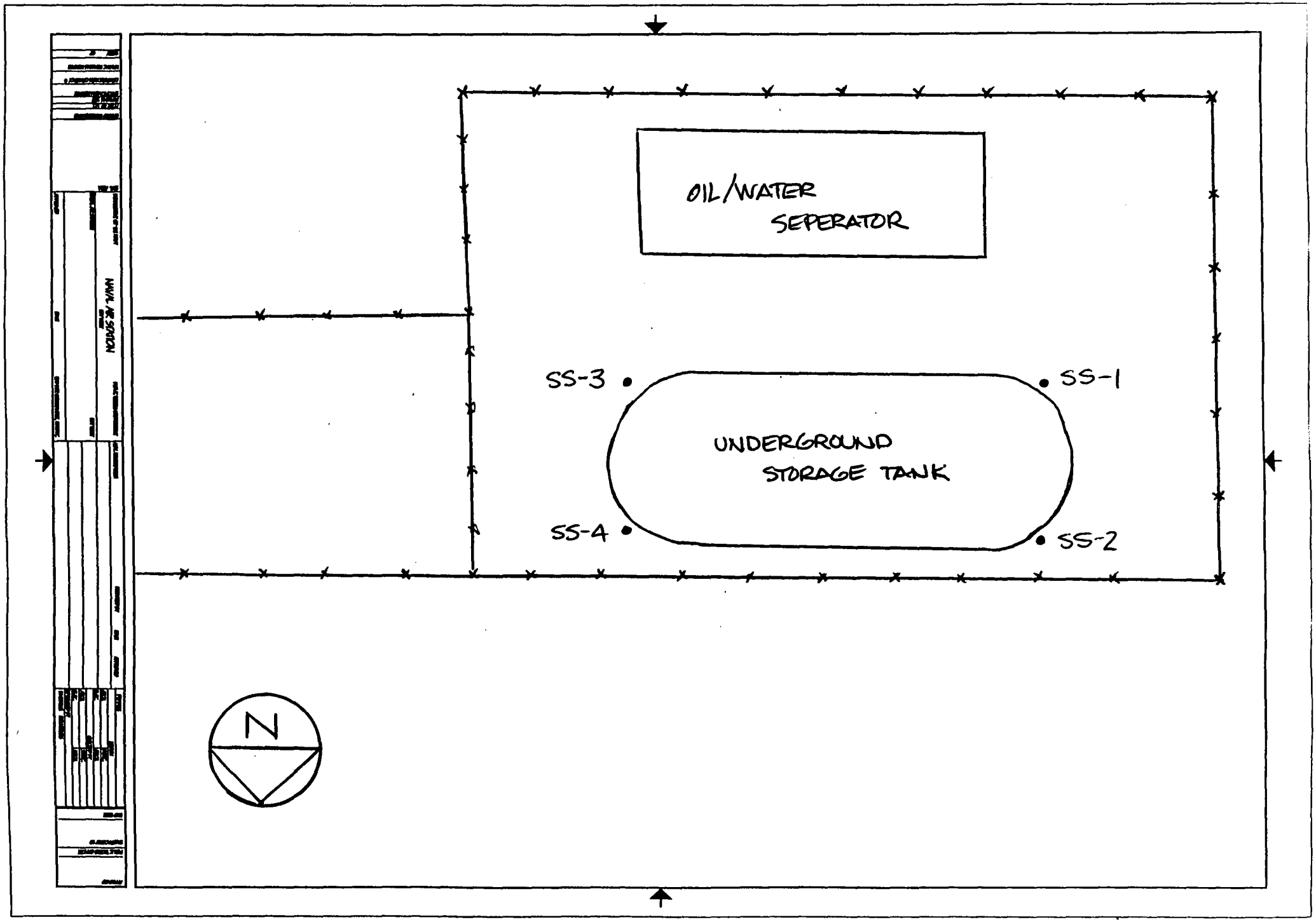

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
ST. ANDREW BAY
UST Site
N
U.S. HIGHWAY 98
NORTH GATE
MARINA
BOQ
SOLOMONS DRIVE
HOUSING AREA
OSPREY LANE
PARROT ROAD
PELICAN LANE
PEACOCK DRIVE
SULL CIRCLE
FIRE TRAINING AREA
PIRATE PL.
OPEN STORAGE
SUPPLY OFFICES
BLDG 110
CIVILIAN PERSONNEL
TRAINING
DISPENSARY
HELIPORT
ALLIGATOR BAYOU
NAVAL DIVING AND SALVAGE TRAINING CENTER
MARINE PATROL STATION
U.S. COAST GUARD STATION
HOUSING AREA
RECREATIONAL FACILITIES
SOFTBALL FIELD
COURTS
POOL
NAVY EXCHANGE
CRAG ROAD
THOMAS DRIVE
ATM
CREDIT UNION
WEST GATE
Potable Well
GRAPHIC SCALE (FT)

FIGURE 2
Site Map


OIL/WATER
SEPERATOR
SS-3
SS-1
UNDERGROUND
STORAGE TANK
SS-4
SS-2
N

ATTACHMENTS

ATTACHMENT A
Disposal Documents - UST

SWS
ENVIRONMENTAL FIRST RESPONSE
800-852-8878

December 5, 1997

C.O.- Code 423.3
Paul Semmes
310 John Tower Road
Pensacola, Florida 32508

Dear Paul:

Enclosed are the copies of the disposal ticket for the fiberglass tanks from OWS 363, 371, and 146. Also enclosed are copies of disposal of the liquid for 363 OWS.

These documents certify that all waste was disposed of properly and in a timely fashion. The original manifest have been sent to Coastal System Stations.

If I can be of further assistance please feel free to contact me at 850-234-8428.

Sincerely,

Candace M. Esparza
Southern Waste Service

STEELFIELD LANDFILL
P O BOX 1230
PANAMA CITY, FL 32402

001013
SOUTHERN WASTE SERVICES
HARRY MARSH
1619 MOYLAN ROAD
PANAMA CITY BEACH FL 32407

SITE	TICKET	GRID
02	102123	

WEIGHMASTER
BRANNING

DATE IN	TIME IN
09/19/97	10:40
DATE OUT	**TIME OUT**
09/19/97	11:03

VEHICLE	ROLL OFF

REFERENCE	ORIGIN
	FCB

Scale Gross Weight 43200 LB Inbound - Cash ticket
Scale 1 Tare Weight 33680 LB
Net Weight 9520 LB

QTY.	DESCRIPTION	AMOUNT
4.76	C C&D UNSIZED/NBR-TN @ $ 25.00 per TON	119.00

FILE

Ck# 7600

NET AMOUNT
119.00
TENDERED
119.00
CHANGE
0.00

VEH & CAN 6002-1
DRIVER DON

Operating hours...7:00 AM to 4:00 PM Monday through Saturday
*** This is to certify that this load does not contain any hazardous materials, medical waste, fluorescent light tubes, motor oils, car batteries or liquids of any type.

SIGNATURE X

Ck# 7600

ATTACHMENT B
Storage Tank Registration Form

Florida Department of Environmental Regulation
Twin Towers Office Bldg • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

DER Form # 17-761.900(1)
Form Title Storage Tank Registration Form
Effective Date December 31, 1990
DER Application No. (Filled in by DER)

Storage Tank Registration Form

Please Print or Type - Review Instructions Before Completing Form

1. DER Facility ID Number: 038518667 2. Facility Type: (F) FEDERAL
3. New Registration ☐ New Owner Data ☐ Facility Revision ☐ Tank(s) Revision ☒
4. County and Code of tank(s) location: BAY / 03

5. Facility Name: NSWC Coastal Systems Station
Tank(s) Address: 6703 West Hwy 98
City/State/Zip: Panama City, FL 32407-7001
Contact Person: Mike Clayton, Code CP2S Telephone: (850) 235-5859
6. Financial Responsibility Type: C

7a. Tank(s) Owner: U.S. Navy (NSWC Coastal Systems Station)
Owner Mailing Address: 6703 West Hwy 98
City/State/Zip: Panama City, FL 32407-7001
Contact Person: Mike Clayton, Code CP2S Telephone: (850) 235-5859

7b. New Owner Signature/Change Date: N/A / / /

8. Location (optional) Latitude: ° ' " Longitude: ° ' " Section Township Range

Complete One Line For Each Tank At This Facility (Use Codes - See Instructions)

Complete 9 - 16 for tanks in use; 9 - 19 for tanks out of use

9	10	11	12	13	14	15	16	17	18	19
G110AE	500	H	xx/82	U	CM	B	X	B	0	8/97
G129	550	H	xx/79	U	CMN	B	X	B	0	8/97
G322	1175	H	xx/75	U	CMN	B	D	B	0	8/97
363	6000	L	xx/81	U	EM	B	B	B	0	8/97
172	2000	B	xx/80	U	EMN	DI	DM	B	0	8/97

20. Naval Public Works Center, Pensacola, FL — Certified Contractor*
DPR# — Department of Professional Regulation License Number

*For new tank installation or tank removal

To the best of my knowledge and belief all information submitted on this form is true, accurate and complete.

J. M. CROSS, DIRECTOR, SAFETY & ENV. — Print name & title of owner or authorized person
Bill Snyder for J.M. CROSS — Signature
22 Aug 97 — Date
ENCL(

Northwest District 160 Governmental Center Pensacola, Florida 32501-5794
Northeast District 7825 Baymeadows Way, Suite B 200 Jacksonville, Florida 32256
Central District 3319 Maguire Blvd. Suite 232 Orlando, Florida 32803-3767
Southwest District 4520 Oak Fair Blvd. Tampa, Florida 33610-7347
South District 2295 Victoria Ave. Fort Myers, Florida 33901-2549
Southeast District 1800 S. Congress Ave., Suite A Palm Springs District, Florida 33461

ATTACHMENT C
Application for Closure of Pollutant Storage Tank System

APPLICATION FOR CLOSURE OF POLLUTANT STORAGE TANK SYSTEM

Provide the facility information requested below.

FDEP Facility # 03/8518667 Facility Name NSWC - CSS

Facility Location Building 363

Property Owner Commanding Officer, Coastal Systems Station (Code P25)

Property Owner Address 6703 West Highway, 98 Panama City, Florida 32407-7001

Phone (850) 235-5859

Method of Tank Closure Removal

Pollutant Storage Systems Specialty Contractor (PSSSC) who will be on site supervising closure activities. Attach copy of PSSSC license.

Individual Licensed as PSSSC N/A PSSSC # N/A

Firm U.S. Navy - Public Works Center (PWC)

Address 310 John Tower Road, Pensacola, FL 32508

Indicate the firm (s) that will degas, remove, and transport the tank(s), and the method of degassification.

Degassification Method Air Eduction (API 1604-4.2.5)

Firm Removing Tanks U.S. Navy - Public Works Center (PWC)

Contact Mr. Paul Semmes, P.E. Phone (850) 452-4315

Firm Transporting Tanks U. S. Navy - Public Works Center (PWC)

Contact Mr. Paul Semmes, P.E. Phone (850) 452-4315

Firm Receiving Tanks for Ultimate Disposal U.S. Navy - DRMO

Contact Mr. Gayle Brown Phone (850) 452-3459

ATTACHMENT D
Underground Storage Tank Installation and Removal Form

Indicate the laboratory that will conduct groundwater analysis.

Contracted Laboratory U.S. Navy - PWC Phone (850) 452-3180

Contact Mr. Joe Moore FDEP QA/QC 920121G

Indicate firm(s) transporting and disposing of contaminated soils.

Firm Transporting Soils Southern Waste Systems, Inc.

Contact Ms. Candace Esparza Phone (850)234-8428

Firm Remediating/Disposing Soils Southern Waste Systems, Inc.

Contact Ms. Candace Esparza Phone (850) 234-8428

Disposal/Remediation Method Landfill

Indicate the firm(s) that will transport and ultimately dispose of residual product and sludge from the tanks.

Firm Transporting Residual Product and Sludge Southern Waste Systems, Inc.
(850) 234-8428
Contact Ms. Candace Esparza Phone (850) 234-8428

Firm Receiving/Disposal Residual Product and Sludge Southern Waste Systems, Inc.
(850) 234-8428
Contact Ms. Candace Esparza Phone (850) 234-8428

Indicate the firm and names of personnel that will conduct field sampling.

Contracted Firm U.S. Navy - Public Works Center (PWC)

Contact Mr. Paul Semmes, P.E. Phone (850) 452-4315

Person (s) Sampling Mr. Paul Semmes, P.E.

Equipment used for soil screening (Specific Make and Model) Organic Vapor Analyzer (OVA) Thermo Environmental (680 HVM) equipped w/Flame Ionization Detector (FID).

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

DER Form # 17-761.900(5)
Form Title Underground Storage Tank Installation & Removal Form for Certified Contractors
Effective Date December 10, 1990
DER Application No. _____ (Filled in by DER)

Underground Storage Tank Installation and Removal Form For Certified Contractors

Pollutant Storage System Specialty Contractors as defined in Section 489.113, Florida Statutes (Certified contractors as defined in Section 17-761.200, Florida Administrative Code) shall use this form to certify that the installation, replacement or removal of the storage tank system(s) located at the address listed below was performed in accordance with Department Reference Standards.

General Facility Information

1. DER Facility Identification No.: 03/8518667
2. Facility Name: NSWC Coastal Systems Station Telephone: (850) 235-5859
3. Street Address (physical location): Building 363
4. Owner Name: CO, Coastal Systems Station Telephone: (850) 235-5859
5. Owner Address: 6703 West Highway 98, Panama City, Florida 32407-7001
6. Number of Tanks: a. Installed at this time None b. Removed at this time One
7. Tank(s) Manufactured by: Unknown
8. Date Work Initiated: 8/7/97 9. Date Work Completed: 8/7/97

Underground Pollutant Tank Installation Checklist

Please certify the completion of the following installation requirements by placing an (X) in the appropriate box.

1. The tanks and piping are corrosion resistant and approved for use by State and Federal Laws. ☐
2. Excavation, backfill and compaction completed in accordance with NFPA (National Fire Protection Association) 30(87), API (American Petroleum Institute) 1615, PEI (Petroleum Equipment Institute) RP100-87 and the manufacturers' specifications. ☐
3. Tanks and piping pretested and installed in accordance with NFPA 30(87), API 1615, PEI/RP100(87) and the manufacturers' specifications. ☐
4. Steel tanks and piping are cathodically protected in accordance with NFPA 30(87), API 1632, UL (Underwriters Laboratory) 1746, STI (Steel Tank Institute) R892-89 and the manufacturer's specifications. ☐
5. Tanks and piping tested for tightness after installation in accordance with NFPA 30(87) and PEI/RP100-87. ☐
6. Monitoring well(s) or other leak detection devices installed and tested in accordance with Section 17-761.640, Florida Administrative Code (F.A.C.) ☐
7. Spill and overfill protection devices installed in accordance with Section 17-761.500, F.A.C. ☐
8. Secondary containment installed for tanks and piping as applicable in accordance with Section 17-761.500, F.A.C. ☐

Please Note: The numbers following the abbreviations (e.g. API 1615) are publication or specification numbers issued by these instututions.

Underground Pollutant Tank Removal Checklist

1. Closure assessment performed in accordance with Section 17-761.800, F.A.C. ☑
2. Underground tank removed and disposed of as specified in API 1604 in acordance with Section 17-761.800, F.A.C. ☒

Northwest District
160 Governmental Center
Pensacola Florida 32501 5794
904 436 8300

Northeast District
7825 Baymeadows Way Suite B 200
Jacksonville Florida 32207
904 798 4200

Central District
3319 Maguire Blvd Suite 232
Orlando Florida 32803 3767
407 894 7555

Southwest District
4520 Oak Fair Blvd
Tampa Florida 33610 7347

South District
2269 Bay St
Fort Myers Florida 33901 2896

Southeast District
1900 S Congress Ave Suite A
West Palm Beach Florida 33406

ATTACHMENT E
Closure Assessment Form
Soil & Groundwater Analyses

Florida Department of Environmental Protection
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

DEP Form # 62-761.900(4)
Form Title: Closure Assessment Form
Effective Date: December 10, 1990
DEP Application No. _____ (Filled in by DEP)

Closure Assessment Form

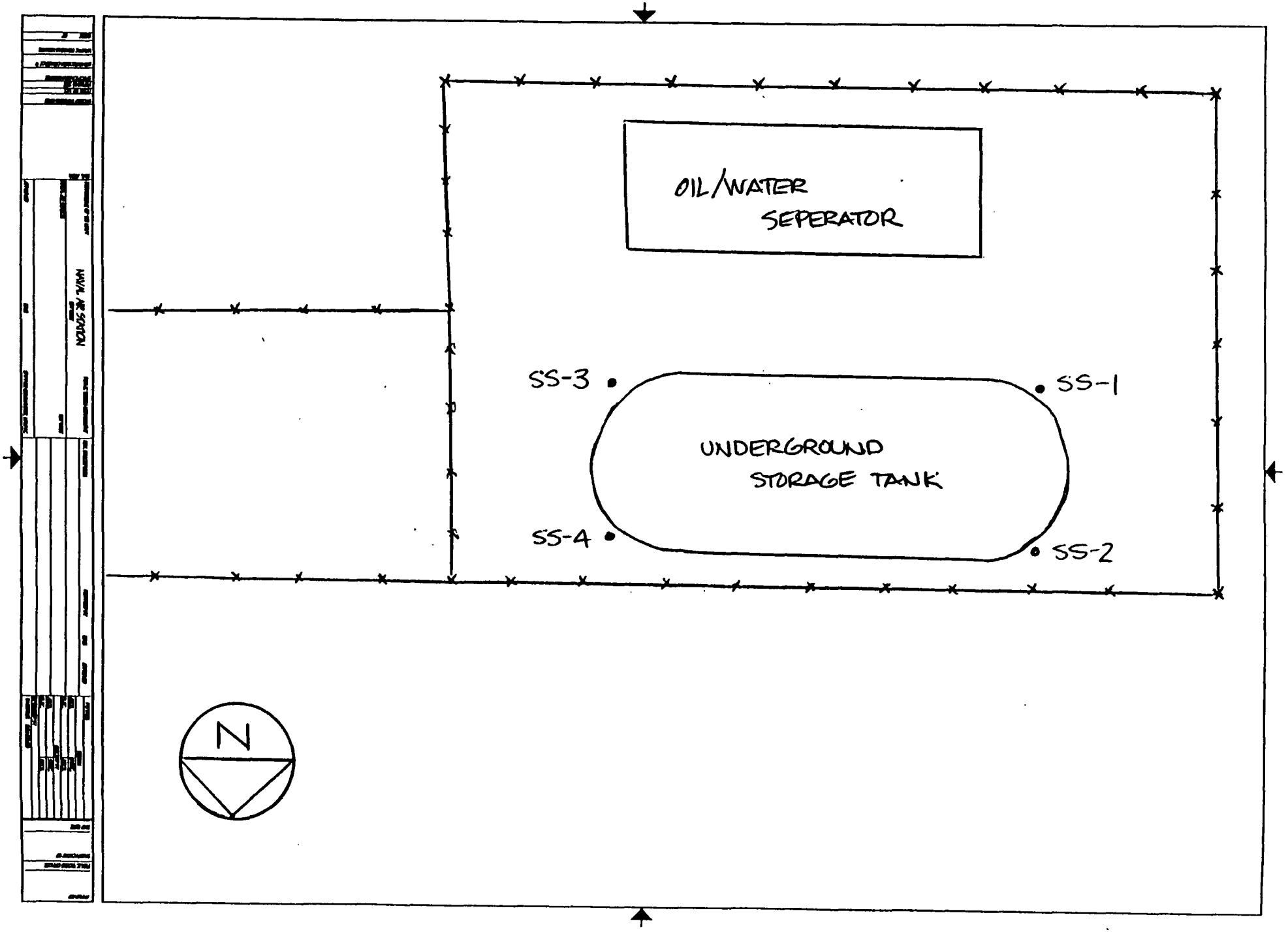
Owners of storage tank systems that are replacing, removing or closing in place storage tanks shall use this form to demonstrate that a storage system closure assessment was performed in accordance with Rule 62-761.800(3) or 62-762.800(3), Florida Administrative Code.

Please Print or Type
Complete All Applicable Blanks

1. Date 12/5/97
2. DEP Facility ID Number: 03/8518667 3. County Bay
4. Facility Name: NSWC Coastal Systems Station
5. Facility Owner: Commanding Officer, Coastal Systems Station
6. Facility Address: Building 363
7. Mailing Address: 6703 West Highway 98, Panama City, Florida 32407-7001
8. Telephone Number: (850) 235-5859 9. Facility Operator: Mike Clayton
10. Are the Storage Tank(s): (Circle one or both) A. Aboveground or (B.) Underground
11. Type of Product(s) Stored: Waste Oil
12. Were the Tank(s): (Circle one) A. Replaced (B.) Removed C. Closed in Place D. Upgraded (aboveground tanks only)
13. Number of Tanks closed: One 14. Age of Tanks: 16

Facility Assessment Information

Yes	No	Not Applicable		
☒	☐		1.	Was a Discharge Reporting Form submitted to the Department? If yes, When: 9/11/97 Where: NW DISTRICT - PENSACOLA
☒	☐		2.	Is the depth to ground water less than 20 feet?
☒	☐	☐	3.	Are monitoring wells present around the storage system? If yes, please specify ☐ Vapor Monitoring ☒ Water Monitoring
☒	☐	☐	4.	Is there free product present in the monitoring wells or within the excavation?
☐	☐	☒	5.	Were the petroleum hydrocarbon vapor levels in the soil greater than 500 parts per million for gasoline? Specify sample type: ☐ Vapor Monitoring wells ☐ Soil sample(s)
☐	☐	☒	6.	Were the petroleum hydrocarbon vapor levels in the soils greater than 50 parts per million for diesel/kerosene? Specify sample type: ☐ Vapor Monitoring wells ☐ Soil sample(s)
☒	☐	☐	7.	Were the analytical laboratory results of the ground water sample(s) greater than the allowable state target levels? (See target levels on reverse side of this form and supply laboratory data sheet(s).
☒	☐	☐	8.	If a used oil storage system, did a visual inspection detect any discolored soil indicating a release?
☐	☒	☐	9.	Are any potable wells located within 1/4 of a mile radius of the facility?
☒	☐	☐	10.	Is there a surface water body within 1/4 mile radius of the site? If yes, indicate distance: 75'
☒	☐	☐	11.	A detailed drawing or sketch of the facility that includes the storage system location, monitoring wells, buildings, storm drains, sample locations, and dispenser locations must accompany this form.
☒	☐	☐	12.	If a facility has a pollutant storage tank system that has both gasoline and kerosine/diesel stored on site, both EPA method 602 and EPA method 610 must be performed on the ground water samples.


OIL/WATER
SEPERATOR
SS-3
SS-1
UNDERGROUND
STORAGE TANK
SS-4
SS-2
N

Summary of OVA Readings

Closure Assessment Report
Underground Storage Tank, Tank 363
Naval Surface Warfare Center
Coastal Systems Station
Panama City, Florida

Hand Auger Sample No.	Depth (Feet)	Unfiltered (ppm)	Filtered (ppm)	Total Hydrocarbon Readings (ppm)
SS-1	7	5	1	0
SS-2	7	<1	<1	0
SS-3	7	68	55	13
SS-4	7	<1	<1	0

Readings for unfiltered samples are total hydrocarbon readings including methane; readings for filtered samples are methane only.

Notes: ppm = parts per million.

Navy Public Works Center
Environmental Laboratory

Bldg. 3887, Code 440
NAS Pensacola, FL 32508
Phone (850) 452-3180/3642
DSN 922-3180/3642
FAX (850) 452-2799/2387

Client: NPWC Engineering
Address: Bldg.458, Code 400
NAS Pensacola, Fl 32508
Phone #: (850) 452-4315
Contact: Paul Semmes

Analytical Report

601/602 Volatiles by Method 8260

Lab Report Number: 74939
Sample Date: 11/12/97
Received Date: 11/13/97
Sample Site: Panama City
Job Order No.: 139 6004

LAB Sample ID#	1- 74939
Sample Name / Location	NAVCSS MW # 363
Collector's Name	P. Keane
Date & Time Collected	11/12/97 @ 1400
Sample Type (composite or grab)	Grab
Analyst	M. Chambers
Date of Extraction / Initials	11/14/97 MC
Date of Analysis	11/14/97
Sample Matrix	GW
Dilution	X 1

Compound Name	1- 74939	units	Det. Limit	Flags
Benzene	2	ug/L	1	
Bromodichloromethane	BDL	ug/L	1	
Bromoform	BDL	ug/L	2	
Bromomethane	BDL	ug/L	3	
Carbon Tetrachloride	BDL	ug/L	1	
Chlorobenzene	BDL	ug/L	1	
Chloroethane	BDL	ug/L	1	
2-Chloroethylvinyl ether	BDL	ug/L	1	
Chloroform	BDL	ug/L	1	
Chloromethane	BDL	ug/L	1	
Dibromochloromethane	BDL	ug/L	1	
1,2-Dichlorobenzene	BDL	ug/L	1	
1,3-Dichlorobenzene	BDL	ug/L	1	
1,4-Dichlorobenzene	BDL	ug/L	1	
Dichlorodifluoromethane	BDL	ug/L	1	
1,1-Dichloroethane	BDL	ug/L	1	
1,2-Dichloroethane	BDL	ug/L	1	
1,1-Dichloroethene	BDL	ug/L	1	
trans-1,2-Dichloroethene	BDL	ug/L	1	
1,2-Dichloropropane	BDL	ug/L	1	
cis-1,3-Dichloropropene	BDL	ug/L	1	
trans-1,3-Dichloropropene	BDL	ug/L	1	
Ethylbenzene	8	ug/L	1	
Methylene Chloride	15	ug/L	1	
Methyl-tert-butyl ether (MTBE) *	BDL	ug/l	1	
1,1,2,2-Tetrachloroethane	BDL	ug/L	1	
Tetrachloroethene	BDL	ug/L	1	
Toluene	26	ug/L	1	
1,1,1-Trichloroethane	BDL	ug/L	1	
1,1,2-Trichloroethane	BDL	ug/L	1	
Trichloroethene	BDL	ug/L	1	
Trichlorofluoromethane	BDL	ug/L	1	
Vinyl Chloride	BDL	ug/L	1	
Xylenes (Total)	44	ug/L	1	

SURROGATE SPIKE RECOVERIES

	Acceptance Limits	Percent Recovery
1,2-Dichloroethane-d4	75-133	116
Toluene-d8	86-119	104
Bromofluorobenzene	85-116	105

COMMENTS :

BDL = Below Detection Limit. ug/L = microgram per Liter. ug/Kg = microgram per Kilogram. * = FL HRS certification pending.

Approved by : Jerry Dees, Laboratory Director

Date: 12/2/97
Report Generated

End of Report

Navy Public Works Center
Environmental Laboratory

Bldg. 3887, Code 440
NAS Pensacola, FL 32508
Phone (850) 452-3180/3642
DSN 922-3180/3642
FAX (850) 452-2799/2387

Client: NPWC Engineering
Address: Bldg.458, Code 400
NAS Pensacola, Fl 32508
Phone #: (850) 452-4315
Contact: Paul Semmes

Analytical Report

610 PAH's by Method 8270

Lab Report Number: 74939
Sample Date: 11/12/97
Received Date: 11/13/97
Sample Site: Panama City
Job Order No.: 139 6004

LAB Sample ID#	1- **74939**
Sample Name / Location	NAVCSS MW # 363
Collector's Name	P. Keane
Date & Time Collected	11/12/97 @ 1400
Sample Type (composite or grab)	Grab
Analyst	J. Moore
Date of Extraction / Initials	11/17/97 JJ
Date of Analysis	11/20/97
Sample Matrix	GW
Dilution	X 1

Compound Name	1- 74939	units	Det. Limit	Flags
Acenaphthene	2	ug/L	2	
Acenaphthylene	BDL	ug/L	2	
Anthracene	BDL	ug/L	2	
Benzo(a)anthracene	BDL	ug/L	2	
Benzo(a)pyrene	BDL	ug/L	2	
Benzo(b)fluoranthene	BDL	ug/L	2	
Benzo(g,h,i)perylene	BDL	ug/L	2	
Benzo(k)fluoranthene	BDL	ug/L	3	
Chrysene	BDL	ug/L	2	
Dibenz(a,h)anthracene	BDL	ug/L	2	
Fluoranthene	BDL	ug/L	2	
Fluorene	3	ug/L	2	
Indeno(1,2,3-cd)pyrene	BDL	ug/L	2	
1-Methylnaphthalene *	29	ug/L	2	
2-Methylnaphthalene	34	ug/L	3	
Naphthalene	26	ug/L	2	
Phenanthrene	2	ug/L	2	
Pyrene	BDL	ug/L	2	

SURROGATE SPIKE RECOVERIES

	Acceptance Limits	Percent Recovery
Nitrobenzene- d5	35-114	82
2-Fluorobiphenyl	43-116	91
Terphenyl -d14	33-141	103

COMMENTS :

BDL = Below Detection Limit. ug/L = microgram per Liter. ug/Kg = microgram per Kilogram. * = FL HRS certification pending.

Approved by : Jerry Dees, Laboratory Director

Date: 12/2/97
Report Generated

End of Report

Navy Public Works Center
Environmental Laboratory

Bldg. 3887, Code 440
NAS Pensacola, FL 32508
Phone (850) 452-3180/3642
DSN 922-3180/3642
FAX (850) 452-2799/2387

Client: NPWC Engineering
Address: Bldg.458, Code 400
NAS Pensacola, Fl 32508
Phone #: (850) 452-4315
Contact: Paul Semmes

Analytical Report

Ethylene Dibromide by Method 504

Lab Report Number: 74939
Sample Date: 11/12/97
Received Date: 11/13/97
Sample Site: Panama City
Job Order No.: 139 6004

LAB Sample ID#	1- 74939			
Sample Name / Location	NAVCSS MW # 363			
Collector's Name	BH/PK			
Date & Time Collected	11/12/97 @ 1400			
Sample Type (composite or grab)	Grab			
Analyst	M. Chambers			
Date of Extraction / Initials	11/20/97 MC			
Date of Analysis	11/20/97			
Sample Matrix	GW			
Dilution	X 1			
Compound Name	1- 74939	units	Det. Limit	Flags
Ethylene Dibromide	BDL	ug/L	0.02	

SURROGATE SPIKE RECOVERIES

	Acceptance Limits	Percent Recovery
Tetra-Chloro-m-Xylene	54-140	70

COMMENTS :

BDL = Below Detection Limit. ug/L = microgram per Liter. ug/Kg = microgram per Kilogram.

Approved by : Jerry Dees, Laboratory Director

Date: 12/2/97
Report Generated

End of Report

Navy Public Works Center
Environmental Laboratory

Analytical Report

Petroleum Range Organics by FLPRO

Bldg. 3887, Code 440
NAS Pensacola, FL 32508
Phone (850) 452-3180/3642
DSN 922-3180/3642
FAX (850) 452-2799/2387

Client: NPWC Engineering
Address: Bldg.458, Code 400
NAS Pensacola, Fl 32508
Phone #: (850) 452-4315
Contact: Paul Semmes

Lab Report Number: 74939
Sample Date: 11/12/97
Received Date: 11/13/97
Sample Site: Panama City
Job Order No.: 139 6004

LAB Sample ID#	1- 74939			
Sample Name / Location	NAVCSS MW # 363			
Collector's Name	BH/PK			
Date & Time Collected	11/12/97 @ 1400			
Sample Type (composite or grab)	Grab			
Analyst	J. Moore			
Date of extraction / Initials	11/17/97 JJ			
Date of Analysis	11/25/97			
Sample Matrix	GW			
Dilution		x 5		
Parameter	**1- 74939**	**units**	**Det. Limit**	**Flags**
Petroleum Range Organics by FLPRO	12	mg/L	1.25	

SURROGATE SPIKE RECOVERIES

	Acceptance Limits	Percent Recovery
ortho-Terphenyl	82-142 *	83
Nonatriacontane (C-39)	42-193 *	86

COMMENTS : * = Suggested surrogate recovery limits listed in the method. In-house laboratory limits are in the process of being determined.

BDL = Below Detection Limit. **mg/L = milligram per Liter. mg/Kg = milligram per Kilogram.**

Approved by : _____ **Date:** 12/2/97
Jerry Dees, Laboratory Director

End of Report

Navy Public Works Center
Environmental Laboratory

Bldg. 3887, Code 440
NAS Pensacola, FL 32508
Phone (850) 452-3180/3642
DSN 922-3180/3642
FAX (850) 452-2799/2387

Client: NPWC Engineering
Address: Bldg.458, Code 400
NAS Pensacola, Fl 32508
Phone #: (850) 452-4315
Contact: Paul Semmes

Analytical Report

Total Lead by Method 239.2

Lab Report Number: 74939
Sample Date: 11/12/97
Received Date: 11/13/97
Sample Site: Panama City
Job Order No.: 139 6004

LAB Sample ID#	1- 74939			
Sample Name / Location	NAVCSS MW # 363			
Collector's Name	P. Keane			
Date & Time Collected	11/12/97 @ 1400			
Sample Type (composite or grab)	Grab			
Analyst	B. Nelson			
Date of Analysis	11/17/97			
Sample Matrix	GW			
Dilution	X 1			
Element Name	1- 74939	units	Det. Limit	Flags
Lead	0.015	mg/L	0.003	

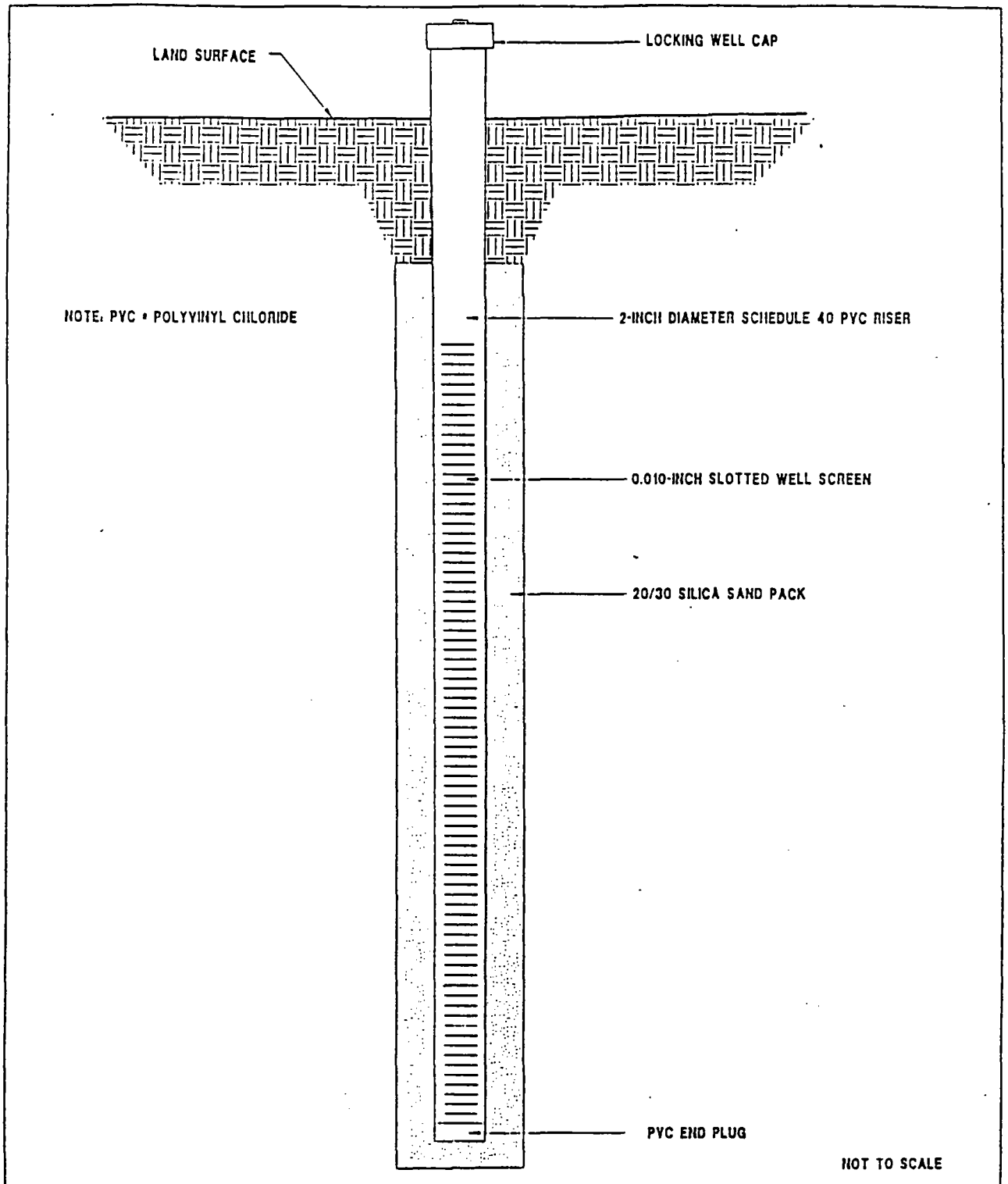
COMMENTS :

BDL = Below Detection Limit. mg/L = milligram per Liter. mg/Kg = milligram per Kilogram.

Approved by : Jerry Dees, Laboratory Director

Date: 12/2/97
Report Generated

End of Report



TYPICAL TEMPORARY MONITORING WELL
INSTALLATION DETAIL

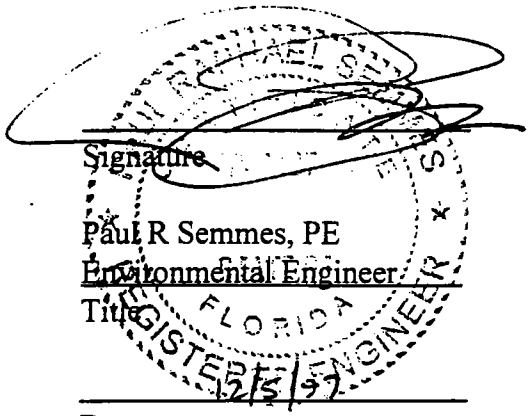
ATTACHMENT F
Decontamination Certification

CERTIFICATE
OF
DECONTAMINATION

It is hereby certified that the following Storage Tanks located at the Naval Surface Warfare Center, Coastal Systems Station, Panama City, Florida have been decontaminated by the Navy Public Works Center (PWC), Pensacola, Florida:

Bldg 92	Bldg 110	Bldg 300	Bldg 371
Bldg 94	Bldg 129	Bldg 321	
Bldg 98	Bldg 146	Bldg 363	

The Storage Tanks listed above have been triple rinsed and cleaned in accordance with **40 CFR 261.7(b)(3)(i)** and have been rendered unusable.



Signature

Paul R Semmes, PE
Environmental Engineer
Title

Date

ATTACHMENT G
Discharge Reporting Form

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

DER Form # 17-761.900(1)
Form Title: Discharge Reporting Form
Effective Date: December 10, 1990
DER Application No. _____ Filled in by DER

Discharge Reporting Form

Use this form to notify the Department of Environmental Regulation of:

1. Results of tank tightness testing that exceed allowable tolerances within ten days of receipt of test result.
2. Petroleum discharges exceeding 25 gallons on pervious surfaces as described in Section 17-761.460 F.A.C. within one working day of discovery.
3. Hazardous substance (CERCLA regulated), discharges exceeding applicable reportable quantities established in 17-761.460(2) F.A.C., within one working day of the discovery.
4. Within one working day of discovery of suspected releases confirmed by: (a) released regulated substances or pollutants discovered in the surrounding area, (b) unusual and unexplained storage system operating conditions, (c) monitoring results from a leak detection method or from a tank closure assessment that indicate a release may have occurred, or (d) manual tank gauging results for tanks of 550 gallons or less, exceeding ten gallons per weekly test or five gallons averaged over four consecutive weekly tests.

Mail to the DER District Office in your area listed on the reverse side of this form

PLEASE PRINT OR TYPE
Complete all applicable blanks

1. DER Facility ID Number: 038518667 2. Tank Number: 363 3. Date: 8/11/97
4. Facility Name: COASTAL SYSTEMS STATION
   Facility Owner or Operator: U. S. NAVY (CODE CP2S)
   Facility Address: 6703 WEST HIGHWAY 98, PANAMA CITY, FL 32407-7001
   Telephone Number: (850) 235-5474 County: BAY
   Mailing Address: SAME AS ABOVE
5. Date of receipt of test results or discovery: 8/7/97 month/day/year
6. Method of initial discovery, (circle one only)
   A. Liquid detector (automatic or manual)
   B. Vapor detector (automatic or manual)
   C. Tightness test (underground tanks only).
   D. Emptying and Inspection.
   E. Inventory control.
   F. Vapor or visible signs of a discharge in the vicinity.
   (G.) Closure: SHEEN (explain)
   H. Other: _____
7. Estimated number of gallons discharged: < 5
8. What part of storage system has leaked? (circle all that apply) A. Dispenser B. Pipe C. Fitting D. Tank (E.) Unknown
9. Type of regulated substance discharged, (circle one)
   A. leaded gasoline
   B. unleaded gasoline
   C. gasohol
   D. vehicular diesel
   F. aviation gas
   G. jet fuel
   (L.) used/waste oil
   M. diesel
   O. new/lube oil
   V. hazardous substance includes pesticides, ammonia, chlorine and derivatives (write in name or Chemical Abstract Service CAS number) _____
   Z. other (write in name) _____
10. Cause of leak, (circle all that apply)
    A. Unknown
    B. Split
    C. Loose connection
    D. Corrosion
    E. Puncture
    F. Installation failure
    G. Spill _____
    H. Overfill
    (I.) Other (specify) DAMAGED DURING REMOVAL
11. Type of financial responsibility, (circle one)
    A. Third party insurance provided by the state insurance contractor
    B. Self-insurance pursuant to Chapter 17-769.500 F.A.C.
    (C.) Not applicable
    D. None
12. **To the best of my knowledge and belief all information submitted on this form is true, accurate, and complete.**

J. M. CROSS
Printed Name of Owner, Operator or Authorized Representative

J M Cross
Signature of Owner, Operator or Authorized Representative

ATTACHMENT H
Disposal Document - Residual Product

Please print or type.
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. . . . . | Manifest Document No. . . . . | 2. Page 1 of 1

3. Generator's Name and Mailing Address
COAST SYSTEM STATION
98 HWY FC BEACH PANAMA CITY BEACH 32407
4. Generator's Phone (907) 235-5671

5. Transporter 1 Company Name: SOUTHERN WASTE SERVISE | 6. US EPA ID Number: FL.0.0.0.0.9.3.6.6.3.7

7. Transporter 2 Company Name: PAN AMERICAN TRANSPORT | 8. US EPA ID Number: . . . . . .

9. Designated Facility Name and Site Address
INDUSTRIAL WASTE SERVISE
1980 AVE A
MOBILE AL 36615

10. US EPA ID Number: AL.0.0.0.8.5.4.4.2.1

A. Transporter's Phone 1-800-633-2678
B. Transporter's Phone 1-800-449-3[illegible]
C. Facility's Phone 334-694-7500 0038

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. OIL WASTE	001	TT	3000	G
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above

E. Handling Codes for Wastes Listed Above

ORIGINAL MAILED 9-11

15. Special Handling Instructions and Additional Information
GROUND WATER & OIL FROM 363 64
CSS

TRANSPORTED TO:

DATE: 8-27

16. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
BILL LOGSDON	Bill Logsdon	08	08	97

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
James Hamilton	James D Hamilton	08	07	97

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
TYRA, DENNIS J.	D J Tyra	08	27	97

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year

GENERATOR — TRANSPORTER — FACILITY

12 BLS-06 (Rev 4-94)

TRANSPORTER #1

CLOSURE ASSESSMENT REPORT
UNDERGROUND STORAGE TANK
BUILDING 98

NAVAL SURFACE WARFARE CENTER
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

Unit Identification Code: N61331

Prepared by:

Navy Public Works Center
Environmental Department
310 John Tower Road
Pensacola, Florida, 32508

Prepared for:

Commanding Officer, Coastal Systems Station
Dahlgren Division, Naval Surface Warfare Center
6703 West Highway 98
Panama City, Florida 32407-7001

Mr Mike Clayton, Code CP2S, Environmental Engineer

December 1997

CLOSURE ASSESSMENT REPORT
UNDERGROUND STORAGE TANK
BUILDING 98

NAVAL SURFACE WARFARE CENTER
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

Unit Identification Code: N61331

Prepared by:

Navy Public Works Center
Environmental Department
310 John Tower Road
Pensacola, Florida, 32508

Prepared for:

Commanding Officer, Coastal Systems Station
Dahlgren Division, Naval Surface Warfare Center
6703 West Highway 98
Panama City, Florida 32407-7001

Mr Mike Clayton, Code CP2S, Environmental Engineer

December 1997

TABLE OF CONTENTS

Closure Assessment Report
Underground Storage Tank, Building 98
Naval Surface Warfare Center
Coastal Systems Station
Panama City, Florida

GLOSSARY

AST	Aboveground Storage Tank
CSS	Coastal Systems Station, Panama City, Florida
DRMO	US Navy, Defense Reutilization and Marketing Organization
EPA	Environmental Protection Agency
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
OVA	Organic Vapor Analyzer
PWC	US Navy, Public Works Center, Pensacola, Florida
UST	Underground Storage Tank

CLOSURE ASSESSMENT REPORT
UNDERGROUND STORAGE TANK
BUILDING 98

1.0 Facility

Building 98, Naval Surface Warfare Center
Coastal Systems Station
Panama City, Bay County, Florida

2.0 Operator

Commanding Officer, Coastal Systems Station
Dahlgren Division, Naval Surface Warfare Center
6703 West Highway 98, Code CP2S
Panama City, Florida 32407-7001

3.0 Site Location

The Coastal Systems Station is located along St Andrew Bay in Panama City, Florida (Figure 1).

4.0 Date of Closure

8 August 1997

5.0 Project Description

The US Navy Public Works Center (PWC), Pensacola, Florida was tasked by the Coastal Systems Station (CSS), Panama City to close a 560 gallon underground storage tank (UST) system located on the west side of Building 98, CSS Panama City (Figure 2). The UST was removed, cleaned and rendered unuseable by PWC. Photographs of the removal are provided as Attachment A. The UST was properly disposed by the US Navy, Defense Reutilization and Marketing Organization (DRMO), Pensacola, Florida (Attachment B).

The Application for Closure of Pollutant Storage Tank System, Underground Storage Tank Installation and Removal Form, Closure Assessment Form, and Decontamination Certification are provided in Attachments C, D, E, and F respectively.

6.0 Tank Contents

The UST was used to store diesel for on-site heating. The contents were emptied by CSS prior to commencement of work.

The rinsate from the UST cleaning operations was disposed at the Fire Training Facility, Building 439, CSS, Panama City. The petroleum constituents were seperated from the water and incinerated.

7.0 Tank Condition

The UST was cylindrically shaped and constructed of steel. The UST was in good condition at the time of removal.

8.0 Excavation Area

The excavation was made approximately eight (8) feet wide, ten (10) feet long and five (5) feet deep. The excavation was filled with clean fill, compacted to grade, and paved with concrete.

Contaminated soil was encountered during the excavation process (Attachment G). Approximately 2 cubic yards of contaminated soil was removed. The contaminated soil was removed horizontally until the hydrocarbon levels in the surrounding soil were less than 50 parts per million (ppm). The contaminated soil was removed vertically until groundwater was encountered. The contaminated soil was stockpiled and is planned to be properly disposed by Southern Waste Systems, Inc (SWS) within six months.

9.0 Soil Screening

Six (6) soil borings were installed around the UST using a manually operated hollow stem auger. The soil samples were collected and screened for organic vapor concentrations using the headspace screening technique. The soil samples were extracted at the limits of the excavation and underneath the middle of the UST. The soil boring locations and screening results are provided in Attachment E.

The soil screening was conducted in accordance with the headspace screening criteria in Chapter 62-770 FAC and PWC's Comprehensive Quality Assurance Plan using an organic vapor analyzer (OVA). The OVA was manufactured by Thermo Environmental Instruments, Inc (Model 680 HVM) and equipped with a flame ionization detector (FID).

10.0 Groundwater Analysis

A temporary groundwater monitoring well was installed on 5 November 1997 by GFA International, Inc (GFA), Sarasota, Florida. The well was constructed with a 2" diameter by 13 foot long, Schedule 40 polyvinyl chloride (PVC) riser. The riser was equipped with a ten foot long by 0.010 inch slotted screen. The well consisted of a course silica sand filter and a bentonite seal. The top of the well was encased with concrete and equipped with a lock and a steel cover. The well location, well construction diagram, and groundwater laboratory analyses are provided in Attachment E.

The well was sampled by PWC on 13 November 1997. These samples were transported to the PWC Laboratory in Pensacola, Florida and analyzed for volatile content in accordance with Environmental Protection Agency (EPA) Method 8260, for poly aromatic hydrocarbons (PAH's) in accordance with EPA Method 8270, for ethylene dibromide content in accordance with EPA Method 504, for lead content in accordance with EPA Method 239.2, and for total petroleum hydrocarbon content in accordance with the State of Florida, Petroleum Range Organics (FL-PRO) method.

11.0 Findings and Conclusions

The site is contaminated. The contaminated soil above the groundwater level was removed but the groundwater analysis yielded high levels of petroleum contamination.

12.0 Recommendations

A Contamination Assessment Report (CAR) should be prepared for this site.

13.0 Closure Assessment

Performed by the US Navy, Public Works Center (PWC) Pensacola, Florida.

14.0 Project Manager

Paul R. Semmes, P.E.

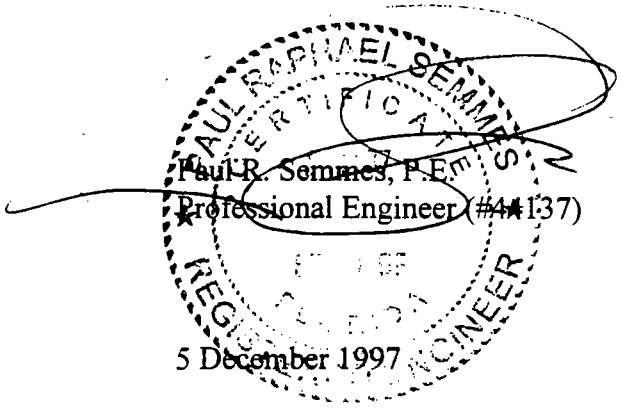
15.0 Project Number

1396004

16.0 Report Date

5 December 1997

The engineering evaluations and professional opinions rendered in this Closure Assessment Report that describes the work associated with the storage tank removal at the Coastal Systems Station, Panama City, Florida were conducted or developed in accordance with the commonly accepted procedures consistent with applicable standards of practice. If conditions are determined to exist differently than those described, the undersigned professional engineer should be notified to evaluate the effects of any additional information on the design described in this report.



Paul R. Semmes, P.E.
Professional Engineer (#44137)

5 December 1997

FIGURES

FIGURE 1
Vicinity Map

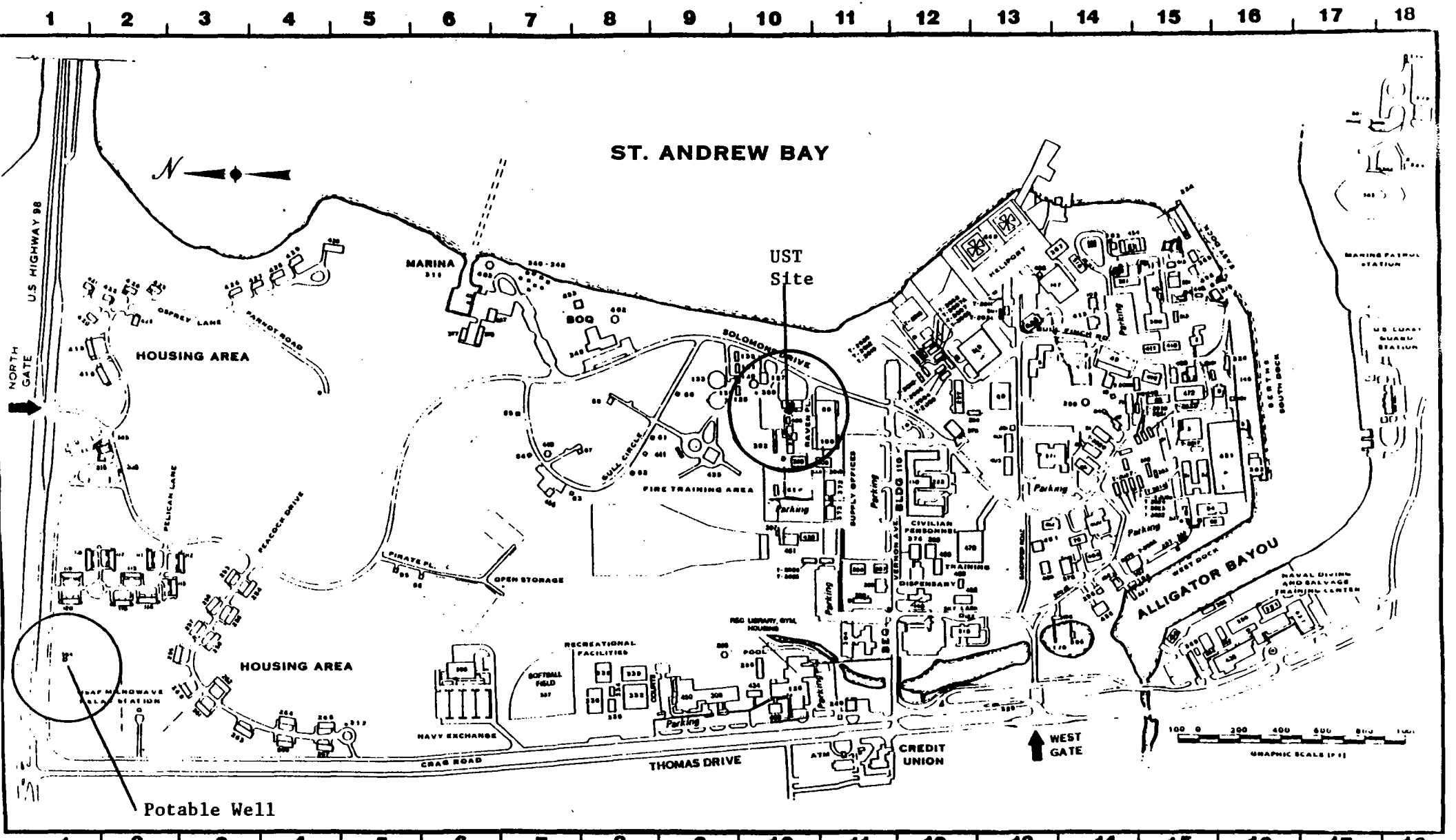
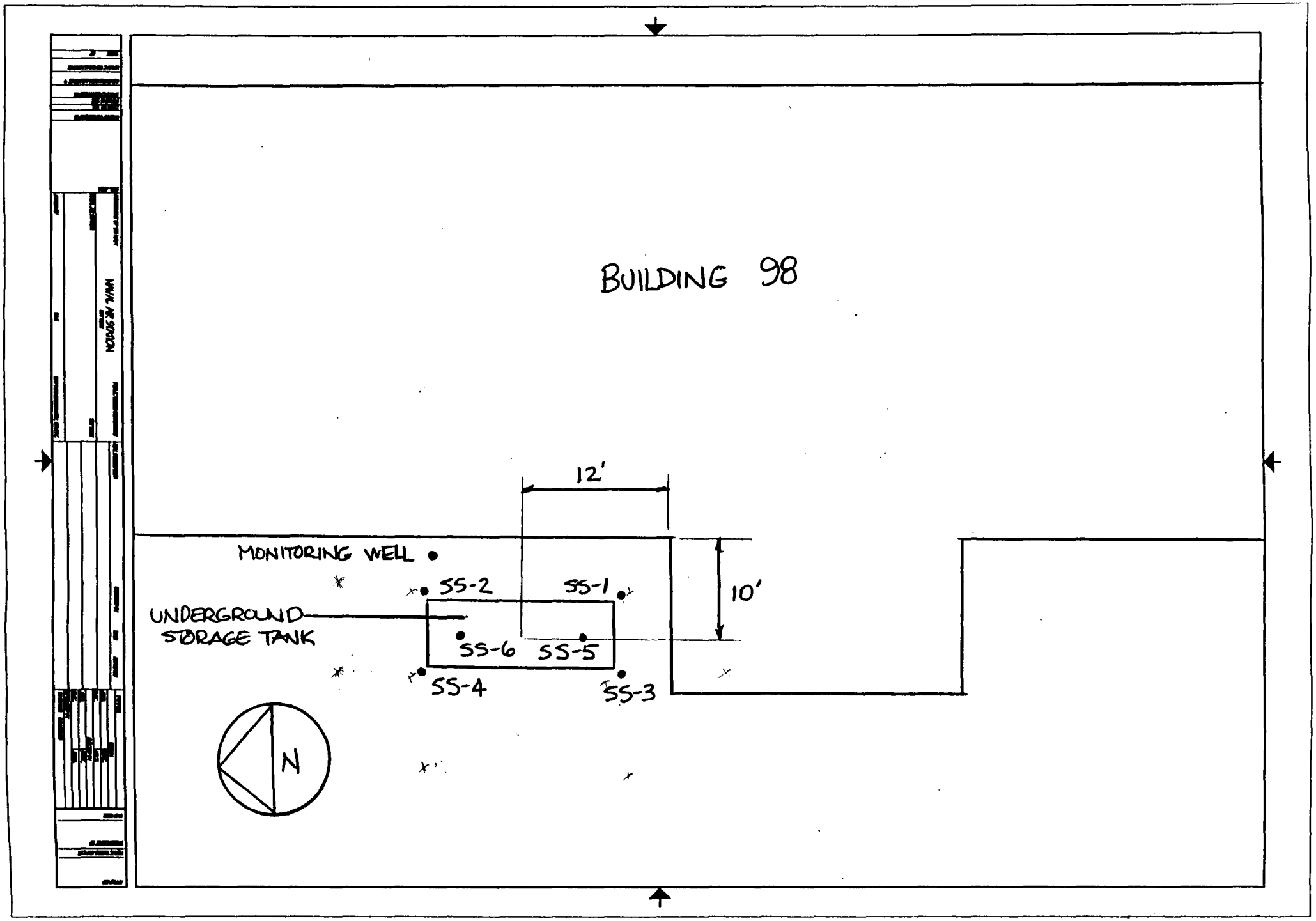
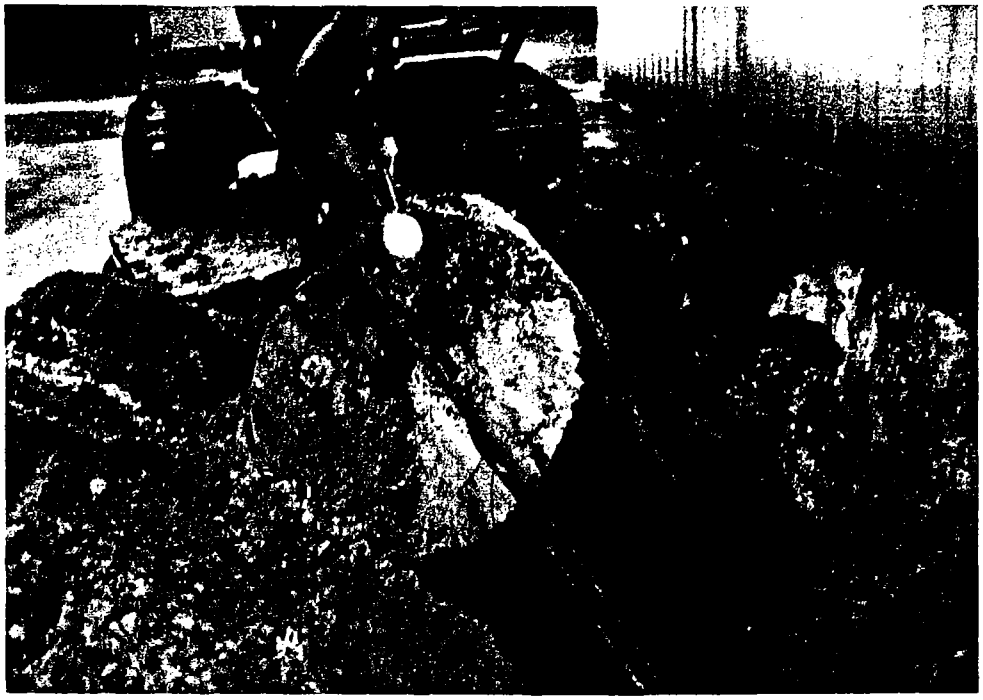

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
ST. ANDREW BAY
N
U.S. HIGHWAY 98
NORTH GATE
MARINA
BOQ
UST Site
SOLOMONS DRIVE
HOUSING AREA
OSPREY LANE
PARROT ROAD
PELICAN LANE
PEACOCK DRIVE
PIRATE PL.
OPEN STORAGE
GULL CIRCLE
FIRE TRAINING AREA
BLDG 110
SUPPLY OFFICES
CIVILIAN PERSONNEL
TRAINING
DISPENSARY
VERMONT AVE.
HELIPORT
MARINE PATROL STATION
U.S. COAST GUARD STATION
ALLIGATOR BAYOU
NAVAL DIVING AND SALVAGE TRAINING CENTER
WEST DOCK
SOUTH DOCK
HOUSING AREA
RECREATIONAL FACILITIES
SOFTBALL FIELD
COURTS
POOL
REC LIBRARY, GYM, HOUSING
BEQ
Parking
NAVY EXCHANGE
CRAG ROAD
THOMAS DRIVE
ATM
CREDIT UNION
WEST GATE
GRAPHIC SCALE (FEET)
Potable Well

FIGURE 2
Site Map


BUILDING 98
12'
10'
MONITORING WELL
SS-2
SS-1
UNDERGROUND
STORAGE TANK
SS-6
SS-5
SS-4
SS-3
N

ATTACHMENTS

ATTACHMENT A
Photographs



ATTACHMENT B
Disposal Document
Scrap Metal

RI FROM | NIIN | FSC | STOCK NUMBER | ADD | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER: SERV | REQUISITIONER | DATE | SERIAL | SUFFIX | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND | DISTRIBUTION | PROJECT | PRIORITY | REQ'D DEL DATE | ADVICE | RI | UNIT PRICE: DOLLARS | CTS.

N65114-7237-9005 RN6

FED FROM NAVY PWC FL 917002 4567 452-2170

SHIP TO B SRMO FL 917002 4567 452-4334

MARK FOR C SCRAP

PROJECT D

TOTAL PRICE: DOLLARS | CTS. E

WAREHOUSE LOCATION | TYPE OF CARGO G | UNIT PACK H | UNIT WEIGHT I | UNIT CUBE J | U F C K | N M F C L | FREIGHT RATE M | N | DOCUMENT DATE O | MAT COND P | QUANTITY Q | R | S

SUBSTITUTE DATA (ITEM ORIGINALLY REQUESTED)

FREIGHT CLASSIFICATION NOMENCLATURE: NAVAL SYSTEMS CMD USED TANKS - PANAMA CITY, FLORIDA V

ITEM NOMENCLATURE: x FUEL STORAGE TANKS Y

1 SELECTED BY AND DATE

2 TYPE OF CONTAINER(S)

3 TOTAL WEIGHT 4060

RECEIVER USE

7 RECEIVED BY AND DATE 8/28/97

8 INSPECTED BY AND DATE

4 PACKED BY AND DATE

5 NO. OF CONTAINER(S) 5 TANKS

6 TOTAL CUBE

9 WAREHOUSED BY AND DATE

10 WAREHOUSE LOCATION

MARKS: BB CC DD EE

1ST DESTINATION ADDRESS

12 DATE SHIPPED FF GG

TRANSPORTATION CHARGEABLE TO

14 BILL OF LADING, AWB, OR RECEIVER'S SIGNATURE (AND DATE) 8-25-97

15 RECEIVER'S DOCUMENT NUMBER

2

DD FORM 1348-1 1 MAR 74 EDITION OF 1 JAN 64 MAY BE USED UNTIL EXHAUSTED

N 0102-LF-013-1040

DOD SINGLE LINE ITEM RELEASE/RECEIPT DOCUMENT

RI FROM | NIIN | FSC | STOCK NUMBER | ADD | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER: SERV | REQUISITIONER | DATE | SERIAL | SUFFIX | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND | DISTRIBUTION | PROJECT | PRIORITY | REQ'D DEL DATE | ADVICE | RI | UNIT PRICE: DOLLARS | CTS.

N65114-7237-9004 RN6

FED FROM NAVY PWC FL 917002 4567 452-2170

SHIP TO B SRMO FL 917002 4567 452-4334

MARK FOR C SCRAP

PROJECT D

TOTAL PRICE: DOLLARS | CTS. E

WAREHOUSE LOCATION | TYPE OF CARGO G | UNIT PACK H | UNIT WEIGHT I | UNIT CUBE J | U F C K | N M F C L | FREIGHT RATE M | N | DOCUMENT DATE O | MAT COND P | QUANTITY Q | R | S

SUBSTITUTE DATA (ITEM ORIGINALLY REQUESTED)

FREIGHT CLASSIFICATION NOMENCLATURE: NAVAL SYSTEMS CMD USED TANKS - PANAMA CITY, FLORIDA V

ITEM NOMENCLATURE: x FUEL STORAGE TANKS Y

1 SELECTED BY AND DATE

2 TYPE OF CONTAINER(S) 1 TANK

3 TOTAL WEIGHT 4220

RECEIVER USE

7 RECEIVED BY AND DATE 8/28/97

8 INSPECTED BY AND DATE

4 PACKED BY AND DATE

5 NO. OF CONTAINER(S)

6 TOTAL CUBE

9 WAREHOUSED BY AND DATE

10 WAREHOUSE LOCATION

MARKS: BB CC DD EE

1ST DESTINATION ADDRESS

12 DATE SHIPPED FF GG

TRANSPORTATION CHARGEABLE TO

14 BILL OF LADING, AWB, OR RECEIVER'S SIGNATURE (AND DATE) 8-25-97

15 RECEIVER'S DOCUMENT NUMBER

2

DD FORM 1348-1 1 MAR 74 EDITION OF 1 JAN 64 MAY BE USED UNTIL EXHAUSTED

N 0102-LF-013-1040

DOD SINGLE LINE ITEM RELEASE/RECEIPT DOCUMENT

ATTACHMENT C
Application for Closure of Pollutant Storage Tank System

APPLICATION FOR CLOSURE OF POLLUTANT STORAGE TANK SYSTEM

Provide the facility information requested below.

FDEP Facility # N/A Facility Name NSWC - CSS

Facility Location Building 98

Property Owner Commanding Officer, Coastal Systems Station (Code P25)

Property Owner Address 6703 West Highway, 98 Panama City, Florida 32407-7001

Phone (850) 235-5859

Method of Tank Closure Removal

Pollutant Storage Systems Specialty Contractor (PSSSC) who will be on site supervising closure activities. Attach copy of PSSSC license.

Individual Licensed as PSSSC N/A PSSSC # N/A

Firm U.S. Navy - Public Works Center (PWC)

Address 310 John Tower Road, Pensacola, FL 32508

Indicate the firm (s) that will degas, remove, and transport the tank(s), and the method of degassification.

Degassification Method Air Eduction (API 1604-4.2.5)

Firm Removing Tanks U.S. Navy - Public Works Center (PWC)

Contact Mr. Paul Semmes, P.E. Phone (850) 452-4315

Firm Transporting Tanks U. S. Navy - Public Works Center (PWC)

Contact Mr. Paul Semmes, P.E. Phone (850) 452-4315

Firm Receiving Tanks for Ultimate Disposal U.S. Navy - DRMO

Contact Mr. Gayle Brown Phone (850) 452-3459

Indicate the laboratory that will conduct groundwater analysis.

Contracted Laboratory U.S. Navy - PWC Phone (850) 452-3180

Contact Mr. Joe Moore FDEP QA/QC 920121G

Indicate firm(s) transporting and disposing of contaminated soils.

Firm Transporting Soils Southern Waste Systems, Inc.

Contact Ms. Candace Esparza Phone (850)234-8428

Firm Remediating/Disposing Soils Southern Waste Systems, Inc.

Contact Ms. Candace Esparza Phone (850) 234-8428

Disposal/Remediation Method Landfill

Indicate the firm(s) that will transport and ultimately dispose of residual product and sludge from the tanks.

Firm Transporting Residual Product and Sludge Southern Waste Systems, Inc.
(850) 234-8428
Contact Ms. Candace Esparza Phone (850) 234-8428

Firm Receiving/Disposal Residual Product and Sludge Southern Waste Systems, Inc.
(850) 234-8428
Contact Ms. Candace Esparza Phone (850) 234-8428

Indicate the firm and names of personnel that will conduct field sampling.

Contracted Firm U.S. Navy - Public Works Center (PWC)

Contact Mr. Paul Semmes, P.E. Phone (850) 452-4315

Person (s) Sampling Mr. Paul Semmes, P.E.

Equipment used for soil screening (Specific Make and Model) Organic Vapor Analyzer (OVA) Thermo Environmental (680 HVM) equipped w/Flame Ionization Detector (FID).

ATTACHMENT D
Underground Storage Tank Installation and Removal Form

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

DER Form # 17-761.900(5)
Form Title Underground Storage Tank Installation & Removal Form for Certified Contractors
Effective Date December 10, 1990
DER Application No. _____ (Filled in by DER)

Underground Storage Tank Installation and Removal Form For Certified Contractors

Pollutant Storage System Specialty Contractors as defined in Section 489.113, Florida Statutes (Certified contractors as defined in Section 17-761.200, Florida Administrative Code) shall use this form to certify that the installation, replacement or removal of the storage tank system(s) located at the address listed below was performed in accordance with Department Reference Standards.

General Facility Information

1. DER Facility Identification No.: N/A
2. Facility Name: NSWC Coastal Systems Station Telephone: (850) 235-5859
3. Street Address (physical location): Building 98
4. Owner Name: CO, Coastal Systems Station Telephone: (850) 235-5859
5. Owner Address: 6703 West Highway 98, Panama City, Florida 32407-7001
6. Number of Tanks: a. Installed at this time None b. Removed at this time One
7. Tank(s) Manufactured by: Unknown
8. Date Work Initiated: 8/8/97 9. Date Work Completed: 8/8/97

Underground Pollutant Tank Installation Checklist

Please certify the completion of the following installation requirements by placing an (X) in the appropriate box.

1. The tanks and piping are corrosion resistant and approved for use by State and Federal Laws. ☐
2. Excavation, backfill and compaction completed in accordance with NFPA (National Fire Protection Association) 30(87), API (American Petroleum Institute) 1615, PEI (Petroleum Equipment Institute) RP100-87 and the manufacturers' specifications. ☐
3. Tanks and piping pretested and installed in accordance with NFPA 30(87), API 1615, PEI/RP100(87) and the manufacturers' specifications. ☐
4. Steel tanks and piping are cathodically protected in accordance with NFPA 30(87), API 1632, UL (Underwriters Laboratory) 1746, STI (Steel Tank Institute) R892-89 and the manufacturer's specifications. ☐
5. Tanks and piping tested for tightness after installation in accordance with NFPA 30(87) and PEI/RP100-87. ☐
6. Monitoring well(s) or other leak detection devices installed and tested in accordance with Section 17-761.640, Florida Administrative Code (F.A.C.) ☐
7. Spill and overfill protection devices installed in accordance with Section 17-761.500, F.A.C. ☐
8. Secondary containment installed for tanks and piping as applicable in accordance with Section 17-761.500, F.A.C. ☐

Please Note: The numbers following the abbreviations (e.g. API 1615) are publication or specification numbers issued by these instututions.

Underground Pollutant Tank Removal Checklist

1. Closure assessment performed in accordance with Section 17-761.800, F.A.C. ☒
2. Underground tank removed and disposed of as specified in API 1604 in acordance with Section 17-761.800, F.A.C. ☒

Northwest District
160 Governmental Center
Pensacola, Florida 32501-5794
Phone: 904-436-8300

Northeast District
7825 Baymeadows Way, Suite B-200
Jacksonville, Florida 32207
Phone: 904-798-4200

Central District
3319 Maguire Blvd, Suite 232
Orlando, Florida 32803-3767
Phone: 407-894-7555

Southwest District
4520 Oak Fair Blvd
Tampa, Florida 33610-7347
Phone: 813-623-5561

South District
2269 Bay St
Fort Myers, Florida 33901-2896
Phone: 813-332-6975

Southeast District
1900 S. Congress Ave., Suite A
West Palm Beach, Florida 33406
Phone: 407-433-2650

ATTACHMENT E
Closure Assessment Form
Soil & Groundwater Analyses

Florida Department of Environmental Protection
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

DEP Form # 62-761.900(3)
Form Title: Closure Assessment Form
Effective Date: December 10, 1996
DEP Application No. _____
(Filled in by DEP)

Closure Assessment Form

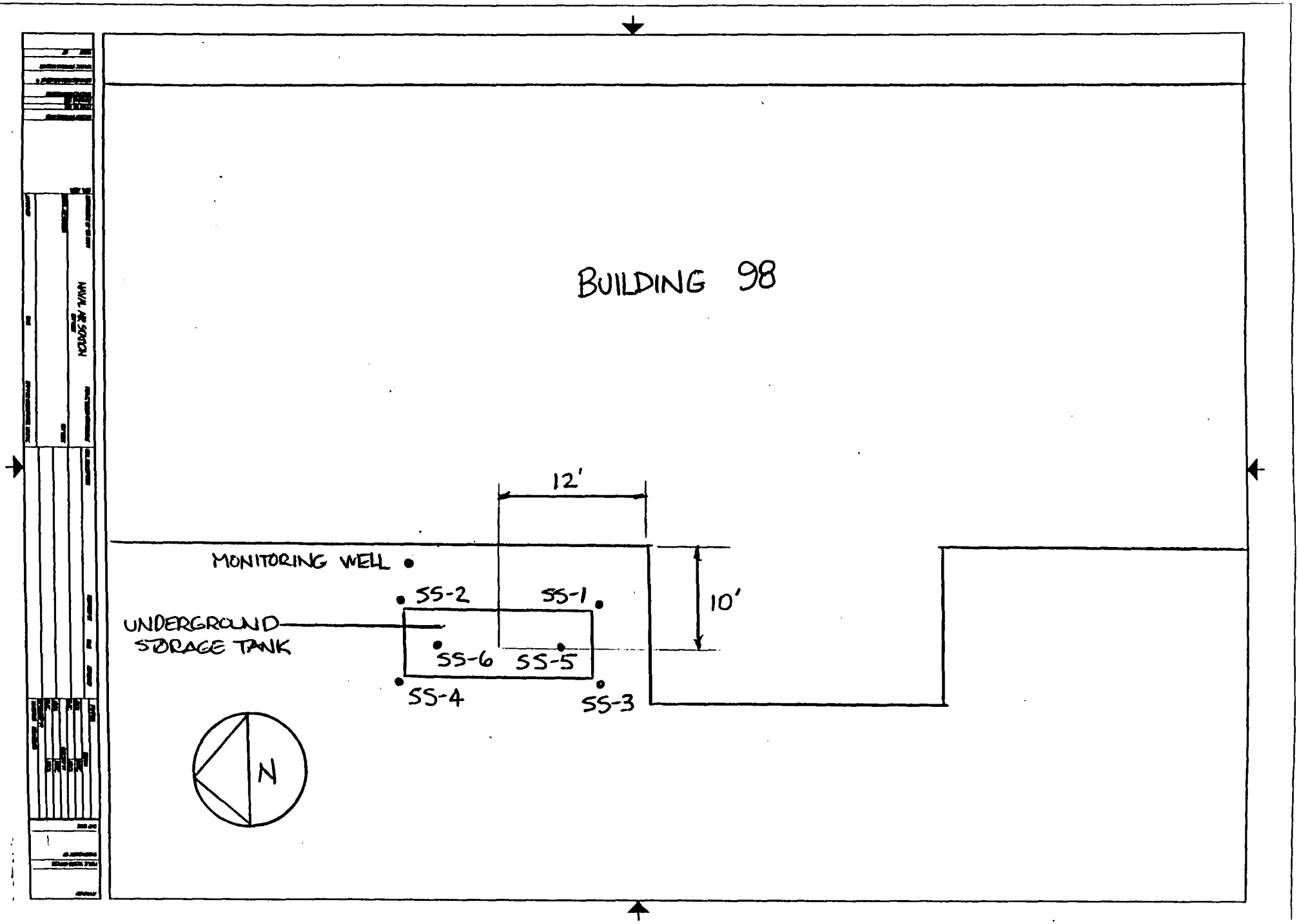
Owners of storage tank systems that are replacing, removing or closing in place storage tanks shall use this form to demonstrate that a storage system closure assessment was performed in accordance with Rule 62-761.800(3) or 62-762.800(3), Florida Administrative Code.

Please Print or Type
Complete All Applicable Blanks

1. Date 12/5/97
2. DEP Facility ID Number: N/A 3. County Bay
4. Facility Name: NSWC Coastal Systems Station
5. Facility Owner: Commanding Officer, Coastal Systems Station
6. Facility Address: Building 98
7. Mailing Address: 6703 West Highway 98, Panama City, Florida 32407-7001
8. Telephone Number: (850) 235-5859 9. Facility Operator: Mike Clayton
10. Are the Storage Tank(s): (Circle one or both) A. Aboveground or (B.) Underground
11. Type of Product(s) Stored: Diesel
12. Were the Tank(s): (Circle one) A. Replaced (B.) Removed C. Closed in Place D. Upgraded (aboveground tanks only
13. Number of Tanks closed: One 14. Age of Tanks: 45

Facility Assessment Information

Yes	No	Not Applicable	
☐	☒		1. Was a Discharge Reporting Form submitted to the Department? If yes, When: _____ Where: _____
☒	☐		2. Is the depth to ground water less than 20 feet?
☒	☐	☐	3. Are monitoring wells present around the storage system? If yes, please specify ☐ Vapor Monitoring ☒ Water Monitoring
☐	☒	☐	4. Is there free product present in the monitoring wells or within the excavation?
☐	☐	☒	5. Were the petroleum hydrocarbon vapor levels in the soil greater than 500 parts per million for gasoline? Specify sample type: ☐ Vapor Monitoring wells ☐ Soil sample(s)
☒	☒	☐	6. Were the petroleum hydrocarbon vapor levels in the soils greater than 50 parts per million for diesel/kerosene? Specify sample type: ☐ Vapor Monitoring wells ☒ Soil sample(s)
☒	☐	☐	7. Were the analytical laboratory results of the ground water sample(s) greater than the allowable state target levels? (See target levels on reverse side of this form and supply laboratory data sheet(s).
☐	☐	☒	8. If a used oil storage system, did a visual inspection detect any discolored soil indicating a release?
☐	☒	☐	9. Are any potable wells located within 1/4 of a mile radius of the facility?
☒	☐	☐	10. Is there a surface water body within 1/4 mile radius of the site? If yes, indicate distance: 1000'
☒	☐	☐	11. A detailed drawing or sketch of the facility that includes the storage system location, monitoring wells, buildings, storm drains, sample locations, and dispenser locations must accompany this form.
☒	☐	☐	12. If a facility has a pollutant storage tank system that has both gasoline and kerosine/diesel stored on site, both EPA method 602 and EPA method 610 must be performed on the ground water samples.


BUILDING 98
12'
MONITORING WELL
SS-2
SS-1
10'
UNDERGROUND
STORAGE TANK
SS-6
SS-5
SS-4
SS-3
N

Summary of OVA Readings

Closure Assessment Report
Underground Storage Tank, Building 98
Naval Surface Warfare Center
Coastal Systems Station
Panama City, Florida

Hand Auger Sample No.	Depth (Feet)	Unfiltered (ppm)	Filtered (ppm)	Total Hydrocarbon Readings (ppm)
SS-1	5	7	5	2
SS-2	5	<1	<1	0
SS-3	5	79	42	37
SS-4	5	60	15	45
SS-5	6	17	4	13
SS-6	6	4	2	2

Readings for unfiltered samples are total hydrocarbon readings including methane; readings for filtered samples are methane only.

Notes: ppm = parts per million.

Navy Public Works Center

Environmental Laboratory

Bldg. 3887, Code 440
NAS Pensacola, FL 32508
Phone (850) 452-3180/3642
DSN 922-3180/3642
FAX (850) 452-2799/2387

Client: NPWC Engineering
Address: Bldg.458, Code 400
NAS Pensacola, Fl 32508
Phone #: (850) 452-4315
Contact: Paul Semmes

Analytical Report

601/602 Volatiles by Method 8260

Lab Report Number: 74947
Sample Date: 11/13/97
Received Date: 11/13/97
Sample Site: Panama City
Job Order No.: 139 6004

LAB Sample ID#	1- 74947
Sample Name / Location	NAVCSS MW # 98
Collector's Name	P. Keane
Date & Time Collected	11/13/97 @ 1340
Sample Type (composite or grab)	Grab
Analyst	M. Chambers
Date of Extraction / Initials	11/14/97 MC
Date of Analysis	11/14/97
Sample Matrix	GW
Dilution	X 1

Compound Name	1- 74947	units	Det. Limit	Flags
Benzene	17	ug/L	1	
Bromodichloromethane	BDL	ug/L	1	
Bromoform	BDL	ug/L	2	
Bromomethane	BDL	ug/L	3	
Carbon Tetrachloride	17	ug/L	1	
Chlorobenzene	BDL	ug/L	1	
Chloroethane	BDL	ug/L	1	
2-Chloroethylvinyl ether	BDL	ug/L	1	
Chloroform	BDL	ug/L	1	
Chloromethane	BDL	ug/L	1	
Dibromochloromethane	BDL	ug/L	1	
1,2-Dichlorobenzene	BDL	ug/L	1	
1,3-Dichlorobenzene	BDL	ug/L	1	
1,4-Dichlorobenzene	BDL	ug/L	1	
Dichlorodifluoromethane	BDL	ug/L	1	
1,1-Dichloroethane	630	ug/L	10	
1,2-Dichloroethane	BDL	ug/L	1	
1,1-Dichloroethene	91	ug/L	1	
trans-1,2-Dichloroethene	BDL	ug/L	1	
1,2-Dichloropropane	BDL	ug/L	1	
cis-1,3-Dichloropropene	BDL	ug/L	1	
trans-1,3-Dichloropropene	BDL	ug/L	1	
Ethylbenzene	90	ug/L	1	
Methylene Chloride	BDL	ug/L	1	
Methyl-tert-butyl ether (MTBE) *	BDL	ug/l	1	
1,1,2,2-Tetrachloroethane	BDL	ug/L	1	
Tetrachloroethene	BDL	ug/L	1	
Toluene	510	ug/L	10	
1,1,1-Trichloroethane	130	ug/L	1	
1,1,2-Trichloroethane	3	ug/L	1	
Trichloroethene	2	ug/L	1	
Trichlorofluoromethane	BDL	ug/L	1	
Vinyl Chloride	BDL	ug/L	1	
Xylenes (Total)	280	ug/L	1	

SURROGATE SPIKE RECOVERIES

	Acceptance Limits	Percent Recovery
1,2-Dichloroethane-d4	75-133	121
Toluene-d8	86-119	104
Bromofluorobenzene	85-116	107

COMMENTS :

BDL = Below Detection Limit. ug/L = microgram per Liter. ug/Kg = microgram per Kilogram. * = FL HRS certification pending.

Approved by : Jerry Dees, Laboratory Director

Date: 12/2/97
Report Generated

End of Report

Navy Public Works Center
Environmental Laboratory

Bldg. 3887, Code 440
NAS Pensacola, FL 32508
Phone (850) 452-3180/3642
DSN 922-3180/3642
FAX (850) 452-2799/2387

Client: NPWC Engineering
Address: Bldg.458, Code 400
NAS Pensacola, Fl 32508
Phone #: (850) 452-4315
Contact: Paul Semmes

Analytical Report

610 PAH's by Method 8270

Lab Report Number: 74947
Sample Date: 11/13/97
Received Date: 11/13/97
Sample Site: Panama City
Job Order No.: 139 6004

LAB Sample ID#	1- 74947
Sample Name / Location	NAVCSS MW # 98
Collector's Name	P. Keane
Date & Time Collected	11/13/97 @ 1340
Sample Type (composite or grab)	Grab
Analyst	J. Moore
Date of Extraction / Initials	11/17/97 JJ
Date of Analysis	11/21/97
Sample Matrix	GW
Dilution	X 1

Compound Name	1- 74947	units	Det. Limit	Flags
Acenaphthene	3	ug/L	2	
Acenaphthylene	BDL	ug/L	2	
Anthracene	BDL	ug/L	2	
Benzo(a)anthracene	BDL	ug/L	2	
Benzo(a)pyrene	BDL	ug/L	2	
Benzo(b)fluoranthene	BDL	ug/L	2	
Benzo(g,h,i)perylene	BDL	ug/L	2	
Benzo(k)fluoranthene	BDL	ug/L	3	
Chrysene	BDL	ug/L	2	
Dibenz(a,h)anthracene	BDL	ug/L	2	
Fluoranthene	BDL	ug/L	2	
Fluorene	6	ug/L	2	
Indeno(1,2,3-cd)pyrene	BDL	ug/L	2	
1-Methylnaphthalene *	37	ug/L	2	
2-Methylnaphthalene	47	ug/L	3	
Naphthalene	48	ug/L	2	
Phenanthrene	3	ug/L	2	
Pyrene	BDL	ug/L	2	

SURROGATE SPIKE RECOVERIES

	Acceptance Limits	Percent Recovery
Nitrobenzene- d5	35-114	87
2-Fluorobiphenyl	43-116	91
Terphenyl -d14	33-141	70

COMMENTS :

BDL = Below Detection Limit. ug/L = microgram per Liter. ug/Kg = microgram per Kilogram. * = FL HRS certification pending.

Approved by : Jerry Dees, Laboratory Director

Date: 12/2/97
Report Generated

End of Report

Navy Public Works Center

Environmental Laboratory

Bldg. 3887, Code 440
NAS Pensacola, FL 32508
Phone (850) 452-3180/3642
DSN 922-3180/3642
FAX (850) 452-2799/2387

Client: NPWC Engineering
Address: Bldg.458, Code 400
NAS Pensacola, Fl 32508
Phone #: (850) 452-4315
Contact: Paul Semmes

Analytical Report

Ethylene Dibromide by Method 504

Lab Report Number: 74947
Sample Date: 11/13/97
Received Date: 11/13/97
Sample Site: Panama City
Job Order No.: 139 6004

LAB Sample ID#	1- 74947			
Sample Name / Location	NAVCSS MW # 98			
Collector's Name	BH/PK			
Date & Time Collected	11/13/97 @ 1340			
Sample Type (composite or grab)	Grab			
Analyst	M. Chambers			
Date of Extraction / Initials	11/20/97 MC			
Date of Analysis	11/21/97			
Sample Matrix	GW			
Dilution	X 5			
Compound Name	1- 74947	units	Det. Limit	Flags
Ethylene Dibromide	2.3	ug/L	0.1	

SURROGATE SPIKE RECOVERIES

	Acceptance Limits	Percent Recovery
Tetra-Chloro-m-Xylene	54-140	90

COMMENTS :

BDL = Below Detection Limit. ug/L = microgram per Liter. ug/Kg = microgram per Kilogram.

Approved by : Jerry Dees, Laboratory Director

Date: 12/2/97
Report Generated

End of Report

Navy Public Works Center
Environmental Laboratory

Analytical Report

Petroleum Range Organics by FLPRO

Bldg. 3887, Code 440
NAS Pensacola, FL 32508
Phone (850) 452-3180/3642
DSN 922-3180/3642
FAX (850) 452-2799/2387

Client: NPWC Engineering
Address: Bldg.458, Code 400
NAS Pensacola, Fl 32508
Phone #: (850) 452-4315
Contact: Paul Semmes

Lab Report Number: 74947
Sample Date: 11/13/97
Received Date: 11/13/97
Sample Site: Panama City
Job Order No.: 139 6004

LAB Sample ID#	1- 74947
Sample Name / Location	NAVCSS MW # 98
Collector's Name	BH/PK
Date & Time Collected	11/13/97 @ 1340
Sample Type (composite or grab)	Grab
Analyst	J. Moore
Date of extraction / Initials	11/17/97 JJ
Date of Analysis	11/25/97
Sample Matrix	GW
Dilution	x 5

Parameter	1- 74947	units	Det. Limit	Flags
Petroleum Range Organics by FLPRO	7.6	mg/L	1.25	

SURROGATE SPIKE RECOVERIES

	Acceptance Limits	Percent Recovery
ortho-Terphenyl	82-142 *	74
Nonatriacontane (C-39)	42-193 *	78

COMMENTS : * = Suggested surrogate recovery limits listed in the method. In-house laboratory limits are in the process of being determined.

BDL = Below Detection Limit. mg/L = milligram per Liter. mg/Kg = milligram per Kilogram.

Approved by : _____ Date: 12/2/97
Jerry Dees, Laboratory Director

End of Report

Navy Public Works Center

Environmental Laboratory

Bldg. 3887, Code 440
NAS Pensacola, FL 32508
Phone (850) 452-3180/3642
DSN 922-3180/3642
FAX (850) 452-2799/2387

Client: NPWC Engineering
Address: Bldg.458, Code 400
NAS Pensacola, Fl 32508
Phone #: (850) 452-4315
Contact: Paul Semmes

Analytical Report

Total Lead by Method 239.2

Lab Report Number: 74947
Sample Date: 11/13/97
Received Date: 11/13/97
Sample Site: Panama City
Job Order No.: 139 6004

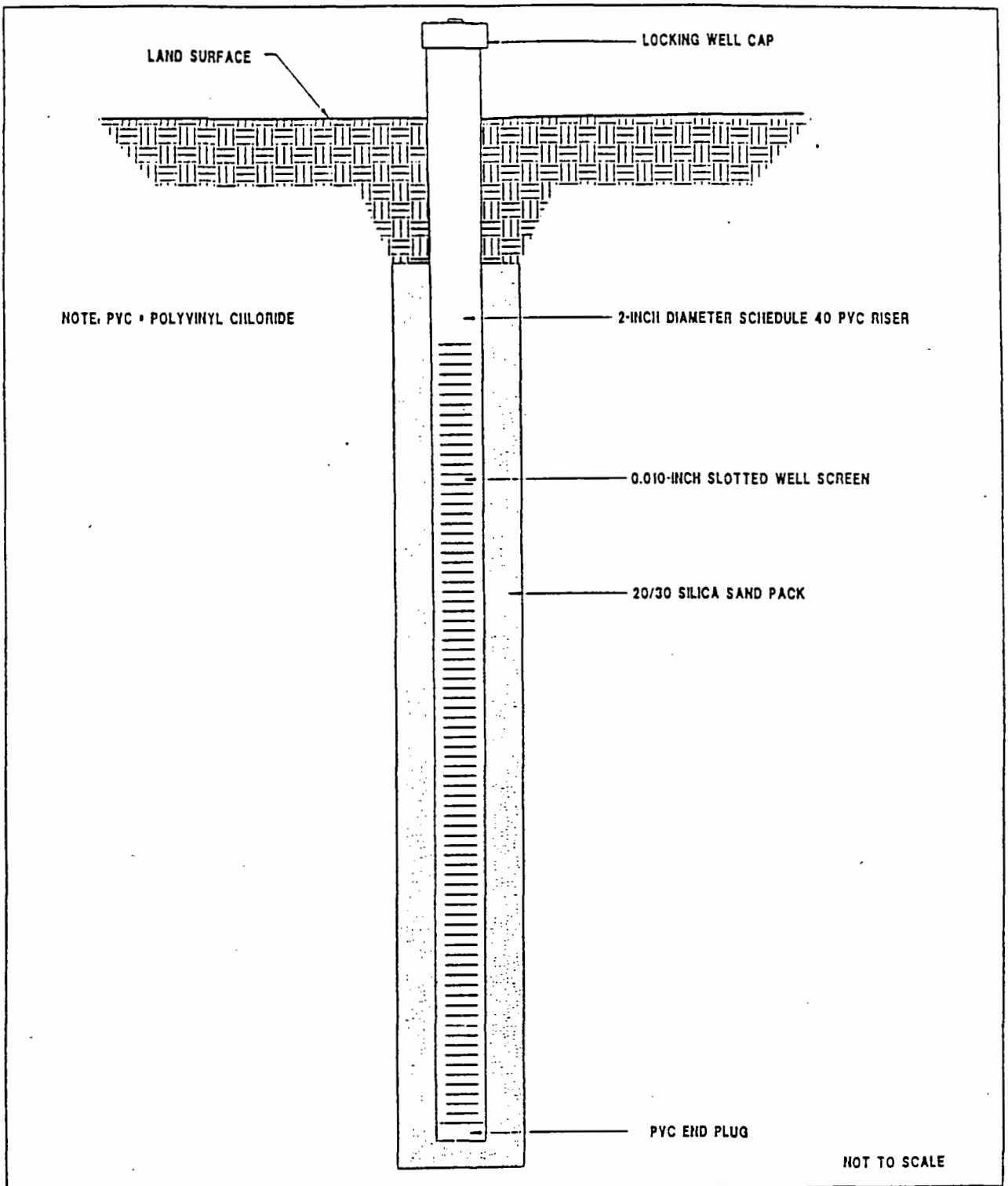
LAB Sample ID#	1- 74947			
Sample Name / Location	NAVCSS MW # 98			
Collector's Name	P. Keane			
Date & Time Collected	11/13/97 @ 1340			
Sample Type (composite or grab)	Grab			
Analyst	B. Nelson			
Date of Analysis	11/17/97			
Sample Matrix	GW			
Dilution	X 1			
Element Name	1- 74947	units	Det. Limit	Flags
Lead	BDL	mg/L	0.003	

COMMENTS :

BDL = Below Detection Limit. mg/L = milligram per Liter. mg/Kg = milligram per Kilogram.

Approved by : Jerry Dees, Laboratory Director

Date: 12/2/97
Report Generated



TYPICAL TEMPORARY MONITORING WELL
INSTALLATION DETAIL

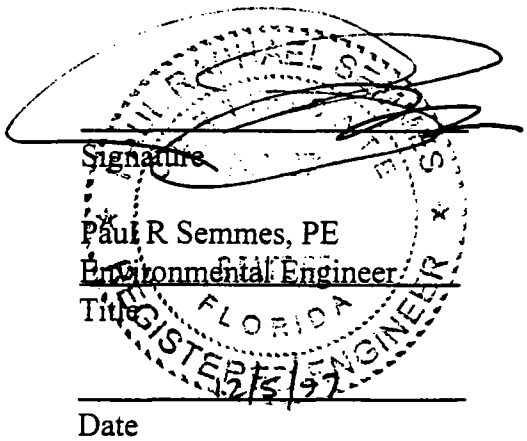
ATTACHMENT F
Decontamination Certification

CERTIFICATE
OF
DECONTAMINATION

It is hereby certified that the following Storage Tanks located at the Naval Surface Warfare Center, Coastal Systems Station, Panama City, Florida have been decontaminated by the Navy Public Works Center (PWC), Pensacola, Florida:

Bldg 92	Bldg 110	Bldg 300	Bldg 371
Bldg 94 (TANK #52)	Bldg 129	Bldg 321 (TANK #322)	
Bldg 98	Bldg 146 (TANK #172)	Bldg 363	

The Storage Tanks listed above have been triple rinsed and cleaned in accordance with **40 CFR 261.7(b)(3)(i)** and have been rendered unusable.



Signature

Paul R Semmes, PE
Environmental Engineer
Title

12/5/97
Date

ATTACHMENT G
Petroleum or Petroleum Product Contamination Report

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Petroleum or Petroleum Product Contamination Report Form

DER Facility ID: 038518667
Facility Name: NSWC Coastal Systems Station
Facility Address: 6703 West Hwy 98
Panama City, FL 32407-7001
County: Bay
Other Names for this Site: Building #98 (Property Disposal Office) Heating Oil Tank (550 GL) installed 1952.

Contact Person's Name: Mike Clayton
Contact Person's Phone No.: (850) 235-5859
Contact Person's Address: Coastal Systems Station, Code CP2SMC
6703 West Hwy 98. Panama City, FL 32407-7001

Date of Discovery: August 8, 1997
Type of Product Discharged: Heating Oil (Diesel)
Estimated Amount of Product Lost: Unknown
How did Discharge occur? (Tank leak, Pipe leak, Truck Accident, Explosion, etc.) Overfill and holes in tank.

What has been done to prevent a further Discharge? Tank has been removed along with contaminated soil down to the groundwater. Ground water analysis will dictate further Contamination Assessment requirements.

To the best of my knowledge, all information on this form is true, accurate, and complete.

J. M. Cross by direction
Signature of Owner, Authorized Representative, Operator

U.S. Navy
Print Name of Owner or Operator

Date 8/26/97

Submit this form to the appropriate district office at the address below

KEEP A COPY OF THIS FORM FOR YOUR RECORDS.

42[illegible] 00005

Bechtel

Oak Ridge Corporate Center
151 Lafayette Drive
P.O. Box 350
Oak Ridge, Tennessee 37831-0350
Telephone: (423) 220-2000

FEB 17 1998

Per telcon w/ Con 2/18/98 @ 1710. / to add wording ab alarm system & give ball park esti. for replacing piping alarm system component repair of tank. (1

Commanding Officer
Department of the Navy
Naval Facilities Engineering Command
Attention: Mr. Nick Ugolini, 1843
2155 Eagle Drive, P.O. Box 190010
North Charleston, SC 29419-9010

SUBJECT: Bechtel Job No. 22567
Department of the Navy Contract No. N62467-93-D-0936
DO 0086, EMERGENCY RESPONSE AT WESTDOCK, TANK 307
Site/Subject Code: 425/1250

Dear Mr. Ugolini:

Enclosed are copies of the test results and certifications for the UST No. 307 and associated piping system at CSS Panama City. Also included is a narrative summary report which describes the tests that were performed and the logic upon which the series of tests were based.

In summary, the inner tank tested tight, but the outer shell failed the tests, even after uncovering typical possible leak points on the top of the tank. Some leaks were located on the tank outer shell at fittings and connection points, and repaired, but it was not possible to locate and repair the remaining leak(s) in the tank outer shell.

The product pipeline passed the test in the portion that is buried under ground or below concrete; the sections that are visible in concrete lined trenches did not pass. None of the outer wall piping passed the tests. The only apparent (visible) release to the environment was in the final section of pipe located in the concrete lined trench along the edge of the pier, just before the dispenser. Since the dispenser itself, and a portion of the final section of piping had been removed by others, it was not possible to determine whether there had been additional leaks from fittings beneath the dispenser before it was removed from service.

Please contact either Tom Conrad at (423) 220-2205 or myself at (423) 220-2167 if you have any questions concerning this report.

Sincerely,

Karen S. Atchley
Project Manager

TMC:dcm:LR[illegible]535
Enclosure: As stated

cc: Mike Cross (3), CSS Panama City
Van Smith (1), CSS Panama City

Bechtel Environmental, Inc.

Post-it® Fax Note 7671	Date 2/18/98	# of pages ▶
To Mike Cross	From K Atchley	
Co./Dept.	Co.	
Phone #	Phone # (423) 220-2167	
Fax # (904) 234-4774	Fax #	

425 - 00005

CSS Panama City
Summary Report
UST System Testing at Tank 307R1
February 17, 1998

1.0 Introduction

This report describes the tests that were performed under DO 86 at Coastal Systems Station Panama City, Florida, to determine the physical integrity of the Underground Storage Tank (UST) system and associated product lines at Tank 307R1

2.0 Description of UST System

The UST 307R1 system consists of a 6,000 gallon Owens-Corning double-wall fiberglass UST, 8' - 1 1/4" in diameter, buried under an earthen mound with two feet of cover, such that the bottom of the tank is about eight feet below the elevation of the surrounding grade (the grade beyond the boundary of the mound), and a double-walled fiberglass pipe fuel delivery system. The pumping system consists of an above-ground suction pump located on a concrete pad in a fenced compound adjacent to the mounded area. The compound includes the pump controls and the leak detection alarm system. The fuel dispenser (now removed) was located remotely from the tank, close to the edge of the concrete pier (West Dock).

The double-wall pipe system is divided into four sections, from the UST to the dispenser. Each section is configured with a separate leak detection zone. The gate valves that are used for isolation valves between sections of the pipeline are located either in shallow valve pits, above ground, or within concrete-lined utility trenches.

Table 1

Section Number	Leak Detection Zone as Labeled on Panel in Compound	Description of Pipe Section (Shown partially on NAVFAC Dwg. 5188518)
1	PD 1	2 1/2" double walled fiberglass reinforced pipe (FRP); runs from sectionalizing (sect.) valve on top of UST to the above-ground galvanized steel pipe and sect. valve, at the pump station.
2	PD 2	Above ground 2" galvanized steel pipe from the pump station transitioning to FRP nearby and running below ground until it comes up into a shallow filter pad, transitioning again from the double walled FRP to 2" galvanized steel on the filter pad.
3	TPD 1 *	2" double walled FRP; runs about 15 ft underground from the dispenser location near the edge of the pier, to a sect. valve in the trench along the edge of the pier, where it connects to TPD 2. This line was not tested because it was previously reported to have leaked (Mike Clayton).
4	TPD 2 *	2" double walled FRP; runs from the sect. valve at TPD 1 in the utility trench for a distance of about 30 ft along the edge of the pier to another sect. valve in the same trench.

CSS Panama City
Summary Report
UST System Testing at Tank 307R1
February 17, 1998

5	TPD 3 *	2" double walled FRP; runs from a sect. valve at TPD 2 about 2 ft along the edge of the pier to a tee (opposite side of tee also has sect. valve), turning shoreward into a covered concrete lined trench which extends about 60 ft across the pier, then through the wall at the end of the trench underground about 2 ft where it comes up to connect to 2" galvanized steel transition on the filter pad.

* Note: These three sections are referred to in this report as TPD1, TPD2, and TPD3 for the purpose of clarity, to indicate that they are in a trench and to differentiate them from PD1 and PD2. The actual panel labels in the field for these sections are PD 1, PD 2, and PD 3, respectively. In other words the panel has two PD 1's and two PD 2's.

3.0 Problem Statement

3.1 Scope of Work

There was a dual objective to the testing that was performed. The first objective was to satisfy the requirements of the Florida Department of Environmental Protection for an inspection of the structural integrity of the UST system as part of an Assessment Report, and the second objective was to determine whether the system can be retained in service for future use, meeting all State and Federal compliance requirements.

To meet these objectives, the plan was to perform a precision tightness test on UST 307R1 and hydrostatic tightness tests (inner walls) on associated product delivery lines from the UST to the dispenser location at the edge of the West Dock pier; also to perform tests of the interstitial space on the double walled UST and the double walled pipe, to determine the physical integrity of the secondary containment outer walls.

3.2 Description of Work Approach

The work was divided into two parts, the precision test of the inner shell of the UST performed by Tanknology-NDE (report attached) and the hydrostatic piping tests and secondary containment tests, performed by Southern Petroleum Systems using the Petrotite pipe testing method for the product piping, nitrogen gas for the secondary wall of the piping, and vacuum for the UST outer shell.

The precision test was to determine the structural integrity of the inner shell of the 6,000 gal UST, to determine whether it might have been the source of a release of fuel into the environment. The Hydrostatic tests of the connected fuel delivery piping system from the tank to the dispenser were similarly to determine the structural integrity of the primary piping, to determine if it might have been the source of a release of fuel into the environment. The tests of the outer wall of the tank and the piping system were to determine if the entire UST system meets the requirements for secondary containment, such that the system can be retained in service, or economically repaired and retained in service, meeting Federal and State compliance requirements.

CSS Panama City
Summary Report
UST System Testing at Tank 307R1
February 17, 1998

4.0 Results of Work Performed

4.1 Precision Tank Test

The tank was filled with diesel fuel by the base fuel handling department. The precision test was performed using the VacuTect tank testing system. The tank tested tight (certificate attached), indicating that there is good structural integrity of the inner shell of the tank, and that it is unlikely that there have been any releases of fuel from shell of the tank.

4.2 Tank Secondary Containment Tests

The two concrete pads and 2 ft of soil were removed from the top of the UST, excavating by hand. This was done to provide visible access to all fittings and connections along the top of the UST, so that openings and connections (sensor wiring and vent stack) could be temporarily isolated from the secondary shell. The part of the tank between the two manways was not uncovered, because a concrete grade beam, not shown on the drawings, was discovered to lie across the center of the tank, presumably for the purpose of providing additional ballast. The use of such grade beams is not recommended for fiberglass UST installations, due to point-loading forces that can distort and crack the shell of the tank. The decision was made to not disturb this grade beam for the initial test periods, for fear of causing a crack to occur by releasing the weight of the grade beam from the tank.

The interstitial space around the tank was tested with vacuum to test the integrity of the outer shell. The first test failed, and a leak was located around a 4 in PVC fitting, and repaired. The tank was retested and failed again, but no leaks could be found along the exposed sections of the tank.

A second test was performed following the repair, and the tank failed again. After consulting with the base environmental personnel (Mike Cross, Mike Clayton, and Arturo McDonald) it was decided to remove the grade beam from the top of the tank and inspect the tank for vacuum leaks. The concrete beam was removed from the top of the tank, and soil was removed by hand. The top of the tank was clean and inspected for cracks. Nothing was found to indicate a breach in the outer shell at this location on top of the tank.

A third vacuum test was performed, and the tank again failed; the top of the tank was again thoroughly inspected during this test to look for possible leak locations, but nothing was found. The test was terminated, and the conclusion was made that there is a leak in the outer shell of the tank that is not related to any of the openings, fittings, or joints that are visible on the top of the tank. Repair of this tank would involve complete excavation to determine the cause(s) of the leaks, and to determine if repairs are feasible.

4.3 Precision Pipeline Tests

The line must be full of fuel to perform the hydrostatic tests; the line was found to be nearly full, and was topped-off with fuel provided by the base fuel department. The PetroTite system was used to apply 40 psig pressure to the inner wall of the pipe system in the steps described below.

CSS Panama City
Summary Report
UST System Testing at Tank 307R1
February 17, 1998

- Test #1 - The first test was performed by applying pressure at the UST end of the pipe system against the entire line as far as the end of TPD 2. The sect. valve between TPD 2 and TPD 3 was closed for this test. Pipe section TPD 3 is the 15 ft section (approx.) from the dispenser to the sect. valve at TPD 2, which was not included in the test because it was previously determined by others to have leaked (verbal from Mike Clayton). This hydrostatic test failed.

- Test #2 - The second test was performed after closing the sect. valve between TPD 2 and TPD 3. This test passed, indicating that pipe sections PD 1, PD 2, and TPD 3 are all tight, and that it is unlikely that any leaks have occurred from this part of the system. This indicates there may be a leak in the inner pipe in section TPD 2.

4.4 Pipeline Secondary Containment Tests

Dry nitrogen at 3 psig was used to pressurize the outer wall of the double walled FRP pipe at the standard test ports. All sections of pipe failed to hold pressure as described below. During the testing period there was no release of fuel observed from any of the outer walls of the exposed FRP sections, including section TPD 2, for which the inner pipe failed. The entire length of TPD 2 is visible within the concrete lined trenches. None of the buried sections of pipe failed the inner wall test, but all failed the outer wall test.

- Test #1 - Section PD 1 from UST to pump station failed to hold pressure.

- Test #2 - Section PD 2 from pump station to filter pad failed to hold pressure.

- Test #3 - Section TPD 3 from filter pad across pier to valve in utility trench on edge of pier failed to hold pressure.

- Test #4 - Section TPD 2 in utility trench on edge of pier failed to hold pressure.

5.0 Certifications and Reports

The certifications and reports from FDEP licensed specialty subcontractors are listed below and are included with this summary report as attachments. A field sketch showing the schematic arrangement of the UST and lines that were tested is also included as an attachment.

Attachments:

(1) Underground Storage Tank System Test Report; Southern Petroleum Systems; January 12, 1998

(2) Certificate of Underground Storage Tank System Testing; Tanknology-NDE; January 8, 1998

(3) Field Sketch of UST 307R1 and associated piping system.

425- 00003

SOUTHERN PETROLEUM SYSTEMS
SERVING THE PETROLEUM INDUSTRY SINCE 1953

2016 STANHOME WAY, ORLANDO, FLORIDA 32804 PHONE 407 481-9755 FAX 407 481-9722
JACKSONVILLE 904 384-1000 MIAMI 305 558-0440 TAMPA 813 620-3300

Underground Storage Tank System Test Report

Date of report: January 12, 1998

Location: US Navy Coastal Systems Station, Panama City, Florida

Technician: Scott Roberts ID of Tank System: UST 307

Tank Precision Tightness Test: by others (Tanknology-NDE)

Tank Outer Shell Test:

Date of Test: January 7, 8, 9, 1998

Test (1) applied 22" Hg vacuum; would not hold vacuum - failed

Test (2) repaired leak at top of tank and retested with 20" Hg vacuum - failed

Test (3) removed grade beam from above tank, to look for an obvious leak in outer shell; cleaned top of tank and checked fittings for tightness; applied 22" Hg vacuum - failed

Line Tests:

Date of Test: January 7, 8, 9, 1998

Internal Pipe Tests (Petrotite):

Test (1) product line from tank to isolation valve at end of section PD 2 along edge of pier failed Petrotite test.

Test (2) product line from tank to isolation valve at end of section PD 3 in concrete lined trench (with covers) passed Petrotite test.

Secondary Containment Pipe Tests:

Test (1) applied 3 psig nitrogen to interstitial space from UST to suction pump; lost pressure - failed (buried pipe labeled PD 1 on alarm panel).

Test (2) applied 3 psig nitrogen to interstitial space from pump to filter; lost pressure - failed (buried pipe labeled PD 2 on alarm panel).

Test (3) applied 3 psig nitrogen to interstitial space of pipe in concrete trench section PD 3, the pipe section from filter to edge of pier; lost pressure - failed.

Test (4) applied 3 psig nitrogen to interstitial space of pipe in concrete trench section PD 2, the pipe section in trench along edge of pier; lost pressure - failed.

Test (5) last section of line labeled PD 1 at edge of pier showed visible leak - failed.

Signed: _____ Date: 2/10/98

CERTIFICATE OF UNDERGROUND STORAGE TANK SYSTEM TESTING

TANKNOLOGY-NDE
8900 SHOAL CREEK BUILDING 200
AUSTIN, TEXAS 78757
(512) 451-6334
FAX (512) 459-1459

425 - 00005

TEST RESULT SITE SUMMARY REPORT

TEST TYPE: VacuTest PURPOSE: REQUEST

TEST DATE: 01/08/98 WORK ORDER NUMBER: 9106790

CLIENT: BPS TREADWELL, INC.
880 SOUTH EDGEWOOD AVE.
JACKSONVILLE, FL 32205

SITE: COASTAL SYSTEMS STATION
HWY 98 (NAVAL BASE)
PANAMA CITY, FL 32401

ATTN: TOM FRANKLIN

The following test(s) were conducted at the site above in accordance with all applicable portions of Federal, NFPA and local regulations

Tank Tests

1	DIESEL	6,000	97.00	PASS	0.000	PASS

Line and Leak Detector Tests

1	DIESEL				

TANKNOLOGY-NDE appreciates the opportunity to serve you, and looks forward to working with you in the future. Please call any time, day or night, when you need us.

TANKNOLOGY-NDE Representative: MARK LINDSEY

Test conducted by: EDDIE METTLES

Reviewed: Technician Certification Number:

Printed 02/11/98 13:34 KOHLMEYER

TANKNOLOGY-NDE

425-00095

TEST DATE: 01/08/98
CLIENT: [illegible] TREADWELL, INC.

WORK ORDER NUMBER: 9106790
SITE: COASTAL BIRDS STATION

Tank ID:	1	Material: [illegible] FIBER		Bottom to top ss in inches:	113.0
Product:	DIESEL	Tank manifolded:		Bottom to grade fill in inches:	116.0
Capacity in gallons:	6,000	Vent manifolded:		Fill pipe length in inches:	16.0
Diameter in inches:	97.00	Vapor recovery manifolded:		Fill pipe diameter in inches:	4.0
Length in inches:	190	Impact Valves Operational:	N	Stage I vapor recovery:	
Tank age (years):		Overfill protection:		Stage II vapor recovery:	
Fuel [illegible] rating:		Overspill protection:		Installed:	

CP installed on: / /

COMMENTS

	Start (in)	End (in)
Dipped Water Level:	0.00	0.00
Dipped Product Level:	83.00	83.00
Probe Water Level:	0.000	0.000

Ingress Detected: Water N Bubble N Vapor N

Test time: 12:49-14:54
VacuTect Test Type: Single tank
VacuTect Probe Entry Point: Fill
Pressure Set Point: 0.93
Tank water level in inches: 0.00
Water table depth in inches: 67.00
Determined by (method): WATER WELL
Result: PASS

COMMENTS
TANK IS FIBER.

	New/passed L.D. #1	Failed/replaced L.D. #1	New/passed L.D. #2	Failed/replaced L.D. #2
Make:				
Model:				
S/N:				
Open time in sec:				
Holding psi:				
Resiliency cc:				
Test leak rate ml/m:				
Metering psi:				
Calib. leak in gph:				
Results:				

COMMENTS
NO LD.

Material: DW FIBER
Diameter (in):
Length (ft):
Test psi:
Bleedback cc:
Test time (min):
Test 1: Start time:
Finish psi:
Vol change cc:
Test 2: Start time:
Finish psi:
Vol change cc:
Test 3: Start time:
Finish psi:
Vol change cc:
Final gph:
Result:
Pump type: SUCTION
Pump make: UNISTRUT

COMMENTS
NO PRODUCT LINE TESTED. ALREADY HAD ANOTHER COMPANY TEST IT.

TRANSTECHNOLOGY - NDE
8900 SHOAL CREEK, BUILDING 200
AUSTIN, TEXAS 78757
(512) 451-6334
FAX (512) 459-1459

425 - 0003

TEST DATE: 01/08/98 WORK ORDER NUMBER: 9106790

CLIENT: SPS TECHNOLOGY, INC. SITE: COASTAL SYSTEMS STATION

COMMENTS

TANK TESTED TIGHT.

PARTS REPLACED

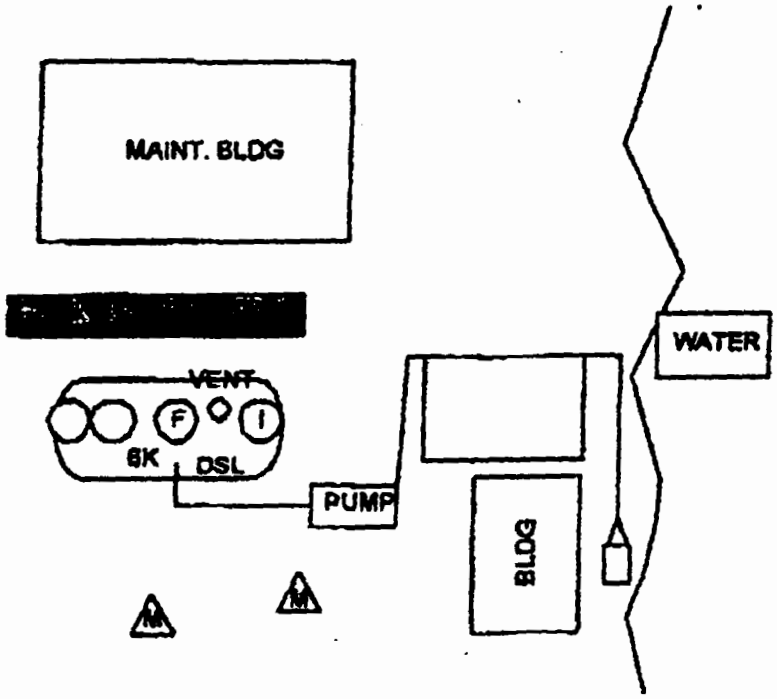
HELIUM PINPOINT TEST RESULTS (IF APPLICABLE)

TANKNOLOGY-NDE
6900 SHOAL CREEK, BUILDING 200
AUSTIN, TEXAS 78757
(512) 451-6334
FAX (512) 459-1459

425 - 00005

TEST DATE: 01/08/98
CLIENT: BPS TREADWELL, INC.

WORK ORDER NUMBER: 9106790
SITE: COASTAL SYSTEMS STATION



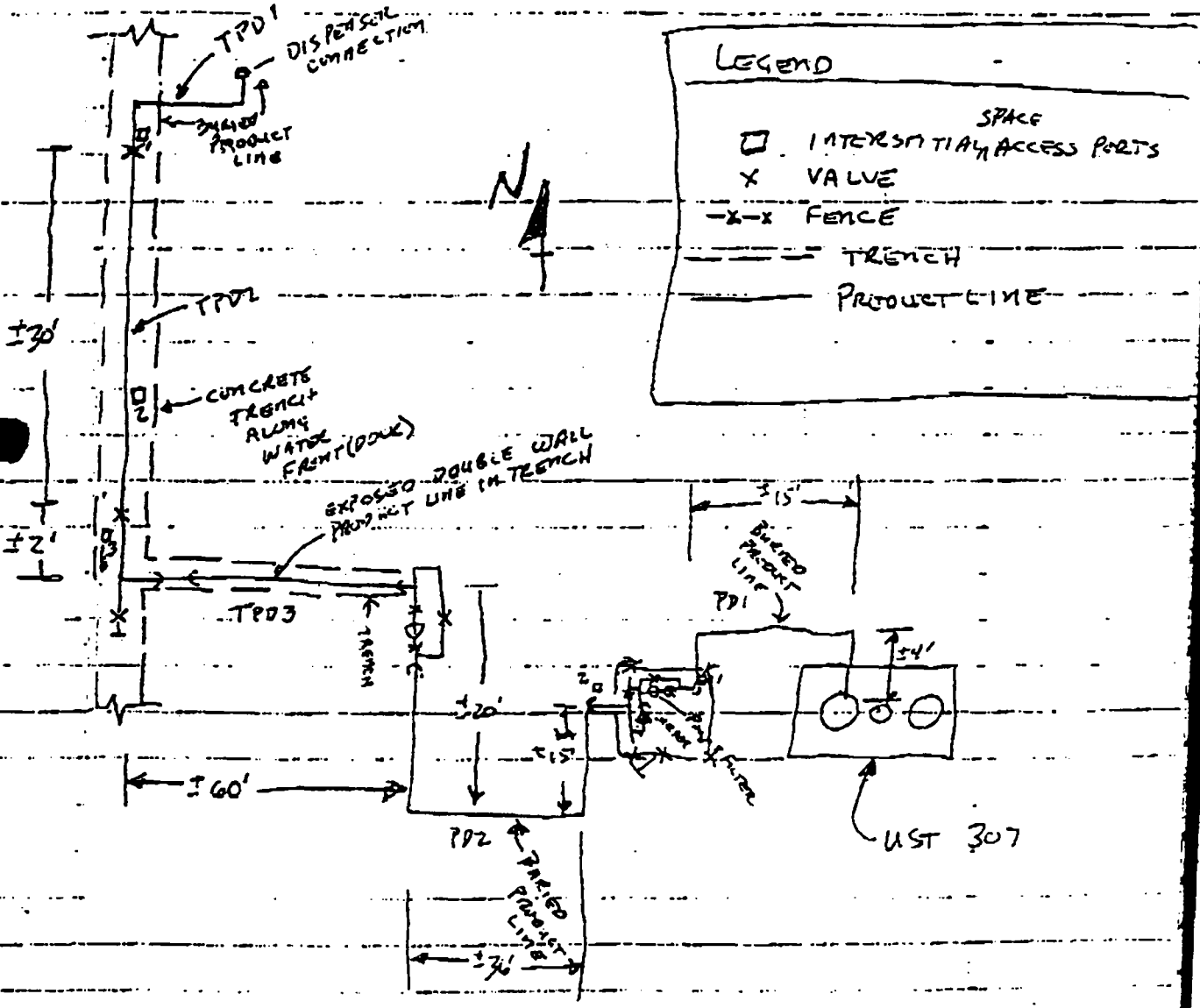
Printed 02/11/98 13:34 KOHLMEYER

DRAWN BY BILL HEVRDEYS 1/8/97 PRELIM. DATA.

	LINE DESIGNATION	LINE PRODUCT	OUTER SHELL	
Pump Str.	PD 1	NO LEAK	LEAK	
	PD 2	NO LEAK	LEAK	
Trench	TPD 1	NO TEST	NO TEST, VISIBLE FUEL	
	TPD 2	LEAK	LEAK	
	TPD 3	NO LEAK	LEAK	

TANK 307

- INTERSTITIAL SPACE LEAKED FAILED VACUUM TEST
- VACUUM TEST ON TANK PASSED. NO LEAK DETECTED.



Bechtel Environmental, Inc.
151 Lafayette Drive
Oak Ridge, Tennessee 37831-0350

Fax Cover Sheet

DATE:	Jan.13, 1998	**TIME:**	
TO:	Jerry Goodey	**PHONE:**	904-656-5458
		FAX:	904-656-7403
FROM:	Karen Atchley BEI	**PHONE:** **FAX:**	423-220-2167 423-220-2748

RE: Grid locations and OVA readings for the area near west dock tank 307R1

CC:

Number of pages including cover sheet:

Message

Jerry - this is the information Nick received a copy of and Bill Hevrdeys spoke to about. I am going to send you a hard copy overnight so you will have a more legible copy. Call me if you have any questions. Thanks.

Karen

CSS PANAMA CITY - EMERGENCY RESPONSE
BUILDING 77, DELIVERY ORDER 86
HEADSPACE ANALYSIS OF SOIL SAMPLES FOR PETROLEUM HYDROCARBONS

Sample I.D./Location	Date	Time	Depth	OVA (unfiltered) ppm	OVA (filtered) ppm
A-1	8/11/97	1407	6' 6"	42	27
B-1	8/11/97	1425	7'	8	8
D-4	8/11/97		No sample: interference	--	--
D-5	8/11/97	1450	6' 8"	110	58
D-6	8/11/97		No sample; interference	--	--
D-7	8/11/97	1523	5' 10"	54	38
D-7	8/11/97	1524	6'	110	56
D-7	8/11/97	1526	6' 6"	120	50
D-7	8/11/97	1528	7' 4"	260	120
D-8	8/11/97	1541	6'	240	110
D-8	8/11/97	1542	6' 6"	110	72
D-8	8/11/97	1544	7'	280	180
D-9	8/11/97	1604	5' 6"	>1000	650
D-9	8/11/97	1623	6'	>1000	900
D-10	8/11/97		No sample; interference	--	--
D-11	8/11/97		No sample; interference	--	--
D-12	8/11/97		No sample; interference	--	--
D-13	8/12/97	0749	5'	>1000	420
D-13	8/12/97	0754	6'	200	100
D-13	8/12/97	0755	6'6"	840	400
D-14	8/12/97	0820	7'	180	100
D-15	8/12/97		No sample; no odor detected	--	--
D-16	8/12/97		No sample; interference	--	--
D-17	8/12/97	0848	7'	6	Not analyzed
D-18	8/12/97		Not done	--	--
D-19	8/12/97		No sample; interference	--	--
C-1	8/12/97	0944	5'	38	30
C-1	8/12/97	0946	5' 5"	310	280
C-1	8/12/97	0950	6' 6"	>1000	>1000

CSS PANAMA CITY - EMERGENCY RESPONSE
BUILDING 77, DELIVERY ORDER 86
HEADSPACE ANALYSIS OF SOIL SAMPLES FOR PETROLEUM HYDROCARBONS

Sample I.D./Location	Date	Time	Depth	OVA (unfiltered) ppm	OVA (filtered) ppm
C-1	8/12/97	0953	7'	880	300
C-2	8/12/97	1100	7'	50	18
C-3	8/12/97	233	7'	>1000	660
C-4	8/12/97	1100	6'	>1000	360
	8/12/97	1100	7'	180	60
C-5	8/12/97	1252	6'	280	110
C-5	8/12/97	1252	7'	>1000	>1000
C-6	8/12/97	1219	6'	0	Not analyzed
C-6	8/12/97	1220	7'	26	18
D-20	8/12/97	1314	6' 6"	110	100
D-21	8/12/97	1315	6' 6"	160	110
D-22	8/12/97	1327	6'	8	Not analyzed
D-23	8/12/97	1355	7'	480	410
D-24	8/12/97	1432	7'	480	320
D-25	8/12/97	1448	6' 6"	280	1180
AST-1	8/12/97	1355	7'	0	Not analyzed
AST-2	8/12/97	1400	3' 11"	460	200
D-26	8/13/97	0829	5'	4	Not analyzed
D-27	8/13/97	0845	5' 6"	200	100
D-27	8/13/97	0849	6'	500	140
D-28	8/13/97		No sample; interference	--	--
D-29	8/13/97	0915	6'	240	100
D-30	8/13/97	0931	6'	640	200
D-31	8/13/97	0945	5'	180	94
D-31	8/13/97	0949	6'	440	260
D-32	8/13/97	1100	6'	88	50
D-33	8/13/97	1116	6'	560	300
D-34	8/13/97	1124	5'	110	60
D-34	8/13/97	1127	6'	240	100
D-35	8/13/97	1131	6'	410	120

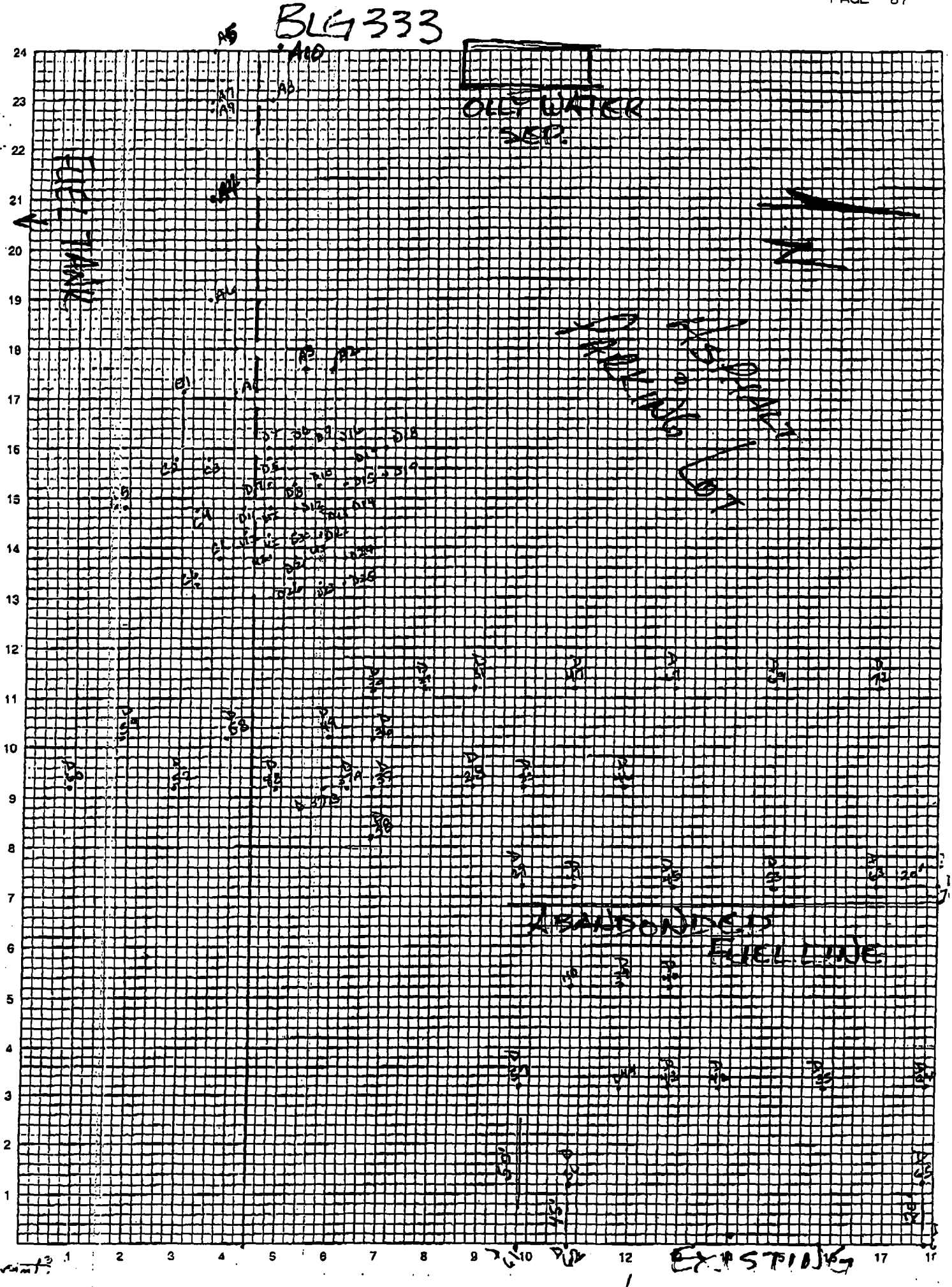
CSS PANAMA CITY - EMERGENCY RESPONSE
BUILDING 77, DELIVERY ORDER 86
HEADSPACE ANALYSIS OF SOIL SAMPLES FOR PETROLEUM HYDROCARBONS

Sample I.D./Location	Date	Time	Depth	OVA (unfiltered) ppm	OVA (filtered) ppm
D-36	8/13/97	1246	6'	380	140
D-37 & D-37A	8/13/97		No samples; interferences	--	--
D-37B	8/13/97	1335	6'	440	200
D-38	8/13/97	1337	5' 6"	11	Not analyzed
D-39	8/13/97	1344	6'	>1000	>1000
D-40	8/13/97	1407	5' 6"	>1000	510
D-40	8/13/97	1409	6'	880	360
D-41	8/13/97	1414	6'	640	200
D-42	8/13/97	1450	6'	800	250
D-43	8/13/97	1456	6'	460	180
D-44	8/13/97	1517	5'	200	62
D-45	8/13/97	1544	6'	380	140
D-46	8/13/97	1610	6'	580	200
D-47	8/13/97	1615	6'	200	88
D-48	8/13/97	1656	6'	360	190
D-49	8/13/97	1703	5' 6"	340	110
D-50	8/14/97	0829	1' - 7' (composite)	84	22
D-51	8/14/97	0934	1' - 7' (composite)	64	33
D-51	8/14/97	0934	6' (discrete/grab)	290	100
D-52	8/14/97	0847	7'	80	28
D-53	8/14/97	0855	6'	300	120
D-54	8/14/97	0904	6'	180	80
D-55	8/14/97	0914	5' 6"	230	80
D-56	8/14/97	0939	6'	270	96
D-57	8/14/97	1008	6'	90	66
D-58	8/14/97	1030	6'	110	60
D-59	8/14/97	1148	6'	0	Not analyzed
D-60	8/14/97	1244	6'	0	Not analyzed
D-61	8/14/97	1307	4' 5" (utility interference)	200	10
D-62	8/14/97	1312	6'	>1000	740

CSS PANAMA CITY - EMERGENCY RESPONSE
BUILDING 77, DELIVERY ORDER 86
HEADSPACE ANALYSIS OF SOIL SAMPLES FOR PETROLEUM HYDROCARBONS

Sample I.D./Location	Date	Time	Depth	OVA (unfiltered) ppm	OVA (filtered) ppm
D-63	8/14/97	1349	5'	520	240
D-64	8/14/97	1430	6'	11	Not analyzed
D-65	8/14/97	1437	6'	2	Not analyzed
D-66	8/14/97	1450	6'	28	16
D-67	8/14/97	1356	6'	100	40
D-68	8/14/97	1418	6'	200	82
D-69	8/14/97	1606	5'	>1000	>1000
D-70	8/14/97	1625	5'	>1000	590
D-71	8/14/97	1615	5'	36	19
D-72	8/14/97	1631	5' 6"	900	400
A-2	8/15/97	0800	7'	200	68
A-3	8/15/97	0807	6'	720	300
A-4	8/15/97	0831	5'	>1000	>1000
A-5	8/15/97	0831	4' 5"; utility interference	0	Not analyzed
A-6	8/15/97	0840	5'	0	Not analyzed
A-7	8/15/97	0943	6'	620	280
A-8	8/15/97	1010	6'	480	110
A-10	8/15/97	1300	6'	280	180
D-73	8/15/97	0959	6'	Lab sample only	Analysis pending
A-9	8/15/97	1054	6'	Lab sample only	Analysis pending
D-74	8/15/97	1131	6'	Lab sample only	Analysis pending
D-75	8/15/97	1155	5'	Lab sample only	Analysis pending

FUEL TANK
24
23
22
21
20
19
18
17
16
15
14
13
12
11


BLG 333
OILY WATER SEP.
ABANDONED FUEL LINE
EXISTING

APPENDIX B

BROWN & ROOT ENVIRONMENTAL
STANDARD OPERATING PROCEDURES
AND STANDARD FIELD FORMS

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

FIGURES

1.0 PURPOSE

The purpose of this document is to establish standard procedures and technical guidance on borehole and sample logging.

2.0 SCOPE

These procedures provide descriptions of the standard techniques for borehole and sample logging. These techniques shall be used for each boring logged to provide consistent descriptions of subsurface lithology. While experience is the only method to develop confidence and accuracy in the description of soil and rock, the field geologist/engineer can do a good job of classification by careful, thoughtful observation and by being consistent throughout the classification procedure.

3.0 GLOSSARY

None.

4.0 RESPONSIBILITIES

Site Geologist. Responsible for supervising all boring activities and assuring that each borehole is completely logged. If more than one rig is being used on site, the Site Geologist must make sure that each field geologist is properly trained in logging procedures. A brief review or training session may be necessary prior to the start up of the field program and/or upon completion of the first boring.

5.0 PROCEDURES

The classification of soil and rocks is one of the most important jobs of the field geologist/engineer. To maintain a consistent flow of information, it is imperative that the field geologist/engineer understand and accurately use the field classification system described in this SOP. This identification is based on visual examination and manual tests.

5.1 Materials Needed

When logging soil and rock samples, the geologist or engineer may be equipped with the following:

- Rock hammer
- Knife
- Camera
- Dilute hydrochloric acid (HCl)
- Ruler (marked in tenths and hundredths of feet)
- Hand Lens

5.2 Classification of Soils

All data shall be written directly on the boring log (Figure 1) or in a field notebook if more space is needed. Details on filling out the boring log are discussed in Section 5.5.

5.2.1 USCS Classification

Soils are to be classified according to the Unified Soil Classification System (USCS). This method of classification is detailed in Figure 1 (Continued).

FIGURE 1

BORING LOG (EXAMPLE)

BORING LOG

Page ___ of ___

PROJECT NAME: _____ BORING NUMBER: _____
PROJECT NUMBER: _____ DATE: _____
DRILLING COMPANY: _____ GEOLOGIST: _____
DRILLING RIG: _____ DRILLER: _____

Sample no. and Type or RQD	Depth (Ft.) or Run no.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample B.Z.	Borehole**	Driller B.Z.**

* When rock coring, enter rock brokenness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated response read.

Remarks: _____

Drilling Area Background (ppm): _____

Converted to Well: Yes _____ No _____ Well I.D. #: _____

FIGURE 1 (CONTINUED)

SOIL TERMS

UNIFIED SOIL CLASSIFICATION (USCS)

COARSE-GRAINED SOILS
More Than Half of Material is LARGER than No. 200 Sieve Size

FIELD IDENTIFICATION PROCEDURES (Excluding Particles Larger than 3 Inches and Basing Fractions on Estimated Weights)			GROUP SYMBOL	TYPICAL NAMES
GRAVELS (50% or more of coarse fraction retained on No. 4 sieve)	CLEAN GRAVELS (Less than 5% fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	well graded gravels, gravel-sand mixtures, little or no fines.
		Predominantly one size or a range of sizes with some intermediate sizes missing.	GP	poorly graded gravels, gravel sand mixtures, little or no fines.
	GRAVELS W/FINES (More than 12% fines)	Non plastic fines (for identification procedures, see ML)	GM	silty gravels, poorly graded gravel-sand-silt mixtures.
		Plastic fines (for identification procedures, see CL)	GC	Clayey gravels, poorly graded gravel sand-clay mixtures.
SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	SW	well graded sand, gravelly sands, little or no fines.
		Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	Poorly graded sands, gravelly sands, little or no fines.
	SANDS W/FINES (More than 12% fines)	Non plastic fines (for identification procedures, see MCL)	SM	Silty sands, poorly graded sand silt mixtures.
		Plastic fines (for identification procedures, see CL)	SC	Clayey sands, poorly graded sand-clay mixtures.

FINE-GRAINED SOILS
More Than Half of Material is SMALLER than No. 200 Sieve Size

FIELD IDENTIFICATION PROCEDURES (Excluding Particles Larger than 3 Inches and Basing Fractions on Estimated Weights)					GROUP SYMBOL	TYPICAL NAMES
	Identification Procedures on Fraction Smaller than No. 40 Sieve Size					
		DRY STRENGTH (Crushing Characteristics)	DILATANCY (Reaction to Shaking)	TOUGHNESS (Consistency near Plastic Limit)		
SILTS AND CLAYS Liquid limit <50		None to Slight	Quick to Slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity.
		Medium to High	None to Very Slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		Slight to Medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity.
SILTS AND CLAYS Liquid limit >50		Slight to Medium	Slow to None	Slight to Medium	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.
		High to Very High	None	High	CH	Inorganic clays of high plasticity, fat clays.
		Medium to High	None to Very Slow	Slight to Medium	OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.			PT	Peat and other organic soils

Boundary classifications: Soils possessing characteristics of two groups are designated by combining group symbols. For example, GW GC, well graded gravel sand mixture with clay binder.
All sieve sizes on this chart are U.S. Standard.

DENSITY OF GRANULAR SOILS

DESIGNATION	STANDARD PENETRATION RESISTANCE BLOWS/FOOT
Very Loose	0-4
Loose	5-10
Medium Loose	11-30
Dense	31-50
Very Dense	Over 50

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNC COMPRESSIVE STRENGTH (TONS/SQ. FT.)	STANDARD PENETRATION RESISTANCE BLOWS/FOOT	FIELD IDENTIFICATION METHODS
Very Soft	Less than 0.25	0 to 2	Easily penetrated several inches by fist
Soft	0.25 to 0.50	3 to 4	Easily penetrated several inches by thumb.
Medium Stiff	0.50 to 1.0	5 to 8	Can be penetrated several inches by thumb.
Stiff	1.0 to 2.0	9 to 15	Readily indented by thumb.
Very Stiff	2.0 to 4.0	15 to 30	Readily indented by thumbnail.
Hard	More than 4.0	Over 30	Indented with difficulty by thumbnail.

ROCK TERMS

ROCK HARDNESS (FROM CORE SAMPLES)

Descriptive Terms	Scratch Test or Knife Effects	Hammer Effects
Soft	Easily Gouged	Crushes when pressed with hammer
Medium Soft	Can be Gouged	Breaks (one blow); crumbly edges
Medium Hard	Can be scratched	Breaks (one blow); sharp edges
Hard	Cannot be scratched	Breaks conchoidally (several blows); sharp edges

ROCK BROKENESS

Descriptive Terms	Abbreviations	Spacing
Very Broken	(V. Br.)	0-3"
Broken	(Br.)	3"-1'
Blocky	(Bl.)	1'-3'
Massive	(M.)	3'-10'

LEGEND:

SOIL SAMPLES - TYPES
- S-3" Split-Barrel Sample
- ST-3" O.D. Undisturbed Sample
- O - Other Samples, Specify in Remarks

ROCK SAMPLES - TYPES
- C HQ (Conventional) Core (2.5-3/8" O.D.)
- Q HQ (Wireline) Core (2.1-7/8" O.D.)
- O - Other Core Sizes, Specify in Remarks

WATER LEVELS
- 12/10 ▽ 12.6' Initial Level w/Date & Depth
- 12/10 ▼ 12.4' Stabilized Level w/Date & Depth

This method of classification identifies soil types on the basis of grain size and cohesiveness.

Fine-grained soils, or fines, are smaller than the No. 200 sieve and are of two types: silt (M) and clay (C). Some classification systems define size ranges for these soil particles, but for field classification purposes, they are identified by their respective behaviors. Organic material (O) is a common component of soil but has no size range; it is recognized by its composition. The careful study of the USCS will aid in developing the competence and consistency necessary for the classification of soils.

Coarse-grained soils shall be divided into rock fragments, sand, or gravel. The terms sand and gravel not only refer to the size of the soil particles but also to their depositional history. To insure accuracy in description, the term rock fragments shall be used to indicate angular granular materials resulting from the breakup of rock. The sharp edges typically observed indicate little or no transport from their source area, and therefore the term provides additional information in reconstructing the depositional environment of the soils encountered. When the term "rock fragments" is used it shall be followed by a size designation such as "(1/4 inchΦ-1/2 inchΦ)" or "coarse-sand size" either immediately after the entry or in the remarks column. The USCS classification would not be affected by this variation in terms.

5.2.2 Color

Soil colors shall be described utilizing a single color descriptor preceded, when necessary, by a modifier to denote variations in shade or color mixtures. A soil could therefore be referred to as "gray" or "light gray" or "blue-gray." Since color can be utilized in correlating units between sampling locations, it is important for color descriptions to be consistent from one boring to another.

Colors must be described while the sample is still moist. Soil samples shall be broken or split vertically to describe colors. Samplers tend to smear the sample surface creating color variations between the sample interior and exterior.

The term "mottled" shall be used to indicate soils irregularly marked with spots of different colors. Mottling in soils usually indicates poor aeration and lack of good drainage.

Soil Color Charts shall not be used unless specified by the project manager.

5.2.3 Relative Density and Consistency

To classify the relative density and/or consistency of a soil, the geologist is to first identify the soil type. Granular soils contain predominantly sands and gravels. They are noncohesive (particles do not adhere well when compressed). Finer-grained soils (silts and clays) are cohesive (particles will adhere together when compressed).

The density of noncohesive, granular soils is classified according to standard penetration resistances obtained from split-barrel sampling performed according to the methods detailed in Standard Operating Procedures GH-1.3 and SA-1.2. Those designations are:

Designation	Standard Penetration Resistance (Blows per Foot)
Very loose	0 to 4
Loose	5 to 10
Medium dense	11 to 30
Dense	31 to 50
Very dense	Over 50

Standard penetration resistance is the number of blows required to drive a split-barrel sampler with a 2-inch outside diameter 12 inches into the material using a 140-pound hammer falling freely through 30 inches. The sampler is driven through an 18-inch sample interval, and the number of blows is recorded for each 6-inch increment. The density designation of granular soils is obtained by adding the number of blows required to penetrate the last 12 inches of each sample interval. It is important to note that if gravel or rock fragments are broken by the sampler or if rock fragments are lodged in the tip, the resulting blow count will be erroneously high, reflecting a higher density than actually exists. This shall be noted on the log and referenced to the sample number. Granular soils are given the USCS classifications GW, GP, GM, SW, SP, SM, GC, or SC (see Figure 1).

The consistency of cohesive soils is determined by performing field tests and identifying the consistency as shown in Figure 2.

Cohesive soils are given the USCS classifications ML, MH, CL, CH, OL or OH (see Figure 1).

The consistency of cohesive soils is determined either by blow counts, a pocket penetrometer (values listed in the table as Unconfined Compressive Strength), or by hand by determining the resistance to penetration by the thumb. The pocket penetrometer and thumb determination methods are conducted on a selected sample of the soil, preferably the lowest 0.5 foot of the sample in the split-barrel sampler. The sample shall be broken in half and the thumb or penetrometer pushed into the end of the sample to determine the consistency. Do not determine consistency by attempting to penetrate a rock fragment. If the sample is decomposed rock, it is classified as a soft decomposed rock rather than a hard soil. Consistency shall not be determined solely by blow counts. One of the other methods shall be used in conjunction with it. The designations used to describe the consistency of cohesive soils are shown in Figure 2.

FIGURE 2

CONSISTENCY FOR COHESIVE SOILS

Consistency	Standard Penetration Resistance (Blows per Foot)	Unconfined Compressive Strength (Tons/Sq. Foot by pocket penetration)	Field Identification
Very soft	0 to 2	Less than 0.25	Easily penetrated several inches by fist
Soft	2 to 4	0.25 to 0.50	Easily penetrated several inches by thumb
Medium stiff	4 to 8	0.50 to 1.0	Can be penetrated several inches by thumb with moderate effort
Stiff	8 to 15	1.0 to 2.0	Readily indented by thumb but penetrated only with great effort
Very stiff	15 to 30	2.0 to 4.0	Readily indented by thumbnail
Hard	Over 30	More than 4.0	Indented with difficulty by thumbnail

5.2.4 Weight Percentages

In nature, soils are comprised of particles of varying size and shape, and are combinations of the various grain types. The following terms are useful in the description of soil:

Terms of Identifying Proportion of the Component	Defining Range of Percentages by Weight
Trace	0 - 10 percent
Some	11 - 30 percent
Adjective form of the soil type (e.g., "sandy")	31 - 50 percent

Examples:

- Silty fine sand: 50 to 69 percent fine sand, 31 to 50 percent silt.
- Medium to coarse sand, some silt: 70 to 80 percent medium to coarse sand, 11 to 30 percent silt.
- Fine sandy silt, trace clay: 50 to 68 percent silt, 31 to 49 percent fine sand, 1 to 10 percent clay.
- Clayey silt, some coarse sand: 70 to 89 percent clayey silt, 11 to 30 percent coarse sand.

5.2.5 Moisture

Moisture content is estimated in the field according to four categories: dry, moist, wet, and saturated. In dry soil, there appears to be little or no water. Saturated samples obviously have all the water they can hold. Moist and wet classifications are somewhat subjective and often are determined by the individual's judgment. A suggested parameter for this would be calling a soil wet if rolling it in the hand or on a porous surface liberates water, i.e., dirties or muddies the surface. Whatever method is adopted for describing moisture, it is important that the method used by an individual remains consistent throughout an entire drilling job.

Laboratory tests for water content shall be performed if the natural water content is important.

5.2.6 Stratification

Stratification can only be determined after the sample barrel is opened. The stratification or bedding thickness for soil and rock is depending on grain size and composition. The classification to be used for stratification description is shown in Figure 3.

5.2.7 Texture/Fabric/Bedding

The texture/fabric/bedding of the soil shall be described. Texture is described as the relative angularity of the particles: rounded, subrounded, subangular, and angular. Fabric shall be noted as to whether the particles are flat or bulky and whether there is a particular relation between particles (i.e., all the flat particles are parallel or there is some cementation). The bedding or structure shall also be noted (e.g., stratified, lensed, nonstratified, heterogeneous varved).

FIGURE 3

BEDDING THICKNESS CLASSIFICATION

Thickness (metric)	Thickness (Approximate English Equivalent)	Classification
> 1.0 meter	> 3.3'	Massive
30 cm - 1 meter	1.0' - 3.3'	Thick Bedded
10 cm - 30 cm	4" - 1.0'	Medium Bedded
3 cm - 10 cm	1" - 4"	Thin Bedded
1 cm - 3 cm	2/5" - 1"	Very Thin Bedded
3 mm - 1 cm	1/8" - 2/5"	Laminated
1 mm - 3 mm	1/32" - 1/8"	Thinly Laminated
< 1 mm	<1/32"	Micro Laminated

(Weir, 1973 and Ingram, 1954)

5.2.8 Summary of Soil Classification

In summary, soils shall be classified in a similar manner by each geologist/engineer at a project site. The hierarchy of classification is as follows:

- Density and/or consistency
- Color
- Plasticity (Optional)
- Soil types
- Moisture content
- Stratification
- Texture, fabric, bedding
- Other distinguishing features

5.3 Classification of Rocks

Rocks are grouped into three main divisions: sedimentary, igneous and metamorphic. Sedimentary rocks are by far the predominant type exposed at the earth's surface. The following basic names are applied to the types of rocks found in sedimentary sequences:

- Sandstone - Made up predominantly of granular materials ranging between 1/16 to 2 mm in diameter.

- Siltstone - Made up of granular materials less than 1/16 to 1/256 mm in diameter. Fractures irregularly. Medium thick to thick bedded.

- Claystone - Very fine-grained rock made up of clay and silt-size materials. Fractures irregularly. Very smooth to touch. Generally has irregularly spaced pitting on surface of drilled cores.

- Shale - A fissile very fine-grained rock. Fractures along bedding planes.

- Limestone - Rock made up predominantly of calcite ($CaCO_3$). Effervesces strongly upon the application of dilute hydrochloric acid.

- Coal - Rock consisting mainly of organic remains.

- Others - Numerous other sedimentary rock types are present in lesser amounts in the stratigraphic record. The local abundance of any of these rock types is dependent upon the depositional history of the area. Conglomerate, halite, gypsum, dolomite, anhydrite, lignite, etc. are some of the rock types found in lesser amounts.

In classifying a sedimentary rock the following hierarchy shall be noted:

- Rock type
- Color
- Bedding thickness
- Hardness
- Fracturing
- Weathering
- Other characteristics

5.3.1 Rock Type

As described above, there are numerous types of sedimentary rocks. In most cases, a rock will be a combination of several grain types, therefore, a modifier such as a sandy siltstone, or a silty sandstone can be used. The modifier indicates that a significant portion of the rock type is composed of the modifier. Other modifiers can include carbonaceous, calcareous, siliceous, etc.

Grain size is the basis for the classification of clastic sedimentary rocks. Figure 4 is the Udden-Wentworth classification that will be assigned to sedimentary rocks. The individual boundaries are slightly different than the USCS subdivision for soil classification. For field determination of grain sizes, a scale can be used for the coarse grained rocks. For example, the division between siltstone and claystone may not be measurable in the field. The boundary shall be determined by use of a hand lens. If the grains cannot be seen with the naked eye but are distinguishable with a hand lens, the rock is a siltstone. If the grains are not distinguishable with a hand lens, the rock is a claystone.

5.3.2 Color

The color of a rock can be determined in a similar manner as for soil samples. Rock core samples shall be classified while wet, when possible, and air cored samples shall be scraped clean of cuttings prior to color classifications.

Rock color charts shall not be used unless specified by the Project Manager.

5.3.3 Bedding Thickness

The bedding thickness designations applied to soil classification (see Figure 3) will also be used for rock classification.

5.3.4 Hardness

The hardness of a rock is a function of the compaction, cementation, and mineralogical composition of the rock. A relative scale for sedimentary rock hardness is as follows:

- Soft - Weathered, considerable erosion of core, easily gouged by screwdriver, scratched by fingernail. Soft rock crushes or deforms under pressure of a pressed hammer. This term is always used for the hardness of the saprolite (decomposed rock which occupies the zone between the lowest soil horizon and firm bedrock).
- Medium soft - Slight erosion of core, slightly gouged by screwdriver, or breaks with crumbly edges from single hammer blow.
- Medium hard - No core erosion, easily scratched by screwdriver, or breaks with sharp edges from single hammer blow.
- Hard - Requires several hammer blows to break and has sharp conchoidal breaks. Cannot be scratched with screwdriver.

Note the difference in usage here of the works "scratch" and "gouge." A scratch shall be considered a slight depression in the rock (do not mistake the scraping off of rock flour from drilling with a scratch in the rock itself), while a gouge is much deeper.

FIGURE 4

GRAIN SIZE CLASSIFICATION FOR ROCKS

Particle Name	Grain Size Diameter
Cobbles	> 64 mm
Pebbles	4 - 64 mm
Granules	2 - 4 mm
Very Coarse Sand	1 - 2 mm
Coarse Sand	0.5 - 1 mm
Medium Sand	0.25 - 0.5 mm
Fine Sand	0.125 - 0.25 mm
Very Fine Sand	0.0625 - 0.125 mm
Silt	0.0039 - 0.0625 mm

After Wentworth, 1922

5.3.5 Fracturing

The degree of fracturing or brokenness of a rock is described by measuring the fractures or joint spacing. After eliminating drilling breaks, the average spacing is calculated and the fracturing is described by the following terms:

- Very broken (V. BR.) - Less than 2-inch spacing between fractures
- Broken (BR.) - 2-inch to 1-foot spacing between fractures
- Blocky (BL) - 1- to 3-foot spacing between fractures
- Massive (M.) - 3 to 10-foot spacing between fractures

The structural integrity of the rock can be approximated by calculating the Rock Quality Designation (RQD) of cores recovered. The RQD is determined by adding the total lengths of all pieces exceeding 4 inches and dividing by the total length of the coring run, to obtain a percentage.

Method of Calculating RQD
(After Deere, 1964)

$$RQD\ \% = r/l \times 100$$

r = Total length of all pieces of the lithologic unit being measured, which are greater than 4 inches length, and have resulted from natural breaks. Natural breaks include slickensides, joints, compaction slicks, bedding plane partings (not caused by drilling), friable zones, etc.

l = Total length of the coring run.

5.3.6 Weathering

The degree of weathering is a significant parameter that is important in determining weathering profiles and is also useful in engineering designs. The following terms can be applied to distinguish the degree of weathering:

- Fresh - Rock shows little or no weathering effect. Fractures or joints have little or no staining and rock has a bright appearance.
- Slight - Rock has some staining which may penetrate several centimeters into the rock. Clay filling of joints may occur. Feldspar grains may show some alteration.
- Moderate - Most of the rock, with exception of quartz grains, is stained. Rock is weakened due to weathering and can be easily broken with hammer.
- Severe - All rock including quartz grains is stained. Some of the rock is weathered to the extent of becoming a soil. Rock is very weak.

5.3.7 Other Characteristics

The following items shall be included in the rock description:

- Description of contact between two rock units. These can be sharp or gradational.
- Stratification (parallel, cross stratified).

- Description of any filled cavities or vugs.
- Cementation (calcareous, siliceous, hematitic).
- Description of any joints or open fractures.
- Observation of the presence of fossils.
- Notation of joints with depth, approximate angle to horizontal, any mineral filling or coating, and degree of weathering.

All information shown on the boring logs shall be neat to the point where it can be reproduced on a copy machine for report presentation. The data shall be kept current to provide control of the drilling program and to indicate various areas requiring special consideration and sampling.

5.3.8 Additional Terms Used in the Description of Rock

The following terms are used to further identify rocks:

- Seam - Thin (12 inches or less), probably continuous layer.
- Some - Indicates significant (15 to 40 percent) amounts of the accessory material. For example, rock composed of seams of sandstone (70 percent) and shale (30 percent) would be "sandstone -- some shale seams."
- Few - Indicates insignificant (0 to 15 percent) amounts of the accessory material. For example, rock composed of seam of sandstone (90 percent) and shale (10 percent) would be "sandstone -- few shale seams."
- Interbedded - Used to indicate thin or very thin alternating seams of material occurring in approximately equal amounts. For example, rock composed of thin alternating seams of sandstone (50 percent) and shale (50 percent) would be "interbedded sandstone and shale."
- Interlayered - Used to indicate thick alternating seams of material occurring in approximately equal amounts.

The preceding sections describe the classification of sedimentary rocks. The following are some basic names that are applied to igneous rocks:

- Basalt - A fine-grained extrusive rock composed primarily of calcic plagioclase and pyroxene.
- Rhyolite - A fine-grained volcanic rock containing abundant quartz and orthoclase. The fine-grained equivalent of a granite.
- Granite - A coarse-grained plutonic rock consisting essentially of alkali feldspar and quartz.
- Diorite - A coarse-grained plutonic rock consisting essentially of sodic plagioclase and hornblende.
- Gabbro - A coarse-grained plutonic rock consisting of calcic plagioclase and clinopyroxene. Loosely used for any coarse-grained dark igneous rock.

The following are some basic names that are applied to metamorphic rocks:

- Slate - A very fine-grained foliated rock possessing a well developed slaty cleavage. Contains predominantly chlorite, mica, quartz, and sericite.
- Phyllite - A fine-grained foliated rock that splits into thin flaky sheets with a silky sheen on cleavage surface.
- Schist - A medium to coarse-grained foliated rock with subparallel arrangement of the micaceous minerals which dominate its composition.
- Gneiss - A coarse-grained foliated rock with bands rich in granular and platy minerals.
- Quartzite - A fine- to coarse-grained nonfoliated rock breaking across grains, consisting essentially of quartz sand with silica cement.

5.4 Abbreviations

Abbreviations may be used in the description of a rock or soil. However, they shall be kept at a minimum. Following are some of the abbreviations that may be used:

C	-	Coarse	Lt	-	Light	Yl	-	Yellow
Med	-	Medium	BR	-	Broken	Or	-	Orange
F	-	Fine	BL	-	Blocky	SS	-	Sandstone
V	-	Very	M	-	Massive	Sh	-	Shale
Sl	-	Slight	Br	-	Brown	LS	-	Limestone
Occ	-	Occasional	Bl	-	Black	Fgr	-	Fine-grained
Tr	-	Trace						

5.5 Boring Logs and Documentation

This section describes in more detail the procedures to be used in completing boring logs in the field. Information obtained from the preceding sections shall be used to complete the logs. A sample boring log has been provided as Figure 5.

The field geologist/engineer shall use this example as a guide in completing each boring log. Each boring log shall be fully described by the geologist/engineer as the boring is being drilled. Every sheet contains space for 25 feet of log. Information regarding classification details is provided either on the back of the boring log or on a separate sheet, for field use.

FIGURE 5
COMPLETED BORING LOG (EXAMPLE)

BORING LOG

Page 1 of 1

PROJECT NAME: NSB - SITE
PROJECT NUMBER: 9594
DRILLING COMPANY: SOILTEST CO.
DRILLING RIG: CME - 55
BORING NUMBER: SB/MW 1
DATE: 3/8/96
GEOLOGIST: SJ CONTI
DRILLER: R. ROCK

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Description or Screened Interval)	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1	0.0	7/6	1.5/2.0		M DENSE	BRN	SILTY SAND - SOME	SM	MOIST SL. ORG.	5	0	0	0
C DROP	2.0	9/10				TO BLK	ROCK FR - TR BRICKS		ODOR				
							(FILL)		FILL TO 4'±				
	4.0			4.0									
S-2 C		5/7	2.9/2.0		M DENSE	BRN	SILTY SAND - TR FINE	SM	MOIST - W ODOR	10	0	-	-
0810	6.0	9/8					GRAVEL		NAT. MATL. — NO SAMPLE				
	•			7'▽					SB01-0406 FOR ANALYSIS				
	9.0			= 8.0									
S-3 C		6/8	1.9/2.0		DENSE	TAN BRN	FINE TO COARSE SAND	SW	WET	0	0	0	0
0820	10.0	17/16					TR. F. GRAVEL		HIT WATER = 7'±				
	12.0			12.0									
S-4 C		7/6	1.6/2.0		STIFF	GRAY	SILTY CLAY	CL	MOIST → WET	0	.5	-	-
0830	14.0	5/8											
	15.0			15.0					AUGER REF @ 15'				
				16	M HARD	BRN	SILTSTONE	WBR	WEATHERED				
									LO ZONES @ 15.5				
9/5	①		4.0/5.0						WATER STAINS @ 16.5, 17.1, 17.5	0	0	0	0
				19'					LOSING SOME				
	20.0				HARD	GRAY	SANDSTONE - SOME	BR	DRILL H2O @ 17'±				
							SILTSTONE		SET TEMP 6" CAS TO 15.5				
4.9/5.0	②		5.0/5.0						SET 2" Ø PVC SCREEN 16'-25'	0	0	0	0
									SAND 14-25				
	25.0			25					PELLETS 12-14				

* When rock coring, enter rock properties.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated response read.

• 1-20Z
1-80Z

Drilling Area Background (ppm): 0

Remarks: CME-55 R16 4¼" ID HSA - 9" OD ±
** SPLIT SPOONS - 140 LB HAMMER - 30" DROP
NX CORE IN BEDROCK RUN ① = 25 MIN. RUN ② = 15 MIN

Converted to Well: Yes ✓ No ____ Well I.D. #: MW-1

5.5.1 Soil Classification

- Identify site name, boring number, job number, etc. Elevations and water level data to be entered when surveyed data is available.

- Enter sample number (from SPT) under appropriate column. Enter depth sample was taken from (1 block = 1 foot). Fractional footages, i.e., change of lithology at 13.7 feet, shall be lined off at the proportional location between the 13- and 14-foot marks. Enter blow counts (Standard Penetration Resistance) diagonally (as shown). Standard penetration resistance is covered in Section 5.2.3.

- Determine sample recovery/sample length as shown. Measure the total length of sample recovered from the split-spoon sampler, including material in the drive shoe. Do not include cuttings or wash material that may be in the upper portion of the sample tube.

- Indicate any change in lithology by drawing a line at the appropriate depth. For example, if clayey silt was encountered from 0 to 5.5 feet and shale from 5.5 to 6.0 feet, a line shall be drawn at this increment. This information is helpful in the construction of cross-sections. As an alternative, symbols may be used to identify each change in lithology.

- The density of granular soils is obtained by adding the number of blows for the last two increments. Refer to Density of Granular Soils Chart on back of log sheet. For consistency of cohesive soils refer also to the back of log sheet - Consistency of Cohesive Soils. Enter this information under the appropriate column. Refer to Section 5.2.3.

- Enter color of the material in the appropriate column.

- Describe material using the USCS. Limit this column for sample description only. The predominate material is described last. If the primary soil is silt but has fines (clay) - use clayey silt. Limit soil descriptors to the following:

  - Trace: 0 - 10 percent
  - Some: 11 - 30 percent
  - And/Or: 31 - 50 percent

- Also indicate under Material Classification if the material is fill or natural soils. Indicate roots, organic material, etc.

- Enter USCS symbol - use chart on back of boring log as a guide. If the soils fall into one of two basic groups, a borderline symbol may be used with the two symbols separated by a slash. For example ML/CL or SM/SP.

- The following information shall be entered under the "Remarks" column and shall include, but is not limited by, the following:

  - Moisture - estimate moisture content using the following terms - dry, moist, wet and saturated. These terms are determined by the individual. Whatever method is used to determine moisture, be consistent throughout the log.

- Angularity - describe angularity of coarse grained particles using the terms angular, subangular, subrounded, or rounded. Refer to ASTM D 2488 or Earth Manual for criteria for these terms.
- Particle shape - flat, elongated, or flat and elongated.
- Maximum particle size or dimension.
- Water level observations.
- Reaction with HCl - none, weak, or strong.

- Additional comments:
  - Indicate presence of mica, caving of hole, when water was encountered, difficulty in drilling, loss or gain of water.
  - Indicate odor and Photoionization Detector (PID) or Flame Ionization Detector (FID) reading if applicable.
  - Indicate any change in lithology by drawing a line through the lithology change column and indicate the depth. This will help when cross-sections are subsequently constructed.
  - At the bottom of the page indicate type of rig, drilling method, hammer size and drop, and any other useful information (i.e., borehole size, casing set, changes in drilling method).
  - Vertical lines shall be drawn (as shown in Figure 5) in columns 6 to 8 from the bottom of each sample to the top of the next sample to indicate consistency of material from sample to sample, if the material is consistent. Horizontal lines shall be drawn if there is a change in lithology, then vertical lines drawn to that point.
  - Indicate screened interval of well, as needed, in the lithology column. Show top and bottom of screen. Other details of well construction are provided on the well construction forms.

5.5.2 Rock Classification

- Indicate depth at which coring began by drawing a line at the appropriate depth. Indicate core run depths by drawing coring run lines (as shown) under the first and fourth columns on the log sheet. Indicate RQD, core run number, RQD percent, and core recovery under the appropriate columns.
- Indicate lithology change by drawing a line at the appropriate depth as explained in Section 5.5.1.
- Rock hardness is entered under designated column using terms as described on the back of the log or as explained earlier in this section.

- Enter color as determined while the core sample is wet; if the sample is cored by air, the core shall be scraped clean prior to describing color.

- Enter rock type based on sedimentary, igneous or metamorphic. For sedimentary rocks use terms as described in Section 5.3. Again, be consistent in classification. Use modifiers and additional terms as needed. For igneous and metamorphic rock types use terms as described in Sections 5.3.8.

- Enter brokenness of rock or degree of fracturing under the appropriate column using symbols VBR, BR, BL or M as explained in Section 5.3.5 and as noted on the back of the Boring Log.

- The following information shall be entered under the remarks column. Items shall include but are not limited to the following:

    - Indicate depths of joints, fractures and breaks and also approximate to horizontal angle (such as high, low), i.e., 70° angle from horizontal, high angle.

    - Indicate calcareous zones, description of any cavities or vugs.

    - Indicate any loss or gain of drill water.

    - Indicate drop of drill tools or change in color of drill water.

- Remarks at the bottom of Boring Log shall include:

    - Type and size of core obtained.

    - Depth casing was set.

    - Type of rig used.

- As a final check the boring log shall include the following:

    - Vertical lines shall be drawn as explained for soil classification to indicate consistency of bedrock material.

    - If applicable, indicate screened interval in the lithology column. Show top and bottom of screen. Other details of well construction are provided on the well construction forms.

5.5.3 Classification of Soil and Rock from Drill Cuttings

The previous sections describe procedures for classifying soil and rock samples when cores are obtained. However, some drilling methods (air/mud rotary) may require classification and borehole logging based on identifying drill cuttings removed from the borehole. Such cuttings provide only general information on subsurface lithology. Some procedures that shall be followed when logging cuttings are:

- Obtain cutting samples at approximately 5-foot intervals, sieve the cuttings (if mud rotary drilling) to obtain a cleaner sample, place the sample into a small sample bottle or "zip lock"

bag for future reference, and label the jar or bag (i.e. hole number, depth, date, etc.). Cuttings shall be closely examined to determine general lithology.

- Note any change in color of drilling fluid or cuttings, to estimate changes in lithology.
- Note drop or chattering of drilling tools or a change in the rate of drilling, to determine fracture locations or lithologic changes.
- Observe loss or gain of drilling fluids or air (if air rotary methods are used), to identify potential fracture zones.
- Record this and any other useful information onto the boring log as provided in Figure 1.

This logging provides a general description of subsurface lithology and adequate information can be obtained through careful observation of the drilling process. It is recommended that split-barrel and rock core sampling methods be used at selected boring locations during the field investigation to provide detailed information to supplement the less detailed data generated through borings drilled using air/mud rotary methods.

5.6 Review

Upon completion of the borings logs, copies shall be made and reviewed. Items to be reviewed include:

- Checking for consistency of all logs.
- Checking for conformance to the guideline.
- Checking to see that all information is entered in their respective columns and spaces.

6.0 REFERENCES

Unified Soil Classification System (USCS).

ASTM D2488, 1985.

Earth Manual, U.S. Department of the Interior, 1974.

7.0 RECORDS

Originals of the boring logs shall be retained in the project files.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

ATTACHMENTS (EXAMPLES)

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to identify and designate the field data record forms, logs and reports generally initiated and maintained for documenting Brown & Root Environmental field activities.

2.0 SCOPE

Documents presented within this procedure (or equivalents) shall be used for all Brown & Root Environmental field activities, as applicable. Other or additional documents may be required by specific client contracts.

3.0 GLOSSARY

None

4.0 RESPONSIBILITIES

Project Manager - The Project Manager is responsible for obtaining hardbound, controlled-distribution logbooks (from the appropriate source), as needed. In addition, the Project Manager is responsible for placing all forms used in site activities (i.e., records, field reports, and upon the completion of field work, the site logbook) in the project's central file.

Field Operations Leader (FOL) - The Field Operations Leader is responsible for ensuring that the site logbook, notebooks, and all appropriate forms and field reports illustrated in this guideline (and any additional forms required by the contract) are correctly used, accurately filled out, and completed in the required time-frame.

5.0 PROCEDURES

5.1 Site Logbook

5.1.1 General

The site logbook is a hard-bound, paginated controlled-distribution record book in which all major onsite activities are documented. At a minimum, the following activities/events shall be recorded (daily) in the site logbook:

- All field personnel present
- Arrival/departure of site visitors
- Arrival/departure of equipment
- Start or completion of borehole/trench/monitoring well installation or sampling activities
- Daily onsite activities performed each day
- Sample pickup information
- Health and Safety issues (level of protection observed, etc.)
- Weather conditions

A site logbook shall be maintained for each project. The site logbook shall be initiated at the start of the first onsite activity (e.g., site visit or initial reconnaissance survey). Entries are to be made for every day that onsite activities take place which involve Brown & Root Environmental or subcontractor personnel. Upon completion of the fieldwork, the site logbook must become part of the project's central file.

The following information must be recorded on the cover of each site logbook:

- Project name
- Brown & Root Environmental project number
- Sequential book number
- Start date
- End date

Information recorded daily in the site logbook need not be duplicated in other field notebooks (see Section 5.2), but must summarize the contents of these other notebooks and refer to specific page locations in these notebooks for detailed information (where applicable). An example of a typical site logbook entry is shown in Attachment A.

If measurements are made at any location, the measurements and equipment used must either be recorded in the site logbook or reference must be made to the site notebook in which the measurements are recorded (see Attachment A).

All logbook, notebook, and log sheet entries shall be made in indelible ink (black pen is preferred). No erasures are permitted. If an incorrect entry is made, the data shall be crossed out with a single strike mark, and initialed and dated. At the completion of entries by any individual, the logbook pages used must be signed and dated. The site logbook must also be signed by the Field Operations Leader at the end of each day.

5.1.2 Photographs

When movies, slides, or photographs are taken of a site or any monitoring location, they must be numbered sequentially to correspond to logbook entries. The name of the photographer, date, time, site location, site description, and weather conditions must be entered in the logbook as the photographs are taken. A series entry may be used for rapid-sequence photographs. The photographer is not required to record the aperture settings and shutter speeds for photographs taken within the normal automatic exposure range. However, special lenses, films, filters, and other image-enhancement techniques must be noted in the logbook. If possible, such techniques shall be avoided, since they can adversely affect the admissibility of photographs as evidence. Chain-of-custody procedures depend upon the subject matter, type of film, and the processing it requires. Film used for aerial photography, confidential information, or criminal investigation require chain-of-custody procedures. Adequate logbook notation and receipts must be compiled to account for routine film processing. Once processed, the slides of photographic prints shall be consecutively numbered and labeled according to the logbook descriptions. The site photographs and associated negatives must be docketed into the project's central file.

5.2 Site Notebooks

Key field team personnel may maintain a separate dedicated notebook to document the pertinent field activities conducted directly under their supervision. For example, on large projects with multiple investigative sites and varying operating conditions, the Health and Safety Officer may elect to maintain a separate site notebook. Where several drill rigs are in operation simultaneously, each site geologist assigned to oversee a rig must maintain a site notebook.

5.3 Sample Forms

A summary of the forms illustrated in this procedure is shown as the listing of Attachments in the Table of Contents for this SOP. Forms may be altered or revised for project-specific needs contingent upon client approval. Care must be taken to ensure that all essential information can be documented. Guidelines for completing these forms can be found in the related sampling SOP.

5.3.1 Sample Collection, Labeling, Shipment and Request for Analysis

5.3.1.1 Sample Log Sheet

Sample Log Sheets are used to record specified types of data while sampling. Attachments B-1 to B-4 are examples of Sample Log Sheets. The data recorded on these sheets are useful in describing the waste source and sample as well as pointing out any problems encountered during sampling. A log sheet must be completed for each sample obtained, including field quality control (QC) samples.

5.3.1.2 Sample Label

A typical sample label is illustrated in Attachment B-5. Adhesive labels must be completed and applied to every sample container. Sample labels can usually be obtained from the appropriate Program source or are supplied from the laboratory subcontractor.

5.3.1.3 Chain-of-Custody Record Form

The Chain-of-Custody (COC) Record is a multi-part form that is initiated as samples are acquired and accompanies a sample (or group of samples) as they are transferred from person to person. This form must be used for any samples collected for chemical or geotechnical analysis whether the analyses are performed on site or off site. One part of the completed form is retained by the field crew while the other two portions are sent to the laboratory. An example of a Chain-of-Custody Record form is provided as Attachment B-6. A supply of these forms are purchased and stocked by the field department of the various Brown & Root Environmental offices. Alternately, COC forms supplied by the laboratory may be used. Once the samples are received at the laboratory, the sample cooler and contents are checked and any problems are noted on the enclosed COC form (any discrepancies between the sample labels and COC form and any other problems that are noted are resolved through communication between the laboratory point-of-contact and the Brown & Root Environmental Project Manager). The COC form is signed and one of the remaining two parts are retained by the laboratory while the last part becomes part of the samples' corresponding analytical data package. Internal laboratory chain-of-custody procedures are documented in the Laboratory Quality Assurance Plan (LQAP).

5.3.1.4 Chain-of-Custody Seal

Attachment B-7 is an example of a custody seal. The Custody seal is also an adhesive-backed label. It is part of a chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field and sealed in coolers for transit to the laboratory. The COC seals are signed and dated by the samplers and affixed across the opening edges of each cooler containing environmental samples. COC seals may be available from the laboratory; these seals may also be purchased from a supplier.

5.3.2 Geohydrological and Geotechnical Forms

5.3.2.1 Groundwater Level Measurement Sheet

A groundwater level measurement sheet, shown in Attachment C-1 must be filled out for each round of water level measurements made at a site.

5.3.2.2 Data Sheet for Pumping Test

During the performance of a pumping test (or an in-situ hydraulic conductivity test), a large amount of data must be recorded, often within a short time period. The pumping test data sheet (Attachment C-2) facilitates this task by standardizing the data collection format, and allowing the time interval for collection to be laid out in advance.

5.3.2.3 Packer Test Report Form

A packer test report form shown in Attachment C-3 must be completed for each well upon which a packer test is conducted following well installation.

5.3.2.4 Summary Log of Boring

During the progress of each boring, a log of the materials encountered, operation and driving of casing, and location of samples must be kept. The Summary Log of Boring (Attachment C-4) is used for this purpose and must be completed for each soil boring performed. In addition, if volatile organics are monitored on cores, samples or cuttings from the borehole (using HNU or OVA detectors), these results must be entered on the boring log (under the "Remarks" column) at the appropriate depth. The "Remarks" column can also be used to subsequently enter the laboratory sample number and the concentration of a few key analytical results. This feature allows direct comparison of contaminant concentrations with soil characteristics.

5.3.2.5 Monitoring Well Construction Details Form

A Monitoring Well Construction Details Form must be completed for every monitoring well piezometer or temporary well point installed. This form contains specific information on length and type of well riser pipe and screen, backfill, filter pack, annular seal and grout characteristics, and surface seal characteristics. This information is important in evaluating the performance of the monitoring well, particularly in areas where water levels show temporal variation, or where there are multiple (immiscible) phases of contaminants. Depending on the type of monitoring well (in overburden or bedrock), different forms are used (see Attachments C-5 through C-9). Similar forms are used for flush-mount well completions. The Monitoring Well Construction Details Form is not a controlled document.

5.3.2.6 Test Pit Log

When a test pit or trench is constructed for investigative or sampling purposes, a Test Pit Log (Attachment C-10) must be filled out by the responsible field geologist or sampling technician.

5.3.3 Equipment Calibration and Maintenance Form

The calibration or standardization of monitoring, measuring or test equipment is necessary to assure the proper operation and response of the equipment, to document the accuracy, precision or sensitivity of the measurement, and determine if correction should be applied to the readings. Some items of

equipment require frequent calibration, others infrequent. Some are calibrated by the manufacturer, others by the user.

Each instrument requiring calibration has its own Equipment Calibration Log (Attachment D) which documents that the manufacturer's instructions were followed for calibration of the equipment, including frequency and type of standard or calibration device. An Equipment Calibration Log must be maintained for each electronic measuring device used in the field: entries must be made for each day the equipment is used.

5.4 Field Reports

The primary means of recording onsite activities is the site logbook. Other field notebooks may also be maintained. These logbooks and notebooks (and supporting forms) contain detailed information required for data interpretation or documentation, but are not easily useful for tracking and reporting of progress. Furthermore, the field logbook/notebooks remain onsite for extended periods of time and are thus not accessible for timely review by project management.

5.4.1 Weekly Status Reports

To facilitate timely review by project management, Xeroxed copies of logbook/notebook entries may be made for internal use. To provide timely oversight of onsite contractors, Daily Activities Reports are completed and submitted as described below.

It should be noted that in addition to the summaries described herein, other summary reports may also be contractually required.

5.4.2 Daily Activities Report

5.4.2.1 Description

The Daily Activities Report (DAR) documents the activities and progress for each day's field work. This report must be filled out on a daily basis whenever there are drilling, test pitting, well construction, or other related activities occurring which involve subcontractor personnel. These sheets summarize the work performed and form the basis of payment to subcontractors (Attachment E is an example of a Daily Activities Report).

5.4.2.2 Responsibilities

It is the responsibility of the rig geologist to complete the DAR and obtain the driller's signature acknowledging that the times and quantities of material entered are correct.

5.4.2.3 Submittal and Approval

At the end of the shift, the rig geologist must submit the Daily Activities Report to the Field Operations Leader (FOL) for review and filing. The Daily Activities Report is not a formal report and thus requires no further approval. The DAR reports are retained by the FOL for use in preparing the site logbook and in preparing weekly status reports for submission to the Project Manager.

6.0 ATTACHMENTS

Attachment A	TYPICAL SITE LOGBOOK ENTRY
Attachment B-1	EXAMPLE GROUNDWATER SAMPLE LOG SHEET
Attachment B-2	EXAMPLE SURFACE WATER SAMPLE LOG SHEET
Attachment B-3	EXAMPLE SOIL/SEDIMENT SAMPLE LOG SHEET
Attachment B-4	CONTAINER SAMPLE LOG SHEET FORM
Attachment B-5	SAMPLE LABEL
Attachment B-6	CHAIN-OF-CUSTODY RECORD FORM
Attachment B-7	CHAIN-OF-CUSTODY SEAL
Attachment C-1	EXAMPLE GROUNDWATER LEVEL MEASUREMENT SHEET
Attachment C-2	EXAMPLE PUMPING TEST DATA SHEET
Attachment C-3	PACKER TEST REPORT FORM
Attachment C-4	EXAMPLE BORING LOG
Attachment C-5	EXAMPLE OVERBURDEN MONITORING WELL SHEET
Attachment C-5A	EXAMPLE OVERBURDEN MONITORING WELL SHEET (FLUSHMOUNT)
Attachment C-6	EXAMPLE CONFINING LAYER MONITORING WELL SHEET
Attachment C-7	EXAMPLE BEDROCK MONITORING WELL SHEET - OPEN HOLE WELL
Attachment C-8	EXAMPLE BEDROCK MONITORING WELL SHEET - WELL INSTALLED IN BEDROCK
Attachment C-8A	EXAMPLE BEDROCK MONITORING WELL SHEET - WELL INSTALLED IN BEDROCK (FLUSHMOUNT)
Attachment C-9	EXAMPLE TEST PIT LOG
Attachment D	EXAMPLE EQUIPMENT CALIBRATION LOG
Attachment E	EXAMPLE DAILY ACTIVITIES RECORD
Attachment F	FIELD TRIP SUMMARY REPORT

ATTACHMENT A
TYPICAL SITE LOGBOOK ENTRY

START TIME: _____ DATE: _____

SITE LEADER: _____
PERSONNEL:

BROWN & ROOT ENV.	DRILLER	EPA
_____	_____	_____
_____	_____	_____
_____	_____	_____

WEATHER: Clear, 68°F, 2-5 mph wind from SE

ACTIVITIES:

1. Steam jenney and fire hoses were set up.
2. Drilling activities at well ____ resumes. Rig geologist was _____. See Geologist's Notebook, No. 1, page 29-30, for details of drilling activity. Sample No. 123-21-S4 collected: see sample logbook, page 42. Drilling activities completed at 11:50 and a 4-inch stainless steel well installed. See Geologist's Notebook, No. 1, page 31, and well construction details for well _____.
3. Drilling rig No. 2 steam-cleaned at decontamination pit. Then set up at location of well _____.
4. Well _____ drilled. Rig geologist was _____. See Geologist's Notebook, No. 2, page ____ for details of drilling activities. Sample numbers 123-22-S1, 123-22-S2, and 123-22-S3 collected: see sample logbook, pages 43, 44, and 45.
5. Well _____ was developed. Seven 55-gallon drums were filled in the flushing stage. The well was then pumped using the pitcher pump for 1 hour. At the end of the hour, water pumped from well was "sand free."
6. EPA remedial project manger arrives on site at 14:25 hours.
7. Large dump truck arrives at 14:45 and is steam-cleaned. Backhoe and dump truck set up over test pit _____.
8. Test pit _____ dug with cuttings placed in dump truck. Rig geologist was _____. See Geologist's Notebook, No. 1, page 32, for details of test pit activities. Test pit subsequently filled. No samples taken for chemical analysis. Due to shallow groundwater table, filling in of test pit ___ resulted in a very soft and wet area. A mound was developed and the area roped off.
9. Express carrier picked up samples (see Sample Logbook, pages 42 through 45) at 17:50 hours. Site activities terminated at 18:22 hours. All personnel off site, gate locked.

_____
Field Operations Leader

ATTACHMENT B-1
EXAMPLE GROUNDWATER SAMPLE LOG SHEET

GROUNDWATER
SAMPLE LOG SHEET

Page ____ of ____

Project Site Name: _____ Sample ID No.: _____

Project No.: _____ Sample Location: _____

☐ Domestic Well Data
☐ Monitoring Well Data
☐ Other Well Type: _____ Sampled By: _____
☐ CA Sample Type: _____ C.O.C. No.: _____

Sampling Data

Date: / Time: / Method:	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD	TBD

Purge Data

Date: / Method:	Volume	pH	S.C.	Temp. (°C)	Turbidity	Color	TBD	TBD
	Initial							
Monitor Reading (ppm):	1							
Well Casing Dia. & Material Type:	2							
	3							
Total Well Depth (TD):	4							
Static Water Level (WL):	5							
TD-WL (ft.) =								
One Casing Volume: (gal/L)								
Start Purge (hrs.):								
End Purge (hrs.):								
Total Purge Time (min):								
Total Amount Purged (gal/L):								

Analytes	Preservative	Container Requirements	Collected (✓)

Observations/Notes:

Circle if Applicable

MS/MSD	Duplicate ID No:	Signature(s):

TBD: To Be Determined

ATTACHMENT B-2
EXAMPLE SURFACE WATER SAMPLING LOG SHEET

SURFACE WATER SAMPLING LOG SHEET

Page ___ of ___

Project Site Name: _____ Sample ID No.: _____

Project No.: _____ Sample Location: _____

☐ Spring ☐ Pond Sampled By: _____
☐ Stream ☐ Lake
☐ Other _____
☐ QA Sample Type: _____ C.O.C. No.: _____

Sample Data		
Date and Time	Method	Depth

pH	S.C.	Temp (°C)	Turbidity	Color	TBD	TBD	TBD

Analysis	Preservative	Container Requirements	Collected (✓)

Observations/Notes:

Circle if Applicable:	Signature(s):
MS/MSD | Duplicate ID No.:	

TBD: To Be Determined

ATTACHMENT B-3
EXAMPLE SOIL/SEDIMENT SINGLE SAMPLE LOG SHEET

SOIL/SEDIMENT
SINGLE SAMPLE LOG SHEET

Page ___ of ___

Project Site Name: _____ Sample ID No.: _____

Project No.: _____ Sample Location: _____

☐ Surface Soil
☐ Subsurface Soil
☐ Sediment
☐ Other _____
☐ QA Sample Type: _____

Sampled By: _____

C.O.C. No.: _____

Sample Method:	Composite Sample Data		
	Sample	Time	Color/Description
Depth Sampled:			
Sample Date and Time:			
Type of Sample			
☐ Grab			
☐ Composite			
☐ Grab-Composite			
☐ High Concentration	Grab Sample Data		
☐ Low Concentration	Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)	

Analyses	Container Type/Preservative	Collected (X)	Map:

Observations/Notes:

Circle If Applicable:		Signature(s):
MS/MSD	Duplicate ID No:	

ATTACHMENT B-4
CONTAINER SAMPLE LOG SHEET FORM

Brown & Root Environmental

Page ___ of ___

☐ Container Data

Case #: _____

By: _____

Project Site Name: _____ Project Site No. _____

Brown & Root Env. Source No. _____ Source Location: _____

Container Source	Container Description
☐ Drum ☐ Bung Top ☐ Lever Lock ☐ Bolted Ring ☐ Other _____ ☐ Bag/Sack ☐ Tank ☐ Other _____	Color: _____ Condition: _____ Markings: _____ Vol. of Contents: _____ Other: _____

Disposition of Sample	Sample Description	Layer 1	Layer 2	Layer 3
☐ Container Sampled ☐ Container opened but not sampled. Reason: _____ ☐ Container not opened. Reason: _____	Phase	☐Sol. ☐Liq.	☐Sol. ☐Liq.	☐Sol. ☐Liq.
	Color			
	Viscosity	☐L ☐M ☐H	☐L ☐M ☐H	☐L ☐M ☐H
	% of Total Volume			
	Other			

Monitor Reading:	Type of Sample
Sample Method:	☐ Low Concentration ☐ High Concentration ☐ Grab ☐ Composite ☐ Grab-composite

Sample Date & Time:	Sample Identification	Organic	Inorganic
Sampled by:			
Signature(s):			
	Date Shipped		
Analysis:	Time Shipped		
	Lab		
	Volume		

ATTACHMENT B-5

SAMPLE LABEL

Brown & Root Environmental PROJECT: _____

STATION LOCATION: _____

DATE: ___/___/___ TIME: _____ hrs.

MEDIA: WATER ☐ SOIL ☐ SEDIMENT ☐ _____ ☐

CONCENTRATION: LOW ☐ MEDIUM ☐ HIGH ☐

TYPE: GRAB ☐ COMPOSITE ☐

ANALYSIS		PRESERVATION	
VOA ☐	BNAs ☐	Cool to 4°C	☐
PCBs ☐	PESTICIDES ☐	HNO_3 to pH < 2	☐
METALS: TOTAL ☐	DISSOLVED ☐	NaOH to pH > 12	☐
CYANIDE ☐		_____	☐
_____ ☐			

Sampled by: _____

Remarks:

ATTACHMENT B-6

CHAIN-OF-CUSTODY RECORD FORM
(Original is 8.5 x 11")

PROJECT NO.	PROJECT NAME					NO. OF CONTAINERS							REMARKS
SAMPLERS: (Signature)													
STA NO.	DATE	TIME			STATION LOCATION								

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks:	

ATTACHMENT B-7

CHAIN-OF-CUSTODY SEAL

Signature	CUSTODY SEAL
Date	Date
CUSTODY SEAL	Signature

ATTACHMENT C-1
EXAMPLE GROUNDWATER LEVEL MEASUREMENT SHEET

GROUNDWATER LEVEL MEASUREMENT SHEET

Page ___ of ___

PROJECT NAME: _____ LOCATION: _____
PROJECT NUMBER: _____ MEASURING DEVICE: _____
PERSONNEL: _____ ADJUSTMENT FACTOR: _____
DATE: _____ REMARKS: _____
WEATHER CONDITIONS: _____

Well or Piezometer Number	Time	Elevation of Reference Point (Feet)*	Water Level Indicator Reading (Feet)*	Groundwater Elevation (Feet)	Comments

*Measurements to nearest 0.01 feet.

Signature(s): _____

ATTACHMENT C-2
EXAMPLE PUMPING TEST DATA SHEET

PUMPING TEST DATA SHEET

Page ___ of ___

PROJECT NAME: _____
PROJECT NUMBER: _____
PUMPING TEST: [ ]
TEST NUMBER: _____
METHOD OF MEASUREMENT: _____
DATE(s): _____
STATIC H_2O LEVEL (ft) (SO) _____
PUMPING TEST PERFORMED BY: _____
REMARKS: _____

PUMPING WELL NUMBER: _____
MEASURED WELL NUMBER: _____
STEP DRAW DOWN TEST [ ]
MONITORING POINT: _____
DEPTH CORRECTION (ft) _____
PUMP SETTING (Ft. below monitoring point): _____
DISTANCE FROM PUMPING WELL (ft) (r): _____

MILITARY TIME	ELAPSED TIME SINCE PUMP START OR STOP (Min.)	WATER LEVEL (Ft.)	CORRECTION (Ft.)	DRAW DOWN OR RECOVERY (Ft.)	FLOW METER READING (Gals.)	PUMPING RATE (GPM)	REMARKS

SIGNATURE(s): _____

ATTACHMENT C-3

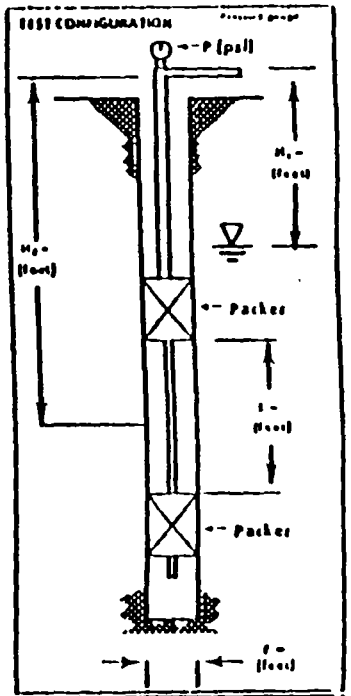
PACKER TEST REPORT FORM

PROJECT: _____ PROJECT NO.: _____ TEST NO: _____ PAGE ____ OF ____

BORING NO.: _____ CASING DEPTH: _____ CONTRACTOR: _____ STATIC WATER LEVEL _____

TEST INTERVAL: _____ BY: _____ CHECKED: _____ PACKER PRESSURE _____

Flow Test					Calculated Results							
Pressure, P (psi)	Elapsed Time (min)	Flow Reading	Δ Flow, ΔQ (ft³)	Δ Flow, ΔQ (gal)	Flow Rate Q (gal/min)	H_1* (ft)	Hp = P (psi) × 2.31 (ft)	H_2* (ft)	H = Hp + (ft or ft)	Cp	E (ft²/s) = Cp Q/H	K (ft/sec) = E / (2π × 10)



Cp = (1/(2 × L)) ln(L/r) (70,315 S)
7.48 Gallons = 1 ft³
1 psi = 2.31 ft head
Remarks: _____

* H_1 is used when the test length is below the water table.
H_2 is used when the test length is above the water table.

Revision 0

Effective Date 03/01/96

19 of 32

ATTACHMENT C-4
EXAMPLE BORING LOG

BORING LOG

Page___ of___

PROJECT NAME: _____ BORING NUMBER: _____
PROJECT NUMBER: _____ DATE : _____
DRILLING COMPANY: _____ GEOLOGIST: _____
WATER LEVEL DATA: _____

Sample no. and Type or RQD	Depth (ft.) or Run No.	Blows/6" or RQD (%)	Sample Recovery & Sample Length	Moisture Change (Dry/Wet) or Saturated Moisture	MATERIAL DESCRIPTION: Soil Description & Consistency or Rock Hardness	Color	Material Classification	USCS	Remarks	RQD or PID Reading (ppm)

*When rock coring enter rock brokeness.

CONVERTED TO WELL : ___ Yes ___ No: WELL I.D.#: _____
REMARKS: _____

Signature(s): _____

LEGEND

SOIL TERMS

UNIFIED SOIL CLASSIFICATION (USCS)

COARSE-GRAINED SOILS
More Than Half of Material is LARGER Than No. 200 Sieve Size

FIELD IDENTIFICATION PROCEDURES (Excluding Particles Larger than 3 Inches and Basing Fractions on Estimated Weights)			GROUP SYMBOL	TYPICAL NAMES
GRAVELS (MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE)	CLEAN GRAVELS (Little or No Fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
		Predominantly one size or a range of sizes with some intermediate sizes missing.	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
	GRAVELS W/FINES (Appreciable Amount of Fines)	Non plastic fines (for identification procedures, see ML)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
		Plastic fines (for identification procedures, see CL)	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
SANDS (MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE)	CLEAN SANDS (Little or No Fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	SW	Well graded sand, gravelly sands, little or no fines.
		Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	Poorly graded sands, gravelly sands, little or no fines.
	SANDS W/FINES (Appreciable Amount of Fines)	Non plastic fines (for identification procedures, see ML)	SM	Silty sands, poorly graded sand-silt mixtures.
		Plastic fines (for identification procedures, see CL)	SC	Clayey sands, poorly graded sand-clay mixtures.

FINE-GRAINED SOILS
More Than Half of Material is SMALLER Than No. 200 Sieve Size

FIELD IDENTIFICATION PROCEDURES (Excluding Particles Larger than 3 Inches and Basing Fractions on Estimated Weights)					GROUP SYMBOL	TYPICAL NAMES
	Identification Procedures on Fraction Smaller than No. 40 Sieve Size					
	DRY STRENGTH (Crushing Characteristics)	DILATANCY (Reaction to Shaking)	TOUGHNESS (Consistency Near Plastic Limit)		
SILTS AND CLAYS Liquid Limit LESS THAN 50	None to Slight	Quick to Slow	None		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity.
	Medium to High	None to Very Slow	Medium		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	Slight to Medium	Slow	Slight		OL	Organic silts and organic silty clays of low plasticity.
SILTS AND CLAYS Liquid Limit GREATER THAN 50	Slight to Medium	Slow to None	Slight to Medium		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
	High to Very High	None	High		CH	Inorganic clays of high plasticity, fat clays.
	Medium to High	None to Very Slow	Slight to Medium		OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS	Readily identified by color, odor, spongy feel and frequently by fibrous texture.				PT	Peat and other organic soils

Boundary classifications: Soils possessing characteristics of two groups are designated by combining group symbols. For example, GW-GC, well graded gravel-sand mixture with clay binder.
All sieve sizes on this chart are U.S. Standard.

DENSITY OF GRANULAR SOILS

DESCRIPTION	STANDARD PENETRATION RESISTANCE (BLOWS/FOOT)
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	Over 50

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNC. COMPRESSIVE STRENGTH (TONS/SQ FT.)	STANDARD PENETRATION RESISTANCE (BLOWS/FOOT)	FIELD IDENTIFICATION METHODS
Very Soft	Less than 0.25	0 to 2	Easily penetrated several inches by fist
Soft	0.25 to 0.50	3 to 4	Easily penetrated several inches by thumb.
Medium Stiff	0.50 to 1.0	5 to 8	Can be penetrated several inches by thumb.
Stiff	1.0 to 2.0	9 to 15	Readily indented by thumb.
Very Stiff	2.0 to 4.0	15 to 30	Readily indented by thumbnail.
Hard	More than 4.0	Over 30	Indented with difficulty by thumbnail.

ROCK TERMS

ROCK HARDNESS (FROM CORE SAMPLES)

Descriptive Terms	Scratcher or Knife Effects	Hammer Effects
Soft	Easily Gouged	Crushes when pressed with Hammer
Medium Soft	Can be Gouged	Breaks (one blow); crumbly edges
Medium Hard	Can be scratched	Breaks (one blow); sharp edges
Hard	Cannot be scratched	Breaks conchoidally (several blows); sharp edges

ROCK BROKENESS

Descriptive Terms	Abbreviations	Spacing
Very Broken	(V. Br.)	0-2"
Broken	(Br.)	2"-1'
Blocky	(Bl.)	1'-3'
Massive	(M.)	3'-10'

LEGEND:

SOIL SAMPLES - TYPES

S 3" Split Barrel Sample

U 3" O.D. Undisturbed Sample

O - Other Samples, Specify in Remarks

ROCK SAMPLES - TYPES

R NX (Conventional) Core (2 1/8" O.D.)

Q NQ (Ultralite) Core (1 7/8" O.D.)

X Other Core Sizes, Specify in Remarks

WATER LEVELS

12/30 ▽ 32.4' Initial Level w/Date & Depth

12/30 ▽ 32.5' Stabilized Level w/Date & Depth

FIELD DOCUMENTATION

Revision 0

SA-6.3

Page 21 of 32

Effective Date 03/01/96

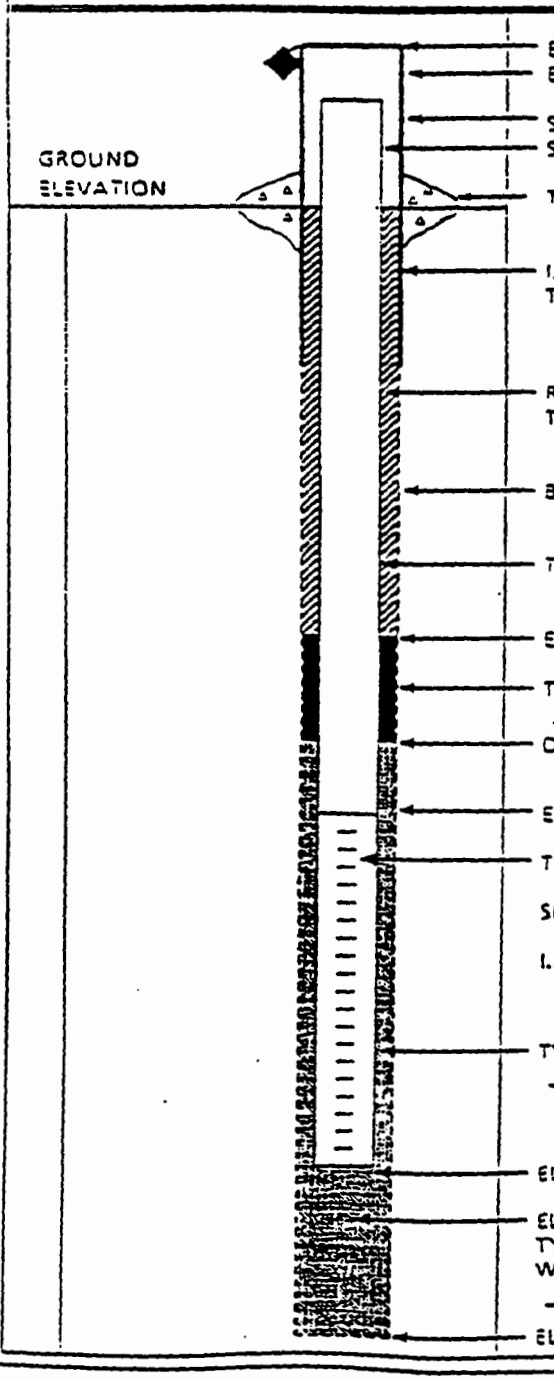
ATTACHMENT C-5
EXAMPLE OVERBURDEN MONITORING WELL SHEET

BORING NO.: _____

OVERBURDEN
MONITORING WELL SHEET

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF SURFACE CASING : _____
ELEVATION OF TOP OF RISER PIPE: _____
STICK - UP TOP OF SURFACE CASING. _____
STICK - UP RISER PIPE . _____
TYPE OF SURFACE SEAL: _____
I.D. OF SURFACE CASING: _____
TYPE OF SURFACE CASING: _____
RISER PIPE I.D. _____
TYPE OF RISER PIPE: _____
BOREHOLE DIAMETER: _____
TYPE OF BACKFILL: _____
ELEVATION / DEPTH TOP OF SEAL: _____ /
TYPE OF SEAL: _____
DEPTH TOP OF SAND PACK: _____
ELEVATION / DEPTH TOP OF SCREEN: _____ /
TYPE OF SCREEN: _____
SLOT SIZE x LENGTH: _____
I.D. OF SCREEN: _____
TYPE OF SAND PACK: _____
ELEVATION / DEPTH BOTTOM OF SCREEN: _____ /
ELEVATION / DEPTH BOTTOM OF SAND PACK: _____ /
TYPE OF BACKFILL BELOW OBSERVATION WELL: _____
ELEVATION / DEPTH OF HOLE: _____ /

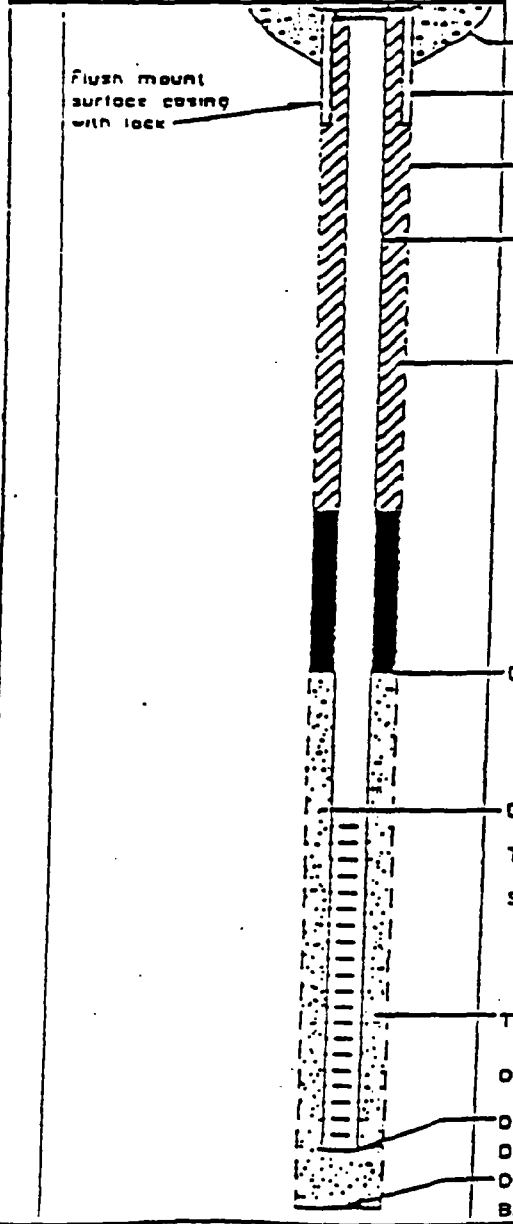
ATTACHMENT C-5A
EXAMPLE OVERBURDEN MONITORING WELL SHEET (FLUSHMOUNT)

BORING NO.: _____

MONITORING WELL SHEET

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



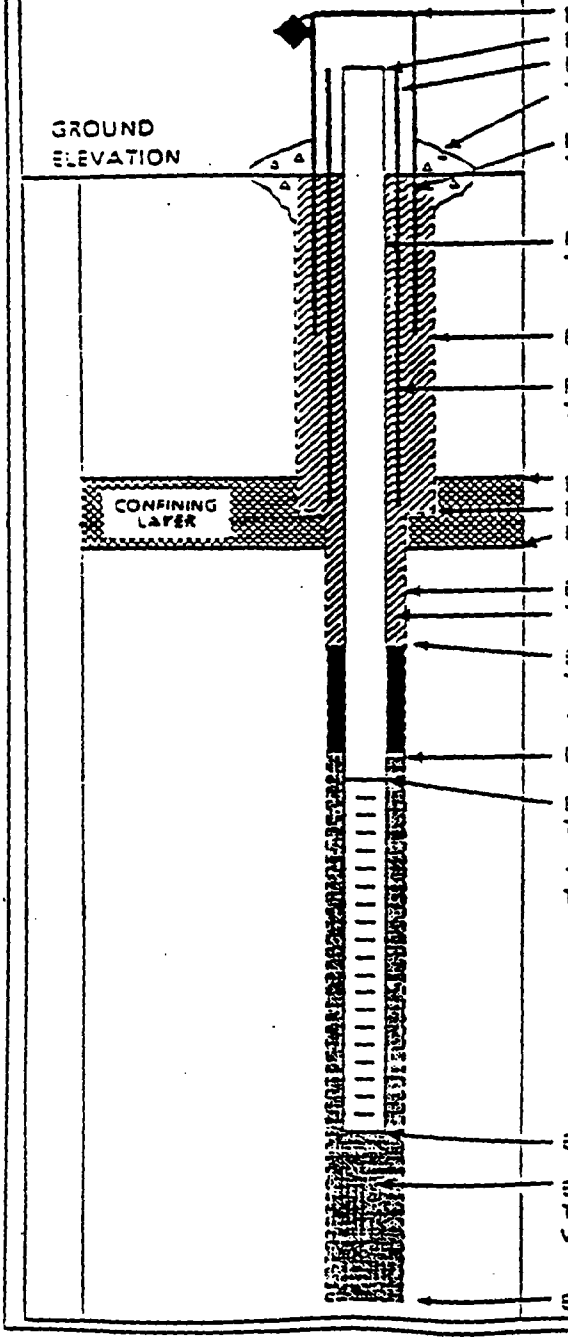
ELEVATION TOP OF RISER: _____
TYPE OF SURFACE SEAL: _____
TYPE OF PROTECTIVE CASING: _____
I.D. OF PROTECTIVE CASING: _____
DIAMETER OF HOLE: _____
TYPE OF RISER PIPE: _____
RISER PIPE I.D.: _____
TYPE OF BACKFILL/SEAL: _____
_____
DEPTH/ELEVATION TOP OF SAND: _____ /
DEPTH/ELEVATION TOP OF SCREEN: _____ /
TYPE OF SCREEN: _____
SLOT SIZE x LENGTH: _____
TYPE OF SAND PACK: _____
DIAMETER OF HOLE IN BEDROCK: _____
DEPTH/ELEVATION BOTTOM OF SCREEN: _____ /
DEPTH/ELEVATION BOTTOM OF SAND: _____ /
DEPTH/ELEVATION BOTTOM OF HOLE: _____ /
BACKFILL MATERIAL BELOW SAND: _____

ATTACHMENT C-6
EXAMPLE CONFINING LAYER MONITORING WELL SHEET

BORING NO.: _____

CONFINING LAYER
MONITORING WELL SHEET

PROJECT _____ LOCATION _____ DRILLER _____
PROJECT NO. _____ BORING _____ DRILLING METHOD _____
ELEVATION _____ DATE _____ DEVELOPMENT METHOD _____
FIELD GEOLOGIST _____



ELEVATION OF TOP OF SURFACE CASING : _____
ELEVATION OF TOP OF RISER PIPE: _____
ELEVATION TOP OF PERM. CASING: _____
TYPE OF SURFACE SEAL: _____
I.D. OF SURFACE CASING: _____
TYPE OF SURFACE CASING: _____
RISER PIPE I.D. _____
TYPE OF RISER PIPE: _____
BOREHOLE DIAMETER: _____
PERM. CASING I.D. _____
TYPE OF CASING & BACKFILL: _____
ELEVATION / DEPTH TOP CONFINING LAYER: _____
ELEVATION / DEPTH BOTTOM OF CASING: _____
ELEVATION / DEPTH BOT. CONFINING LAYER: _____
BOREHOLE DIA. BELOW CASING: _____
TYPE OF BACKFILL: _____
ELEVATION / DEPTH TOP OF SEAL: _____
TYPE OF SEAL: _____
DEPTH TOP OF SAND PACK: _____
ELEVATION/DEPTH TOP OF SCREEN: _____
TYPE OF SCREEN: _____
TYPE OF SAND PACK: _____
ELEVATION / DEPTH BOTTOM OF SCREEN: _____
ELEVATION / DEPTH BOTTOM OF SAND PACK: _____
TYPE OF BACKFILL BELOW OBSERVATION WELL: _____
ELEVATION / DEPTH OF HOLE: _____

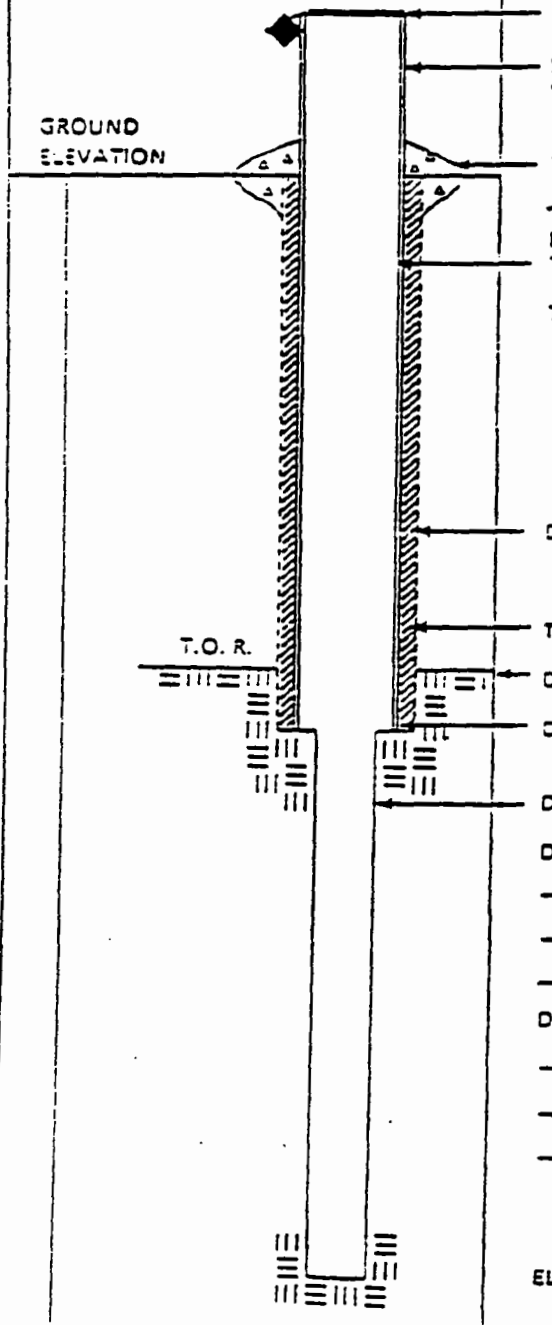
ATTACHMENT C-7
EXAMPLE BEDROCK MONITORING WELL SHEET - OPEN HOLE WELL

BORING NO.: _____

BEDROCK MONITORING WELL SHEET
OPEN HOLE WELL

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF CASING: _____

STICK UP OF CASING ABOVE GROUND SURFACE: _____

TYPE OF SURFACE SEAL: _____

I.D. OF CASING: _____
TYPE OF CASING: _____

TEMP. / PERM.: _____

DIAMETER OF HOLE: _____

TYPE OF CASING SEAL: _____

DEPTH TO TOP OF ROCK: _____

DEPTH TO BOTTOM CASING: _____

DIAMETER OF HOLE IN BEDROCK: _____

DESCRIBE IF CORE / REAMED WITH BIT:

_____

_____

_____

DESCRIBE JOINTS IN BEDROCK AND DEPTH:

_____

_____

_____

ELEVATION / DEPTH OF HOLE: _____ / _____

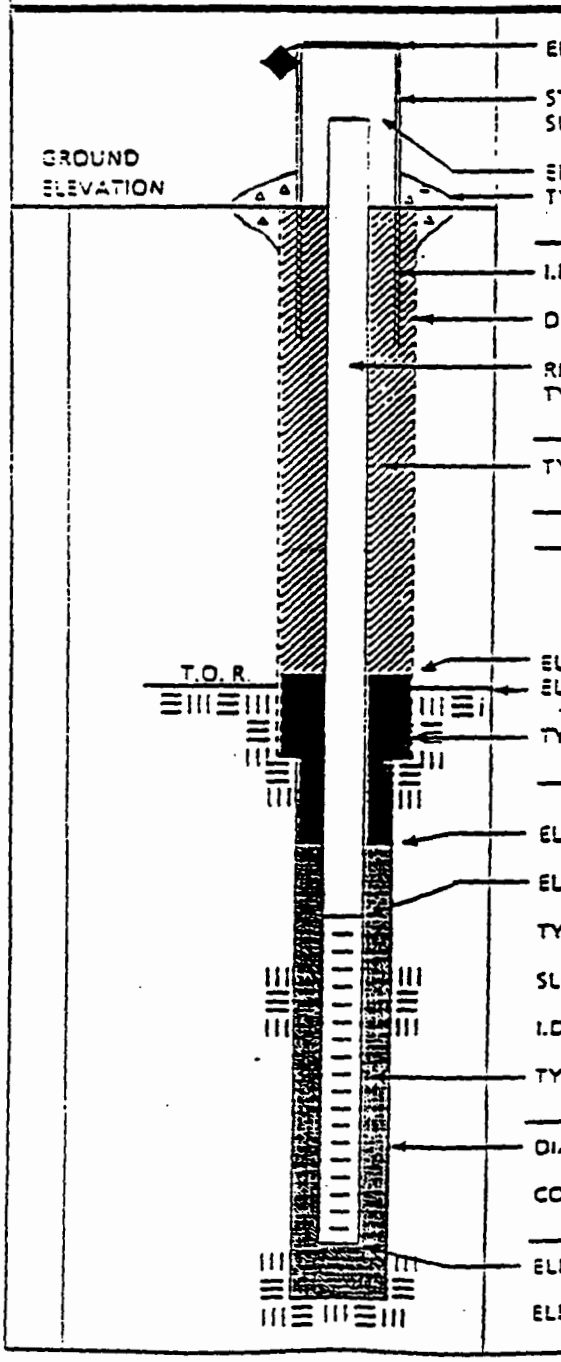
ATTACHMENT C-8
EXAMPLE BEDROCK MONITORING WELL SHEET - WELL INSTALLED IN BEDROCK

BORING NO.: _____

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF SURFACE CASING: _____

STICK UP OF CASING ABOVE GROUND SURFACE: _____

ELEVATION TOP OF RISER: _____

TYPE OF SURFACE SEAL: _____

I.D. OF SURFACE CASING: _____

DIAMETER OF HOLE: _____

RISER PIPE I.D.: _____

TYPE OF RISER PIPE: _____

TYPE OF BACKFILL: _____

ELEVATION / DEPTH TOP OF SEAL: _____ / _____

ELEVATION / DEPTH TOP OF BEDROCK: _____ / _____

TYPE OF SEAL: _____

ELEVATION / DEPTH TOP OF SAND: _____ / _____

ELEVATION / DEPTH TOP OF SCREEN: _____ / _____

TYPE OF SCREEN: _____

SLOT SIZE x LENGTH: _____

I.D. SCREEN: _____

TYPE OF SAND PACK: _____

DIAMETER OF HOLE IN BEDROCK: _____

CORE / REAM: _____

ELEVATION / DEPTH BOTTOM SCREEN: _____ / _____

ELEVATION / DEPTH BOTTOM OF HOLE: _____ / _____

ATTACHMENT C-8A
EXAMPLE BEDROCK MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK (FLUSHMOUNT)

BORING NO.: _____

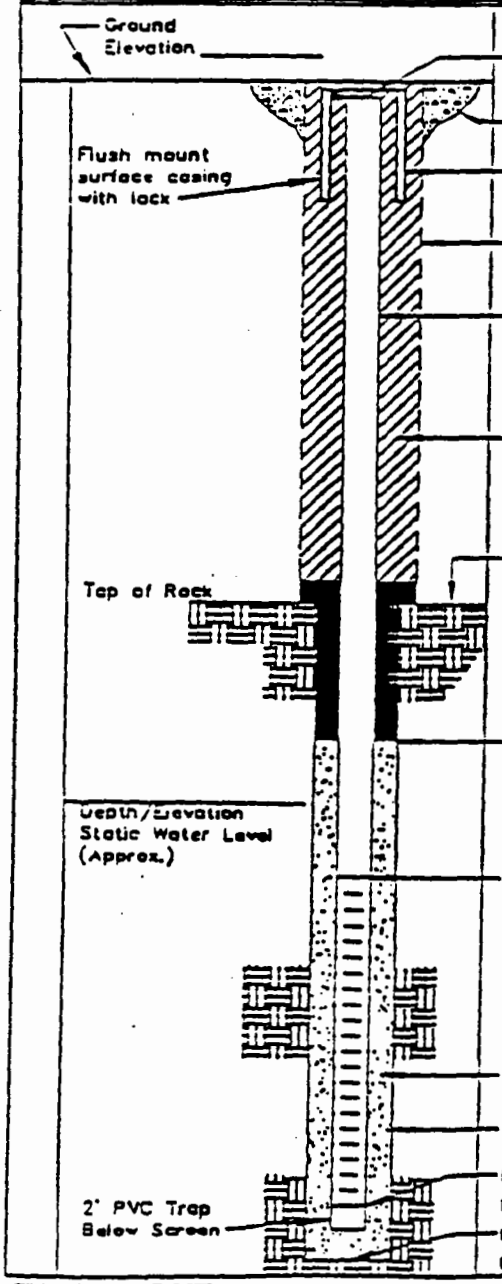
BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT: _____ LOCATION: _____ DRILLER: _____

PROJECT NO.: _____ BORING: _____ DRILLING METHOD: _____

ELEVATION: _____ DATE: _____ DEVELOPMENT METHOD: _____

FIELD GEOLOGIST: _____



ELEVATION TOP OF RISER: _____

TYPE OF SURFACE SEAL: _____

TYPE OF PROTECTIVE CASING: _____

I.D. OF PROTECTIVE CASING: _____

DIAMETER OF HOLE: _____

TYPE OF RISER PIPE: _____

RISER PIPE I.D.: _____

TYPE OF BACKFILL/SEAL: _____

_____

DEPTH/ELEVATION TOP OF BEDROCK: _____ /

DEPTH/ELEVATION TOP OF SAND: _____ /

DEPTH/ELEVATION TOP OF SCREEN: _____ /

TYPE OF SCREEN: _____

SLOT SIZE x LENGTH: _____

TYPE OF SAND PACK: _____

DIAMETER OF HOLE IN BEDROCK: _____

DEPTH/ELEVATION BOTTOM OF SCREEN: _____ /

DEPTH/ELEVATION BOTTOM OF SAND: _____ /

DEPTH/ELEVATION BOTTOM OF HOLE: _____ /

BACKFILL MATERIAL BELOW SAND: _____

ATTACHMENT C-9
EXAMPLE TEST PIT LOG

TEST PIT LOG

Brown & Root Environmental

PROJECT: _____ TEST PIT NO.:

PROJECT NO _____ DATE: _____

LOCATION: _____

FIELD GEOLOGIST: _____

DEPTH (ft.)	LITHOLOGY CHANGE (Depth ft.)	MATERIAL DESCRIPTION (Soil Density / Consistency, Color)	USCS	REMARKS

Test Pit: Cross Section and / or Plan View

REMARKS _____

PHOTO LOG _____ TEST PIT _____

PAGE ____ OF ____

ATTACHMENT D
EXAMPLE EQUIPMENT CALIBRATION LOG

Brown & Root Environmental

EQUIPMENT CALIBRATION LOG

INSTRUMENT NAME / MODEL : _____

JOB NAME : _____

MANUFACTURER : _____

JOB NUMBER : _____

CALIBRATION DATE	INITIAL SETTINGS	STANDARDS USED	PROCEDURE	ADJUSTMENTS MADE	FINAL SETTINGS	SIGNATURE	COMMENTS

ATTACHMENT E
EXAMPLE DAILY ACTIVITIES RECORD

Brown & Root Environmental

DAILY ACTIVITIES RECORD

PROJECT _____ LOCATION _____
CLIENT _____ ARRIVAL TIME _____ JOB NO. _____
DATE _____ DEPARTURE TIME _____
CONTRACTOR _____ DRILLER _____
BORING NO. _____ HNUS REPRESENTATIVE _____

ITEM	QUANTITY ESTIMATE	QUANTITY TODAY	PREVIOUS TOTAL QUANTITY	CUMULATIVE QUANTITY TO DATE

COMMENTS: _____

APPROVED BY:

_____ HNUS FIELD REPRESENTATIVE

_____ DRILLER OR REPRESENTATIVE

ATTACHMENT F
FIELD TRIP SUMMARY REPORT
PAGE 1 OF 2

SUNDAY
Date: _____ Personnel: ____
Weather: _____ Onsite: ____
____

Site Activities: _____
_____
_____
_____

MONDAY
Date: _____ Personnel: ____
Weather: _____ Onsite: ____
____

Site Activities: _____
_____
_____
_____

TUESDAY
Date: _____ Personnel: ____
Weather: _____ Onsite: ____
____

Site Activities: _____
_____
_____
_____

WEDNESDAY
Date: _____ Personnel: ____
Weather: _____ Onsite: ____
____

Site Activities: _____
_____
_____
_____

ATTACHMENT F
PAGE 2 OF 2
FIELD TRIP SUMMARY REPORT

THURSDAY

Date: _____ Personnel: ____

Weather: _____ Onsite: ____

____

Site Activities: _____

_____

_____

_____

FRIDAY

Date: _____ Personnel: ____

Weather: _____ Onsite: ____

____

Site Activities: _____

_____

_____

_____

SATURDAY

Date: _____ Personnel: ____

Weather: _____ Onsite: ____

____

Site Activities: _____

_____

_____

_____

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this procedure is to provide guidelines regarding the appropriate procedures to be followed when decontaminating drilling equipment, monitoring well materials, chemical sampling equipment and field analytical equipment.

2.0 SCOPE

This procedure addresses drilling equipment and monitoring well materials decontamination, as well as chemical sampling and field analytical equipment decontamination. This procedure also provides general reference information on the control of contaminated materials.

3.0 GLOSSARY

None.

4.0 RESPONSIBILITIES

Project Manager - Responsible for ensuring that all field activities are conducted in accordance with approved project plan(s) requirements.

Field Operations Leader (FOL) - Responsible for the onsite verification that all field activities are performed in compliance with approved Standards Operating Procedures or as otherwise dictated by the approved project plan(s).

5.0 PROCEDURES

To ensure that analytical chemical results reflect actual contaminant concentrations present at sampling locations, the various drilling equipment and chemical sampling and analytical equipment used to acquire the environment sample must be properly decontaminated. Decontamination minimizes the potential for cross-contamination between sampling locations, and the transfer of contamination offsite.

5.1 Drilling Equipment

Prior to the initiation of a drilling program, all drilling equipment involved in field sampling activities shall be decontaminated by steam cleaning at a predetermined area. The steam cleaning procedure shall be performed using a high-pressure spray of heated potable water producing a pressurized stream of steam. This steam shall be sprayed directly onto all surfaces of the various equipment which might contact environmental samples. The decontamination procedure shall be performed until all equipment is free of all visible potential contamination (dirt, grease, oil, noticeable odors, etc.) In addition, this decontamination procedure shall be performed at the completion of each sampling and/or drilling location, including soil borings, installation of monitoring wells, test pits, etc. Such equipment shall include drilling rigs, backhoes, downhole tools, augers, well casings, and screens. Where the drilling rig is set to perform multiple borings at a single area of concern, the steam-cleaning of the drilling rig itself may be waived with proper approval. Downhole equipment, however, must always be steam-cleaned between borings. Where PVC well casings are to be installed, decontamination is not required if the manufacturer provides these casings in factory-sealed, protective, plastic sleeves (so long as the protective packaging is not compromised until immediately before use.

The steam cleaning area shall be designed to contain decontamination wastes and waste waters and can be a lined excavated pit or a bermed concrete or asphalt pad. For the latter, a floor drain must be

provided which is connected to a holding facility. A shallow above-ground tank may be used or a pumping system with discharge to a waste tank may be installed.

In certain cases such an elaborate decontamination pad is not possible. In such cases, a plastic lined gravel bed pad with a collection system may serve as an adequate decontamination area. Alternately, a lined sloped pad with a collection pump installed at the lower end may be permissible. The location of the steam cleaning area shall be onsite in order to minimize potential impacts at certain sites.

Guidance to be used when decontaminating drilling equipment shall include:

- As a general rule, any part of the drilling rig which extends over the borehole, shall be steam cleaned.
- All drilling rods, augers, and any other equipment which will be introduced to the hole shall be steam cleaned.
- The drilling rig, all rods and augers, and any other potentially contaminated equipment shall be decontaminated between each well location to prevent cross contamination of potential hazardous substances.

Prior to leaving at the end of each work day and/or at the completion of the drilling program, drilling rigs and transport vehicles used onsite for personnel or equipment transfer shall be steam cleaned, as practicable. A drilling rig left at the drilling location does not need to be steam cleaned until it is finished drilling at that location.

5.2 Sampling Equipment

5.2.1 Bailers and Bailing Line

The potential for cross-contamination between sampling points through the use of a common bailer or its attached line is high unless strict procedures for decontamination are followed. For this reason, it is preferable to dedicate an individual bailer and its line to each sample point, although this does not eliminate the need for decontamination of dedicated bailers. For non-dedicated sampling equipment, the following conditions and/or decontamination procedures must be followed.

Before the initial sampling and after each successive sampling point, the bailer must be decontaminated. The following steps are to be performed when sampling for organic contaminants. Note: contract-specific requirements may permit alternative procedures.

- Potable water rinse
- Alconox or Liquinox detergent wash
- Scrubbing of the line and bailer with a scrub brush (may be required if the sample point is heavily contaminated with heavy or extremely viscous compounds)
- Potable water rinse
- Rinse with 10 percent nitric acid solution*
- Deionized water rinse

* Due to the leaching ability of nitric acid on stainless steel, this step is to be omitted if a stainless steel sampling device is being used and metals analysis is required with detection limits less than approximately 50 ppb.

- Acetone or methanol rinse (in some EPA Regions, isopropanol is used instead)
- Hexane rinse**
- Copious distilled/Deionized water rinse
- Air dry

If sampling for volatile organic compounds (VOCs) only, the nitric acid, acetone, methanol, and hexane rinses may be omitted. Only reagent grade or purer solvents are to be used for decontamination. When isopropanol is used, the bailer must be thoroughly dry before using to acquire the next sample.

In general, specially purchased pre-cleaned disposable sampling equipment is not decontaminated (nor is an equipment rinsate blank collected) so long as the supplier has provided certification of cleanliness. If decontamination is performed on several bailers at once (i.e., in batches), bailers not immediately used may be completely wrapped in aluminum foil (shiny-side toward equipment) and stored for future use. When batch decontamination is performed, one equipment rinsate is generally collected from one of the bailers belonging to the batch before it is used for sampling.

It is recommended that clean, dedicated braided nylon or polypropylene line be employed with each bailer use.

5.2.2 Sampling Pumps

Most sampling pumps are low volume (less than 2 gpm) pumps. These include peristaltic, diaphragm, air-lift, pitcher and bladder pumps, to name a few. If these pumps are used for sampling from more than one sampling point, they must be decontaminated prior to initial use and after each use.

The procedures to be used for decontamination of sampling pumps compare to those used for a bailer except that the 10 percent nitric acid solution is omitted. Each of the liquid factions is to be pumped through the system. The amount of pumping is dependent upon the size of the pump and the length of the intake and discharge hoses. Certain types of pumps are unacceptable for sampling purposes. For peristaltic pumps, the tubing is replaced rather than cleaned.

An additional problem is introduced when the pump relies on absorption of water via an inlet or outlet hose. For organic sampling, this hose should be Teflon. Other types of hoses leach organics (especially phthalate esters) into the water being sampled or adsorb organics from the sampled water. For all other sampling, the hose should be Viton, polyethylene, or polyvinyl chloride (listed in order of preference). Whenever possible, dedicated hoses should be used. It is preferable that these types of pumps not be used for sampling, only for purging.

5.2.3 Filtering Equipment

On occasion, the sampling plan may require acquisition of filtered groundwater samples. Field-filtering is addressed in SOP SA-6.1 and should be conducted as soon after sample acquisition as possible. To this end, three basic filtration systems are most commonly used: the in-line disposable Teflon filter, the inert gas over-pressure filtration system, and the vacuum filtration system.

For the in-line filter, decontamination is not required since the filter cartridge is disposable, however, the cartridge must be disposed of in an approved receptacle and the intake and discharge lines must still be decontaminated or replaced before each use.

** If sampling for pesticides, PCBs, or fuels.

For the over-pressure and the vacuum filtration systems, the portions of the apparatus which come in contact with the sample must be decontaminated as outlined in the paragraphs describing the decontamination of bailers. (Note: Varieties of both of these systems come equipped from the manufacturer with Teflon-lined surfaces for those that would come into contact with the sample. These filtration systems are preferred when decontamination procedures must be employed.)

5.2.4 Other Sampling Equipment

Field tools such as trowels and mixing bowls are to be decontaminated in the same manner as described above.

5.3 Field Analytical Equipment

5.3.1 Water Level Indicators

Water level indicators that come into contact with groundwater must be decontaminated using the following steps:

- Rinse with potable water
- Rinse with deionized water
- Acetone or methanol rinse (unless otherwise directed by manufacturer)
- Rinse with deionized water

Water level indicators that do not come in contact with the groundwater but may encounter incidental contact during installation or retrieval need only undergo the first and last steps stated above.

5.3.2 Probes

Probes (e.g., pH or specific-ion electrodes, geophysical probes, or thermometers) which would come in direct contact with the sample, will be decontaminated using the procedures specified above unless manufacturer's instructions indicate otherwise (e.g., dissolved oxygen probes). Probes that contact a volume of groundwater not used for laboratory analyses can be rinsed with deionized water. For probes which make no direct contact, (e.g., OVA equipment) the probe is self-cleaning when exposure to uncontaminated air is allowed and the housing can be wiped clean with paper-towels or cloth wetted with alcohol.

5.4 Waste Handling

For the purposes of these procedures, contaminated materials are defined as any byproducts of field activities that are suspected or known to be contaminated with hazardous substances. These byproducts include such materials as decontamination solutions, disposable equipment, drilling muds, well-development fluids, and spill-contaminated materials and Personal Protection Equipment (PPE).

The procedures for obtaining permits for investigations of sites containing hazardous substances are not clearly defined at present. In the absence of a clear directive to the contrary by the EPA and the states, it must be assumed that hazardous wastes generated during field activities will require compliance with Federal agency requirements for generation, storage, transportation, or disposal. In addition, there may be state regulations that govern the disposal action. This procedure exclusively describes the technical methods used to control contaminated materials.

The plan documents for site activities must include a description of control procedures for contaminated materials. This planning strategy must assess the type of contamination, estimate the amounts that would be produced, describe containment equipment and procedures, and delineate storage or disposal methods. As a general policy, it is wise to select investigation methods that minimize the generation of contaminated spoils. Handling and disposing of potentially hazardous materials can be dangerous and expensive. Until sample analysis is complete, it is assumed that all produced materials are suspected of contamination from hazardous chemicals and require containment.

5.5 Sources of Contaminated Materials and Containment Methods

5.5.1 Decontamination Solutions

All waste decontamination solutions and rinses must be assumed to contain the hazardous chemicals associated with the site unless there are analytical or other data to the contrary. The waste solution volumes could vary from a few gallons to several hundred gallons in cases where large equipment required cleaning.

Containerized waste rinse solutions are best stored in 55-gallon drums (or equivalent containers) that can be sealed until ultimate disposal at an approved facility. Larger equipment such as backhoes and tractors must be decontaminated in an area provided with an impermeable liner and a liquid collection system. A decontamination area for large equipment could consist of a bermed concrete pad with a floor drain leading to a buried holding tank.

5.5.2 Disposable Equipment

Disposable equipment that could become contaminated during use typically includes PPE, rubber gloves, boots, broken sample containers, and cleaning-wipes. These items are small and can easily be contained in 55-gallon drums with lids. These containers should be closed at the end of each work day and upon project completion to provide secure containment until disposed.

5.5.3 Drilling Muds and Well-Development Fluids

Drilling muds and well-development fluids are materials that may be used in groundwater monitoring well installations. Their proper use could result in the surface accumulation of contaminated liquids and muds that require containment. The volumes of drilling muds and well-development fluids used depend on well diameter and depth, groundwater characteristics, and geologic formations. There are no simple mathematical formulas available for accurately predicting these volumes. It is best to rely on the experience of reputable well drillers familiar with local conditions and the well installation techniques selected. These individuals should be able to estimate the sizes (or number) of containment structures required. Since guesswork is involved, it is recommended that an slight excess of the estimated amount of containers required will be available.

Drilling muds are mixed and stored in what is commonly referred to as a mud pit. This mud pit consists of a suction section from which drilling mud is withdrawn and pumped through hoses, down the drill pipe to the bit, and back up the hole to the settling section of the mud pit. In the settling section, the mud's velocity is reduced by a screen and several flow-restriction devices, thereby allowing the well cuttings to settle out of the mud/fluid.

The mud pit may be either portable above-ground tanks commonly made of steel (which is preferred) or stationary in-ground pits as depicted in Attachment A. The above-ground tanks have a major advantage over the in-ground pits because the above-ground tanks isolate the natural soils from the

contaminated fluids within the drilling system. These tanks are also portable and can usually be cleaned easily.

As the well is drilled, the cuttings that accumulate in the settling section must be removed. This is best done by shoveling them into drums or other similar containers. When the drilling is complete, the contents of the above-ground tank are likewise shoveled or pumped into drums, and the tank is cleaned and made available for its next use.

If in-ground pits are used, they should not extend into the natural water table. They should also be lined with a bentonite-cement mixture followed by a layer of flexible impermeable material such as plastic sheeting. Of course, to maintain its impermeable seal, the lining material used would have to be nonreactive with the wastes. An advantage of the in-ground pits is that well cuttings do not necessarily have to be removed periodically during drilling because the pit can be made deep enough to contain them. Depending on site conditions, the in-ground pit may have to be totally excavated and refilled with uncontaminated natural soils when the drilling operation is complete.

When the above-ground tank or the in-ground pit is used, a reserve tank or pit should be located at the site as a backup system for leaks, spills, and overflows. In either case, surface drainage should be such that any excess fluid could be controlled within the immediate area of the drill site.

The containment procedure for well-development fluids is similar to that for drilling muds. The volume and weight of contaminated fluid will be determined by the method used for development. When a new well is pumped or bailed to produce clear water, substantially less volume and weight of fluid result than when backwashing or high-velocity jetting is used.

5.5.4 Spill-Contaminated Materials

A spill is always possible when containers of liquids are opened or moved. Contaminated sorbents and soils resulting from spills must be contained. Small quantities of spill-contaminated materials are usually best contained in drums, while larger quantities can be placed in lined pits or in other impermeable structures. In some cases, onsite containment may not be feasible and immediate transport to an approved disposal site will be required.

5.6 Disposal of Contaminated Materials

Actual disposal techniques for contaminated materials are the same as those for any hazardous substance, that is, incineration, landfilling, treatment, and so on. The problem centers around the assignment of responsibility for disposal. The responsibility must be determined and agreed upon by all involved parties before the field work starts. If the site owner or manager was involved in activities that precipitated the investigation, it seems reasonable to encourage his acceptance of the disposal obligation. In instances where a responsible party cannot be identified, this responsibility may fall on the public agency or private organization investigating the site.

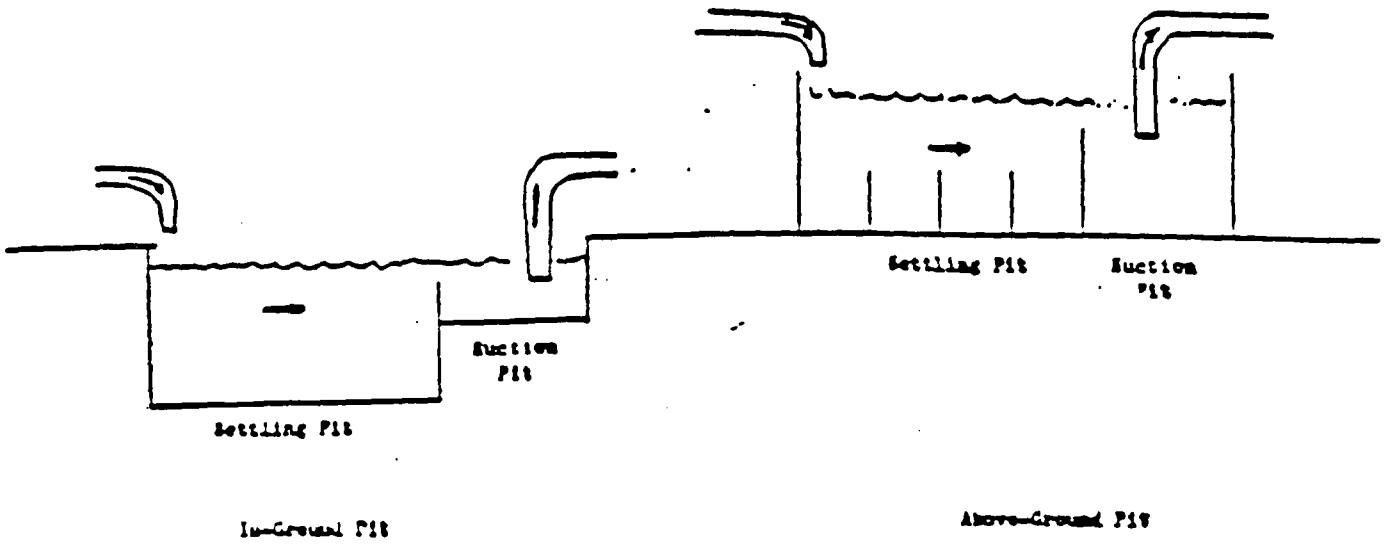
Another consideration in selecting disposal methods for contaminated materials is whether the disposal can be incorporated into subsequent site cleanup activities. For example, if construction of a suitable onsite disposal structure is expected, contaminated materials generated during the investigation should be stored at the site for disposal with other site materials. In this case, the initial containment structures should be evaluated for use as long-term storage structures. Also, other site conditions such as drainage control, security, and soil type must be considered so that proper storage is provided. If onsite storage is expected, then the containment structures should be specifically designed for that purpose.

6.0 REFERENCES

Brown & Root Environmental: Standard Operating Procedure No. 4.33. Control of Contaminated Material.

ATTACHMENT A

TWO TYPES OF MUD PITS USED IN WELL DRILLING



In-Ground Pit

Above-Ground Pit

STANDARD FIELD FORMS

AS A MINIMUM, THE FOLLOWING ITEMS MUST BE INCLUDED IN THE FIELD LOGBOOK

- o All entries must be made in blue or black indelible ink.
- o Errors must be lined out ONCE and INITIALED.
- o Each page must be sequentially numbered, dated, signed and the project number must be written at the top of each page. No blank pages.
- o List the time of arrival at work site, and the names of all BRE personnel.
- o State the level of personal protection required (level D, level D mod., level C, etc.)
- o Designation of the Field Team Leader and a Site Safety Officer.
- o State that a Site Safety Meeting/Briefing was conducted and who was present.
- o List weather conditions and update as necessary.
- o List specific reason(s) for site visit (sampling, drilling, etc...).
- o List Subcontractor(s) present at the site and time of arrivals to the site, list all heavy equipment (such as drilling rig, back hoe, jackhammer, etc....).
- o List name(s) and time(s) of arrival/departure of anyone visiting the site (such as BRE or subcontractor personnel, Client, regulators, inspectors.....)
- o Describe the method of decontamination for drilling tools, bailers, and other equipment. Site the reference(s) that you use for decontamination (i.e., In accordance with Section 5 of BRE's FDEP -approved CompQAP, etc...)
- o Indicate that the field instruments have been calibrated and indicate where the calibration information can be found if it is not listed in this logbook. Identify field instruments used by model number and I.D. number or serial number.
- o A physical description of all samples must be recorded. Give location of samples, boreholes, etc... A diagram or map would be most appropriate.
- o Describe the condition of the site prior to departure (such as wells locked, pump operational, diffused aerator down, barricades properly located, boreholes properly abandoned, etc.....)
- o Handling of drill cuttings, development/purge water, and other site derived wastes (e.g., drumming, spreading on plastic, etc.)
- o Reference all field forms that are used.

UNDER NO CIRCUMSTANCES SHOULD THE FIELD LOGBOOK BE IN ANYONE'S POSSESSION OTHER THAN BRE PERSONNEL.

Arnold C. Lamb
District Manager of Quality Assurance
February 2, 1995

DAILY ACTIVITIES RECORD

PROJECT NAME: _____ PROJECT NUMBER: _____

CLIENT: _____ LOCATION: _____

DATE: _____ ARRIVAL TIME: _____

B&RE PERSONNEL: _____ DEPARTURE TIME: _____

CONTRACTOR: _____ DRILLER: _____

ITEM	QUANTITY ESTIMATE	QUANTITY TODAY	PREVIOUS TOTAL QUANTITY	CUMULATIVE QUANTITY TO DATE

COMMENTS: _____

APPROVED BY:

_____ _____

B&RE REPRESENTATIVE DRILLER

DATE: _____

DOCUMENTATION OF FIELD CALIBRATION

SITE NAME: ______________________________ PROJECT NO.: ________________

Date of Calibration	Instrument Name and Model	B & R Environmental Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot Number)	Remarks/ Comments
				Pre-Calibration	Post-Calibration	Pre-Calibration	Post-Calibration		

Brown & Root Environmental

MULTIPLE SAMPLE LOG SHEET

PAGE ___ OF ___

[ ] SURFACE SOIL
[ ] SUBSURFACE SOIL
[ ] SEDIMENT
[ ] LAGOON/POND
[ ] OTHER

SAMPLER(S) SIGNATURE _____

PROJECT NAME: _____

PROJECT NUMBER: _____

AREA DESIGNATION _____

Sample No.	Sample Method	Depth (FT)	Date	Time	Sampled By	Concentration (L)Low (H)High	(G)Grab (C)Composite	Analyses							No. of Cont. Total	Soil Description

REMARKS:

LAB:

COC NO:

Brown & Root Environmental
455 FAIRWAY DRIVE, SUITE 200
DEERFIELD BEACH, FLORIDA 33441
(305) 570-5885 (305) 570-5974 (FAX)

SITE MANAGER: _____
PROJECT NAME: _____
BRE PROJECT NO.: _____ CODE: _____
P.O. NO.: _____

SHIPPED TO: _____ PAGE __ OF __
(LABORATORY NAME, CITY)

CHAIN OF CUSTODY RECORD

LABORATORY ANALYSIS

SAMPLED BY (PRINT): _____
SAMPLER SIGNATURE: _____

☐ STANDARD TAT ☐ RUS
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☐ 7 DA
RESULTS DUE DATE: _____

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	PRES. TYPE / PARAMETERS / NUMBER OF CONTAINERS
			TOTAL NUMBER OF CONTAINERS				

COMMENTS:

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ②	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ③	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS:

SAMPLE CONTAINERS PRECLEANED BY:
☐ BRE ☐ LABORATORY ☐ MANUFACTURER

METHOD OF SHIPMENT: _____

BILL OF LADING NO.: _____

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY

SAMPLING TEAM: _____

RECEIVED FOR LABORATORY BY (SIGNATURE): _____

No. 0257

BRE Project No: | Date: | Sampler(s):

Client Site ID: | Facility Address:

Weather: | Sampling Method: Teflon Bailer Y N Other | SOP Cleaning Y N

Comments:

GROUNDWATER SYSTEM PERFORMANCE AND QUALITY CONTROL SAMPLES											TEST PARAMETERS			
A	B	C	D	E	Sample ID	Time	Source	pH	Temp.	Sp. Cond.		Test Method	Container Type	Preserv. Type
							GWS Influent				A			
							GWS Effluent				B			
							Equipment Blank				C			
							Equipment Blank				D			
							Trip Blank				E			
							Duplicate 1							
							Duplicate 1							

GROUNDWATER SAMPLES											TD	Csg Dia (in)	DTW	Purge Vol

UNITS: TEMPERATURE = DEGREES CELSIUS/pH = STANDARD UNITS/SPECIFIC CONDUCTANCE = UMHOS/CM

WELL CASING VOLUMES (GALLONS/FT OF SATURATED CASING, FOR 5x PURGE) 1.25" = 0.32 / 2" = 0.32 / 4" = 3.27 / 6" = 7.35

NOTE: A 3x PURGE IS OK FOR: 4" = 1.96 / 6" = 4.41 PROVIDED 3 CONSISTENT REPEAT FIELD METER READINGS ARE OBSERVED

SINGLE SAMPLE LOG SHEET

Project Site Name: _____

Project No.: _____

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Other _____
- ☐ QA Sample Type: _____

Sample ID No.: _____

Sample Location: _____

Sampled By: _____

C.O.C. No.: _____

Sample Method:

Type of Sample
- ☐ Grab
- ☐ Composite
- ☐ Grab-Composite
- ☐ High Concentration
- ☐ Low Concentration

Depth Sampled:

Sample Date and Time:

Composite Sample Data

Sample	Time	Color/Description

Grab Sample Data

Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)

Analysis	Container Requirements	Collected (✓)

Map:

Observations/Notes:

Circle if Applicable:

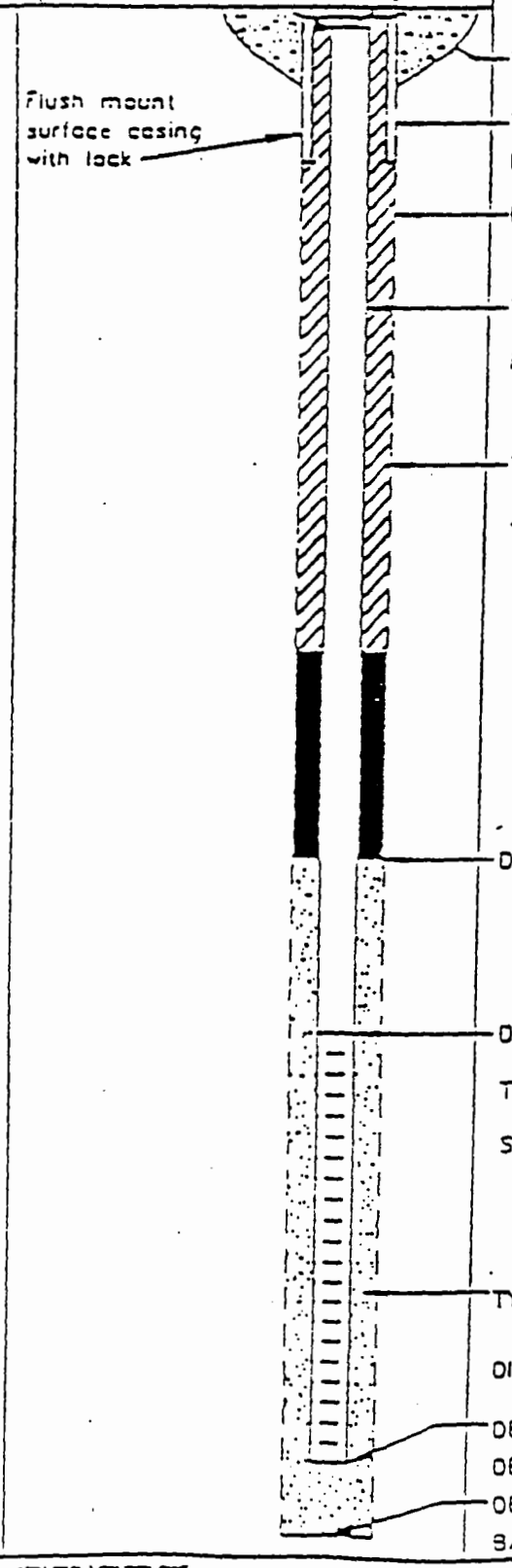
MS/MSD | Duplicate ID No:

Signature(s):

MONITORING WELL SHEET

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION TOP OF RISER: _____

TYPE OF SURFACE SEAL: _____

TYPE OF PROTECTIVE CASING: _____

I.D. OF PROTECTIVE CASING: _____

DIAMETER OF HOLE: _____

TYPE OF RISER PIPE: _____

RISER PIPE I.D.: _____

TYPE OF BACKFILL/SEAL: _____

_____

DEPTH/ELEVATION TOP OF SAND: _____ / _____

DEPTH/ELEVATION TOP OF SCREEN: _____ / _____

TYPE OF SCREEN: _____

SLOT SIZE x LENGTH: _____

TYPE OF SAND PACK: _____

DIAMETER OF HOLE IN BEDROCK: _____

DEPTH/ELEVATION BOTTOM OF SCREEN: _____ / _____

DEPTH/ELEVATION BOTTOM OF SAND: _____ / _____

DEPTH/ELEVATION BOTTOM OF HOLE: _____ / _____

BACKFILL MATERIAL BELOW SAND: _____

MONITORING WELL DEVELOPMENT RECORD

Well:_____ Depth to Bottom (ft): _____ Site Geologist: _____

Site :_____ Static Water Level Before(ft):_____ Drilling Co.: _____

Date Installed: _____ Static Water Level After (ft):_____ Project:_____

Date Developed:_____ Screen Length (ft):_____ Project Number:_____

Dev. Method:_____ Specific Capacity:_____ Sheet No._____ of _____

Pump Type:_____ Casing ID (in): _____

Time	Estimated Sediment Thickness (ft)	Cumulative Water Volume or Pumping Rate (gallons/gpm)	Water Level Reading (ft. below TOC)	Temperature (units_____)	pH	Specific Conductance (microsiemens/cm)	Turbidity (NTU)	Remarks (odor, color, etc.)

SOUTHNAVFAC

LOG OF BORING

Page

PROJECT NO:	PROJECT NAME:
PROJECT LOCATION:	DATE DRILLED:
DRILLING COMPANY:	SURFACE ELEVATION: *Feet*
DRILLING METHOD:	BORING DIAMETER: *Inches*
DRILLING RIG:	GEOLOGIST:

DEPTH feet	SAMPLE NUMBER	BLOWS/FT.	PID (ppm)				GRAPHIC LOG	USCS/ROD	GEOLOGIC DESCRIPTION Density/Consistency, Hardness, Color	WELL DIAGRAM
			Sample	B. Zone	Borehole	Drill B. Z.				
5										
10										
15										
20										
25										
30										
35										
40										

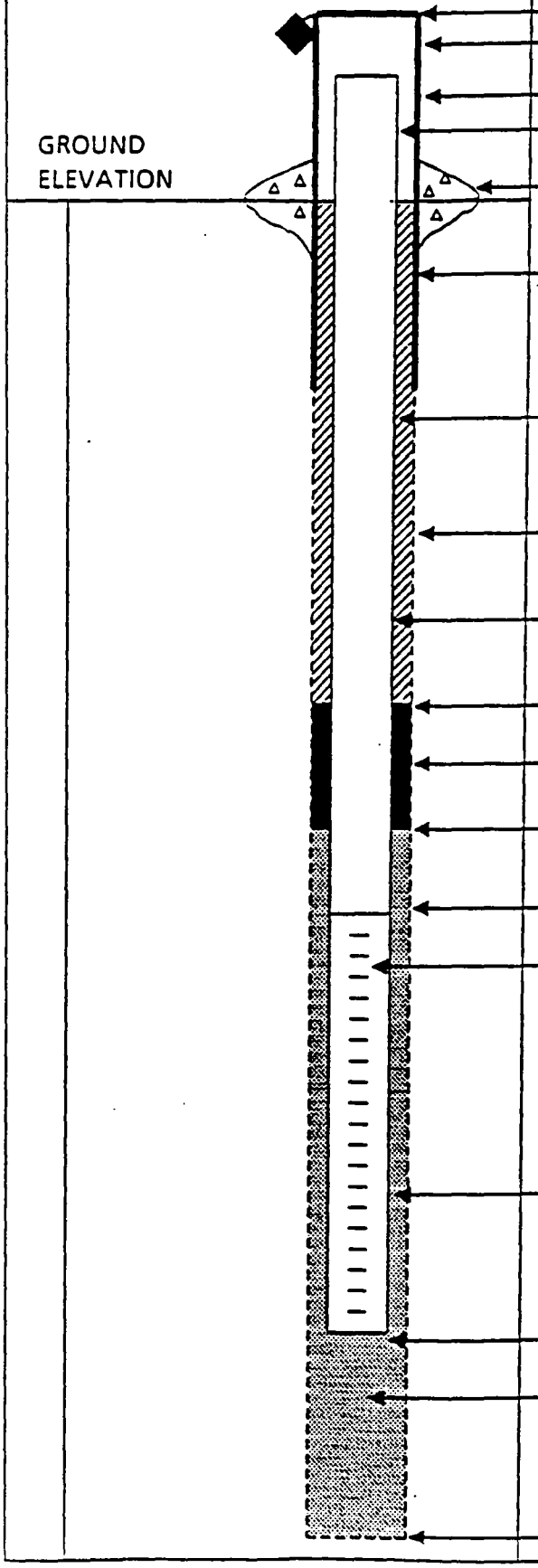
JOB NUMBER:

SOUTHNAVFAC

OVERBURDEN MONITORING WELL SHEET

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF SURFACE CASING : _____
ELEVATION OF TOP OF RISER PIPE: _____

STICK - UP TOP OF SURFACE CASING: _____
STICK - UP RISER PIPE : _____

TYPE OF SURFACE SEAL: _____

I.D. OF SURFACE CASING: _____
TYPE OF SURFACE CASING: _____

RISER PIPE I.D. _____
TYPE OF RISER PIPE: _____

BOREHOLE DIAMETER: _____

TYPE OF BACKFILL: _____

ELEVATION / DEPTH TOP OF SEAL: _____/

TYPE OF SEAL: _____

DEPTH TOP OF SAND PACK: _____

ELEVATION / DEPTH TOP OF SCREEN: _____/

TYPE OF SCREEN: _____

SLOT SIZE x LENGTH: _____

I.D. OF SCREEN: _____

TYPE OF SAND PACK: _____

ELEVATION / DEPTH BOTTOM OF SCREEN: _____/

ELEVATION / DEPTH BOTTOM OF SAND PACK: _____/
TYPE OF BACKFILL BELOW OBSERVATION WELL: _____

ELEVATION / DEPTH OF HOLE: _____/

CERTIFICATE OF CONFORMANCE

Well Designation:_____ Site Geologist: _____

Site Name: _____ Drilling Company: _____

Date Installed: _____ Driller:_____

Project Name: _____ Project Number: _____

Material	Brand/Description	Source/Supplier	Sample Collected ?
Well Casing			
Well Screen			
End Cap			
Drilling Fluid			
Drilling Fluid Additives			
Backfill Material			
Annular Filter Pack			
Bentonite Seal			
Annular Grout			
Surface Cement			
Protective Casing			
Paint			
Rod Lubricant			
Compressor Oil			

To the best of my knowledge, I certify that the above described materials were used during installation of this monitoring well.

Signature of Site Geologist:_____

FLORIDA

FDEP Form # 62-770.900(3)
Form Title: Petroleum or Petroleum Products Water Sampling Log
Effective Date:

Petroleum or Petroleum Products Water Sampling Log

FDEP FACILITY NO.:	WELL NO.:	SAMPLE ID:	DATE: / /
SITE NAME:	SITE LOCATION:		

PURGE DATA

WELL DIAMETER (in):	TOTAL WELL DEPTH (ft):	DEPTH TO WATER (ft):	WELL CAPACITY (gal/ft):

1 WELL VOLUME (gal) = (TOTAL WELL DEPTH – DEPTH TO WATER) x WELL CAPACITY =

= (–) x =

PURGE METHOD:					PURGING INITIATED AT:		PURGING ENDED AT:	
WELL VOLS. PURGED	CUMUL. VOLUME PURGED (gal)	pH	TEMP. (°C)	COND. (umhos)	PURGE RATE (gpm):		TOTAL VOLUME PURGED (gal):	
					COLOR	ODOR	APPEARANCE	OTHER

SAMPLING DATA

SAMPLED BY / AFFILIATION		SAMPLER(S) SIGNATURE(S)	
SAMPLING METHOD(S):		SAMPLING INITIATED AT:	SAMPLING ENDED AT:

FIELD DECONTAMINATION: Y N | FIELD-FILTERED: Y N | DUPLICATE: Y N

SAMPLE CONTAINER SPECIFICATIONS			SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD
NO.	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOLUME ADDED IN FIELD (ml)	FINAL pH	

REMARKS:

MATERIAL CODES: AG = AMBER GLASS; CG = CLEAR GLASS; HDP = HIGH DENSITY POLYETHYLENE; O = OTHER (SPECIFY)

WELL CAPACITY: 1.25" = 0.06 gal/ft; 2" = 0.16 gal/ft; 4" = 0.65 gal/ft; 6" = 1.47 gal/ft; 8" = 2.61 gal/ft; 12" = 5.88 gal/ft

NOTE: this does not constitute all the information required by Chapter 62-160, F.A.C.