DRAFT FINAL CONTAMINATION ASSESSMENT REPORT FOR BERTHING WHARF BUILDING 189 TRUMAN ANNEX NAS KEY WEST FL

2/1/1992

ABB ENVIRONMENTAL SERVICES INC

0020

DRAFT FINAL

FEBRUARY 1992
CONTAMINATION ASSESSMENT REPORT

BERTHING WHARF
BUILDING 189
TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA
29411-0068

TtNUS
AIK

DISTRIBUTION

SOUTHNAVFACENGCOM (5)
NAS KEY WEST (2)

CONTAMINATION ASSESSMENT REPORT

BERTHING WHARF SITE

BUILDING 189

TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

UIC NO.: N00213

CONTRACT NO. 62467-89-D-0317

Prepared by:

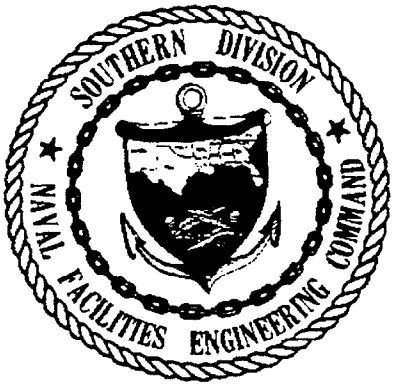
ABB ENVIRONMENTAL SERVICES INC.
2571 EXECUTIVE CENTER CIRCLE EAST, SUITE 100
TALLAHASSEE, FLORIDA

Prepared for:

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
P.O. BOX 10068
CHARLESTON, SOUTH CAROLINA 29411-0068

CARL LOOP, ENGINEER IN CHARGE

FEBRUARY 1992



FOREWORD

Subtitle I of the Hazardous and Solid Waste Amendments (HSWA) of 1984 to the Solid Waste Disposal Act (SWDA) of 1965 established a national regulatory program for managing underground storage tanks (USTs) containing hazardous materials, primarily petroleum products. Prior to 1984, hazardous wastes stored in USTs were regulated under the Resource Conservation and Recovery Act (RCRA) of 1976, an earlier amendment to SWDA. Subtitle I requires the U.S. Environmental Protection Agency (USEPA) promulgate UST regulations. Accordingly, programs were designed by the USEPA to be administered by individual states, allowing each state the alternative to develop more stringent, but not less stringent standards for the management and regulation of USTs than the Federal regulations provided in Subtitle I. Local governments were also permitted to establish regulatory standards that were more stringent, but not less stringent than either State or Federal regulations. The USEPA UST regulations are found in the Code of Federal Regulations, Title 40, Part 280 (40 CFR 280), *Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks* and 40 CFR 281, *Approval of State Underground Storage Tank Programs*. 40 CFR 280 was revised and published on September 23, 1988, and became effective December 22, 1988.

It is the policy of the Navy to comply with all Federal, State, and local regulations pertaining to USTs. This report was prepared to satisfy the requirements of the Florida Department of Environmental Regulations (FDER) Chapter 17-770, Florida Administrative Code (FAC), *State Underground Petroleum Environmental Response*, regarding regulations on petroleum contamination.

Questions regarding this report should be addressed to the Commanding Officer, Naval Air Station (NAS) Key West, Florida, or to Southern Division Naval Facilities Engineering Command (SOUTHNAVFAC), Code 18237, at 803-743-0528.

EXECUTIVE SUMMARY

The Berthing Wharf is located in the northern part of Truman Annex, Naval Air Station (NAS) Key West. The wharf was reconstructed in 1989. During reconstruction activities, discharges from a broken fuel transfer pipeline was discovered beneath the site. The line was reportedly used to carry Bunker-C fuel oil, a viscous, tarry petroleum product classified in the kerosene analytical group as defined by Chapter 17-770, Florida Administrative Code (FAC).
A contamination assessment (CA) was performed by ABB Environmental Services Inc. (ABB-ES) in July and August, 1991. The objective of the CA was to identify petroleum contaminants at the site, to assess the degree and extent of petroleum contamination in soils and in the surficial aquifer, and to recommend a feasible course of action, if necessary, to attain compliance with State regulatory levels.

Thirteen soil borings were conducted and nine groundwater monitoring wells were installed at the site. Soil and groundwater samples were collected and analyzed for petroleum constituents of the kerosene analytical group. A Contamination Assessment Report (CAR) was prepared and is attached herewith. The findings, conclusions, and recommendations of the CAR are summarized below.

FINDINGS

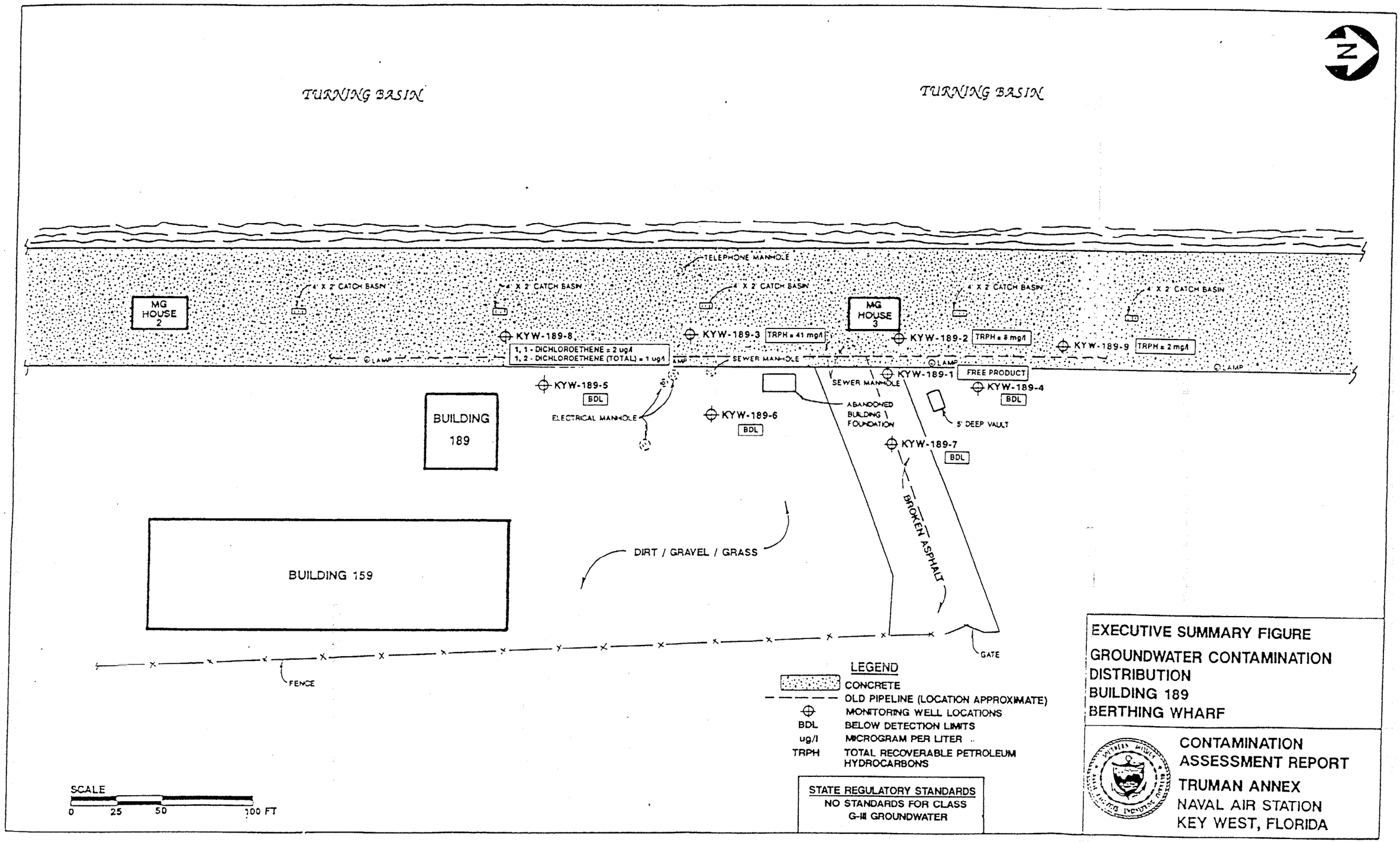
- No petroleum contaminated soils above regulatory limits were identified by organic vapor analyzer (OVA) headspace analysis.
- No official potable wells are present in the Key West area. Groundwater from the surficial aquifer is an unlikely source of potable water (McKenzie, 1990), and is designated as a Class G-III non-potable groundwater source.
- Groundwater contaminant levels were only slightly above detection limits with the exception of well KYW-189-1, which contained free product. Other wells close to well KYW-189-1 did not contain free product and had low contamination levels.
- The highest soil and groundwater contamination exist adjacent to small areas along the former pipeline location that are now covered with concrete.
- The source of contamination has been abated through the removal of the Bunker-C fuel pipeline during reconstruction activities at the wharf.

CONCLUSIONS

The net groundwater flow direction in the surficial aquifer is westerly toward the shoreline. Although relatively rapid groundwater flow velocities are indicated, suggesting potential groundwater contaminant migration, the highly viscous Bunker-C fuel oil is expected to be retained by soil adhesion. In addition, contaminant contact with potential receptors are through seaward migration of groundwater contaminants. The presence of two seawalls at the site will hinder seaward contaminant migration.

RECOMMENDATIONS

A monitoring only plan (MOP) has been recommended to monitor the potential migration of contamination from the vicinity of well KYW-189-1. The MOP will require the quarterly groundwater sampling of the three site wells. These samples will be analyzed for constituents of the kerosene analytical group. It is anticipated that monitoring will continue for a period of 1 year, or until contamination drops to regulatory levels acceptable to FDER.



EXECUTIVE SUMMARY FIGURE
GROUNDWATER CONTAMINATION DISTRIBUTION
BUILDING 189
BERTHING WHARF

CONTAMINATION ASSESSMENT REPORT
TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

00304017

ACKNOWLEDGEMENTS

In preparing this report, the Underground Storage Tank Section of the Comprehensive Long-Term Environmental Action Navy (CLEAN) Group at ABB-ES commends the support, assistance, and cooperation provided by the personnel at NAS Key West, Florida, and Southern Division, Naval Facilities Engineering Command. In particular, ABB-ES acknowledges the effort, dedication, and professionalism provided by the following people during the investigation and preparation of this report.

NAME	TITLE	POSITION	LOCATION
Carl Loop	Env. Engineer	Engineer in Charge	SOUTHNAVFAC
William Hunt	Env. Coordinator	Environmental Coordinator	NAS Key West
Diane Lancaster	Env. Specialist	Environmental Specialist	NAS Key West

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ACRONYMS, INITIALISMS, AND ABBREVIATIONS

The following list contains many of the acronyms, initialisms, abbreviations, and units of measure that may be used in this report.

ABB-ES	ABB Environmental Services Inc.
BDL	below detection limits
BTEX	benzene, toluene, ethylbenzene, and xylenes
bls	below land surface
CA	Contamination Assessment
CAP	Contamination Assessment Plan
CAR	Contamination Assessment Report
CFR	Code of Federal Regulations
CompQAPP	Comprehensive Quality Assurance Program Plan
CTO	Contract Task Order
EDB	ethylene dibromide
FAC	Florida Administrative Code
FDER	Florida Department of Environmental Regulations
ft/day	feet per day
ft2/day	feet squared per day
gpd/ft	gallons per day per foot
HSWA	Hazardous and Solid Waste Amendments of 1984
msl	mean sea level
MOP	Monitoring Only Plan
MTBE	methyl-tert-butyl ether
NAS	Naval Air Station
NGVD	National Geodetic Vertical Datum
OVA	organic vapor analyzer
PAH	polynuclear aromatic hydrocarbons
POA	Plan of Action
ppb	parts per billion
ppm	parts per million
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
SOUTHNAVFAC	Southern Division Naval Facilities Engineering Command
SPT	standard penetration test
SWDA	Solid Waste Disposal Act of 1965
TRPH	total recoverable petroleum hydrocarbons
µg/l	micrograms per liter
µmhos/cm	micromhos per centimeter
UIC	unit identification code
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
VOA	volatile organic aromatics
1,2-DCA	1,2-dichloroethane

1.0 INTRODUCTION

ABB Environmental Services Inc. (ABB-ES) was contracted by the Naval Facilities Engineering Command, Southern Division (SOUTHNAVFAC) to perform a contamination assessment (CA) and submit a Contamination Assessment Report (CAR) for the Berthing Wharf, Naval Air Station (NAS), Key West, Florida. The limits of the investigation were between Station 127 + 00 and Station 129 + 09. During reconstruction of the wharf in 1989, a fuel transfer pipeline containing Bunker-C fuel oil was discovered beneath the existing structure. The pipeline was broken during the reconstruction activities resulting in the release of petroleum. Although the pipeline and much of the contaminated soils have been removed, a site investigation program was required to identify petroleum contaminants remaining at the site and to assess the extent of contamination.
The scope of services provided by ABB-ES to SOUTHNAVFAC during the CA were defined by and performed under Contract Task Order (CTO) No. 007, the Plan of Action (POA), and the Contamination Assessment Plan (CAP), and included the following:

- installing soil borings and monitoring wells,
- analyzing groundwater and soil samples to assess the extent of soil and groundwater petroleum contamination,
- collecting water level data,
- conducting an inventory of potable wells within a 1/4-mile radius of the site,
- performing slug tests on select wells to estimate aquifer characteristics, and
- reducing and analyzing data gathered during the CA to complete this CAR.

The assessment under this contract was conducted during July and August 1991. The following sections of the report present the background information, investigative methodologies, data compilation, results, conclusions, and recommendations of the CAR.

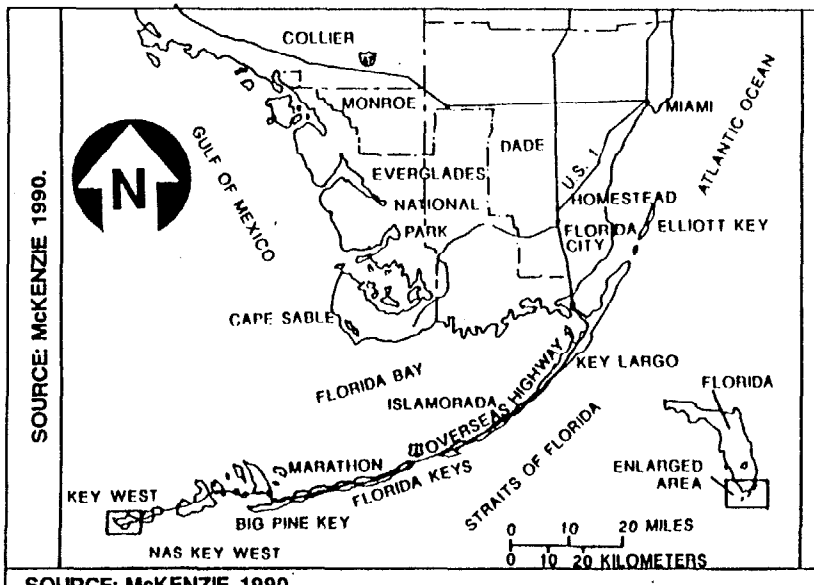
2.0 SITE BACKGROUND

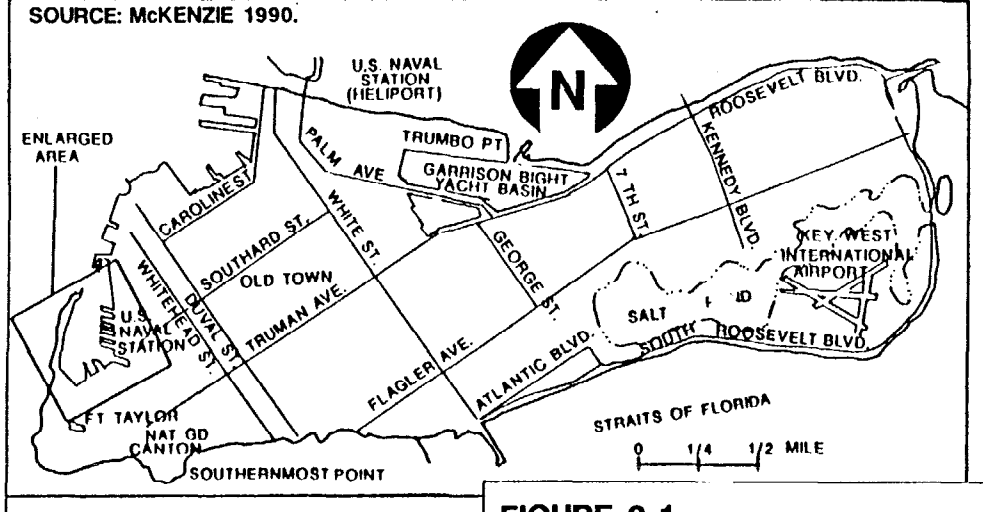
2.1 SITE DESCRIPTION

Naval Air Station Key West (NAS Key West) is located approximately 150 miles southwest of Miami in Monroe County, Florida (Figure 2-1). NAS Key West, a complex of activities located in numerous areas of the Lower Florida Keys, encompasses approximately 5,000 acres. The majority of these activities are concentrated on Boca Chica Key and Key West. The mission of NAS Key West is to maintain and operate facilities and provide services and materials to support operations of aviation activities and units designated by the Chief of Naval Operations (CNO). The site is located on Key West near Building 189 at the Berthing Wharf in Truman Annex. Building 189 is located approximately 25 feet west of Building 159 (Figure 2-2).

2.2 SITE HISTORY

During reconstruction of the wharf in 1989, a fuel transfer pipeline containing Bunker-C fuel oil was discovered beneath the existing structure. The pipeline was used to transport Bunker-C fuel oil from Trumbo Point to the Berthing Wharf. The pipeline was located approximately 25 feet west of Building 189 and was oriented in a north-south direction. An east-west oriented spur of the pipeline was discovered in the northern portion of the site. The pipeline was broken prior to or during the reconstruction, resulting in the release of petroleum. The pipeline in the site vicinity and much of the contaminated soils were removed during wharf reconstruction activities, and the area above the north-south pipeline has since been covered with concrete.





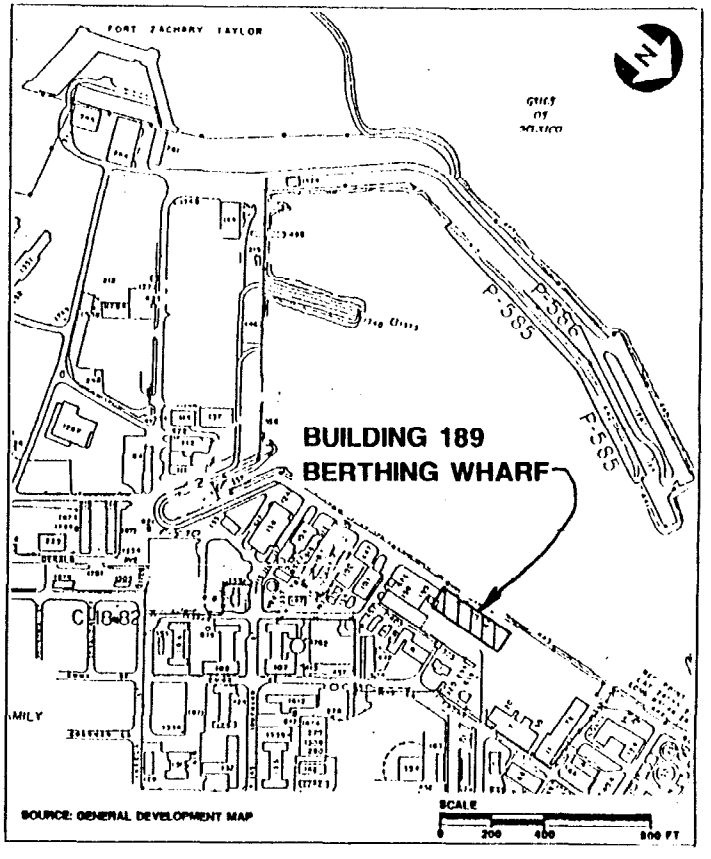


FIGURE 2-1

FACILITY LOCATION MAP
BUILDING 189
BERTHING WHARF

CONTAMINATION ASSESSMENT REPORT
TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

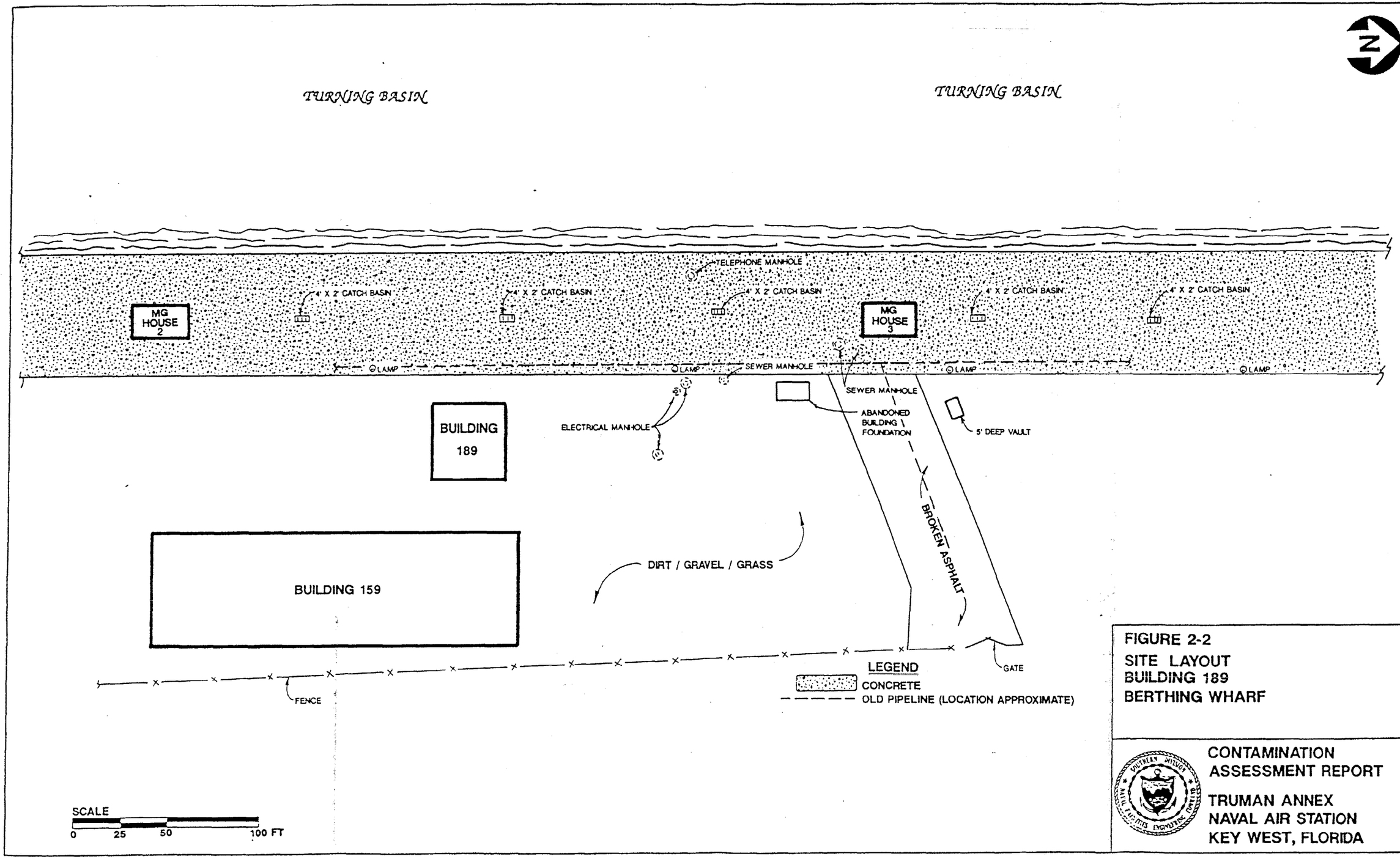


FIGURE 2-2
SITE LAYOUT
BUILDING 189
BERTHING WHARF

CONTAMINATION ASSESSMENT REPORT

TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

0020H027

3.0 SITE CONDITIONS

3.1 PHYSIOGRAPHY

Regional physiography is discussed in Appendix A. The site lies within the southern or distal geomorphic zone of Florida (White, 1970). Ground elevations at the Truman Annex site are approximately 10 feet above mean sea level.

3.2 HYDROGEOLOGY

3.2.1 **Regional.** Regional hydrogeology is discussed in Appendix A.

3.2.2 **Site Specific.** Site-specific hydrogeologic characteristics were predominantly obtained from information gleaned during soil boring and monitoring well installation. The surficial aquifer is the only aquifer of concern in the Key West area. The surficial aquifer in the Key West area is unconfined. The water table is found at shallow depths at the site, occurring from 5 to 7 feet below land surface (bls) during this investigation. Groundwater flow direction in the surficial aquifer is predominantly to the west.

Sediments from the surface to depths of 5 to 6 feet appear to be composed of imported fill material. The fill material is composed of tan to brown sand with limestone cobbles. The fill material is underlain by tan to light gray to white, weathered limestone. The limestone is occasionally silty, often contains coarse shell fragments, and is present to the total depth of 13 feet penetrated by borings and monitoring wells installed at the site. Complete lithologic logs for all site monitoring wells are presented in Appendix B.

4.0 METHODOLOGIES AND EQUIPMENT

4.1 SOIL BORING PROGRAM

Soil borings were placed along the length of the fuel oil pipeline and in areas of suspected contamination. Thirteen soil borings (SB-1 through SB-13) were drilled into the water table to assess the degree and extent of soil contamination, to identify the type of subsurface material, and to aid in placement of subsequent groundwater monitoring wells. Soil boring locations are shown in Figure 4-1. Soil samples were collected from each borehole and underwent organic vapor analyzer (OVA) headspace analysis and field gas chromatograph (GC) analysis. The results of the soil boring program are discussed in Section 5.2 of this report.

4.2 MONITORING WELL INSTALLATION PROGRAM

Nine 2-inch-diameter monitoring wells (KYW-189-1 through KYW-189-9) were installed using a hollow-stem auger drill rig. Monitoring wells were drilled to a depth of 13 feet. Monitoring well locations are shown in Figure 4-1. Monitoring well construction methodologies and materials are discussed in Appendix C.

4.3 GROUNDWATER ELEVATION SURVEY

The elevation and slope of the water table were estimated by surveying the top of the well casing for each monitoring well to a common reference datum. As no benchmark could be located in the area, an arbitrary reference elevation of 10.00 feet was established at the top-of-casing for monitoring well KYW-189-1. To assess the effects of tidal fluctuations, groundwater levels were measured over an 8 hour period on August 13, 1991. Procedures for groundwater level measurements are contained in Appendix C.

4.4 GROUNDWATER SAMPLING PROGRAM

Groundwater samples were collected from site monitoring wells on August 14 and 15, 1991. Sampling procedures followed the guidelines set forth in the Florida Department of Environmental Regulation (FDER) approved Comprehensive Quality Assurance Program Plan (CompQAPP) of ABB-ES. The appropriate number of field blanks, equipment blanks, and duplicates were collected. Samples were sent, under chain of custody, to Wadsworth/Alert Laboratories in Tampa, Florida. Procedures for collection of groundwater samples are presented in Appendix C.

4.5 AQUIFER SLUG TESTS

Aquifer slug tests were performed on monitoring wells KYW-189-6 and KYW-189-9 to assess the hydraulic conductivity of the surficial aquifer. Slug test procedures are discussed in Appendix C.

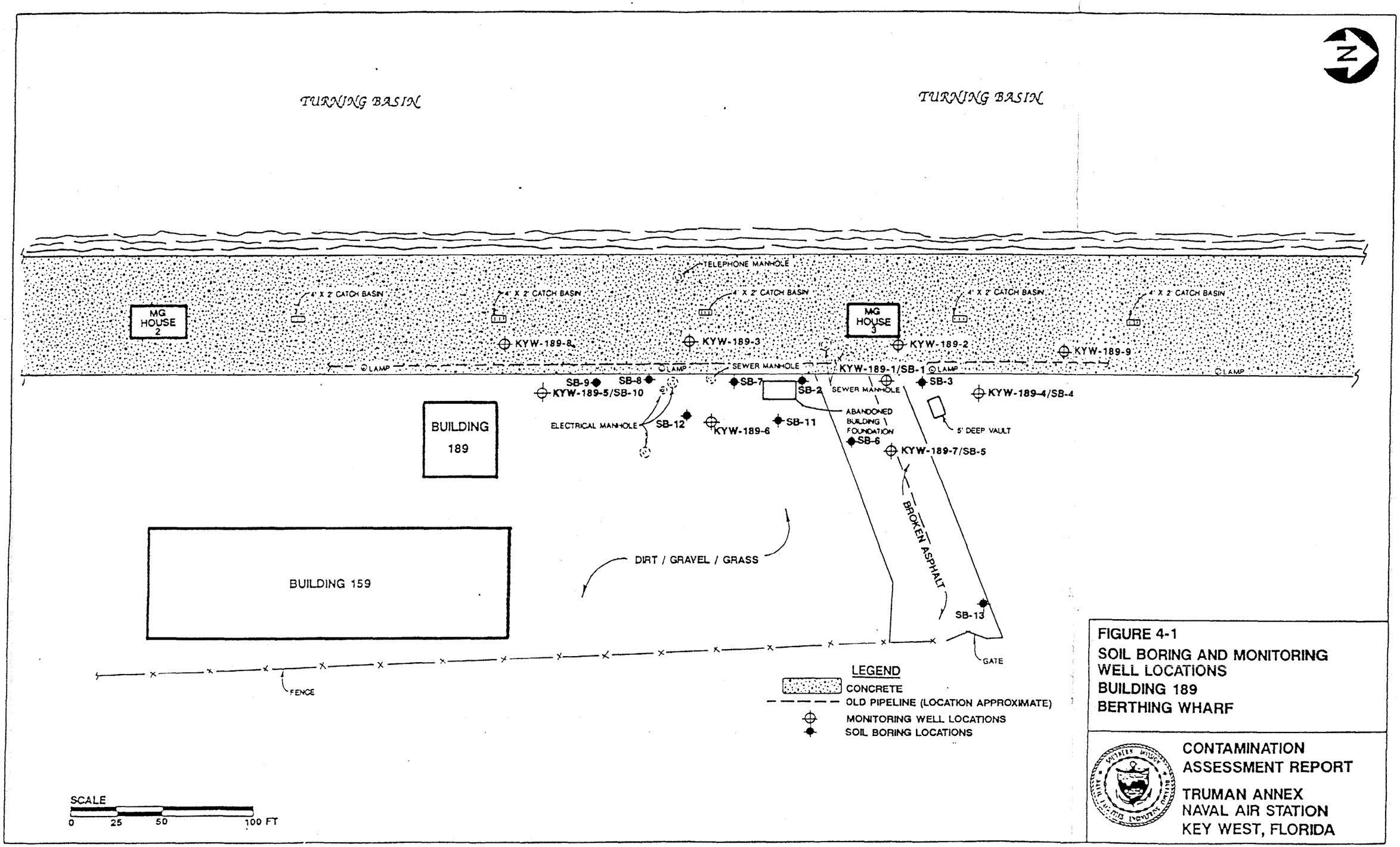


FIGURE 4-1
SOIL BORING AND MONITORING WELL LOCATIONS
BUILDING 189
BERTHING WHARF

CONTAMINATION ASSESSMENT REPORT

TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

0020H032

5.0 CONTAMINATION ASSESSMENT RESULTS

5.1 AQUIFER CHARACTERISTICS AND HYDROGEOLOGIC PARAMETERS

The slug test analyses indicate an average horizontal hydraulic conductivity of 81 feet per day (ft/day) and 2.9 ft/day for wells KYW-189-6 and KYW-189-9, respectively. The average hydraulic conductivity for the two slug test results is 42 ft/day. The variation in slug test results suggests that a heterogeneous condition exists within the aquifer. These values represent hydraulic conductivities of silty sands to clean sands (Freeze and Cherry, 1979).

Hydraulic gradients were assessed for both low tide and high tide periods. The calculated hydraulic gradients vary from 3.0×10^{-3} feet per feet (ft/ft) at low tide to 1.4×10^{-2} ft/ft at high tide. The average hydraulic gradient for the high and low tide measurements is 8.5×10^{-3} ft/ft or approximately 45 feet per mile (ft/mile). The calculated hydraulic gradients are significantly higher than the hydraulic gradients reported by McKenzie (1990) for the Key West area, which ranged from 1 to 4 ft/mile.

Calculated groundwater flow velocity in the surficial aquifer varies from 1.1×10^{-1} ft/day to 3.1 ft/day. Transmissivity varies from 18 feet squared per day (ft^2/day) to 6.4×10^2 ft^2/day.

Presented in Appendix D are the slug test results and aquifer calculations.

5.2 CONTAMINATION ASSESSMENT AND CHARACTERIZATION

5.2.1 Soil Assessment. Soil samples collected with a split-spoon sampler from soil borings and monitoring well borings underwent OVA headspace analysis. For kerosene analytical group constituents, excessively contaminated soils are defined as those having OVA detected organic vapor concentrations in excess of 50 parts per million (ppm) and these soils must be remediated. Soils having OVA concentrations between 10 ppm and 50 ppm may require remediation, and soils with OVA concentrations below 10 ppm do not require remediation (FDER, 1991). Table 5-1 summarizes results of the OVA headspace survey, and indicates maximum OVA concentrations detected in each soil sample.

Figure 5-1 is a soil contamination map showing OVA concentrations from samples obtained from soil borings and monitoring well borings at the site. No excessively contaminated soils (>50 ppm) were identified by OVA headspace analysis. Only four borings, KYW-189-1, KYW-189-2, KYW-189-7, and SB-3 had OVA concentrations in excess of 10 ppm. An isoconcentration contour line of 10 ppm is shown on the map. The area of highest OVA concentrations appears to be restricted to the vicinity of KYW-189-2, which yielded a maximum OVA concentration of 46 ppm.

Although no excessively contaminated soils were identified from the OVA headspace survey, strong odor and discoloration of soils were observed in soil borings SB-1, SB-2, SB-3, SB-7, and SB-8. Currently, the cause of the soil discoloration

TABLE 5-1
SUMMARY OF SOIL SAMPLE
ORGANIC VAPOR ANALYZER (OVA) READINGS
BUILDING 189, BERTHING WHARF
TRUMAN ANNEX
NAS KEY WEST, FLORIDA

LOCATION	DEPTH (ft)	MAXIMUM OVA READING (ppm)
SB-1/KYW-189-1	5.0	9.8
SB-2	5.0	5.4
SB-3	5.0	32.0
SB-4/KYW-189-4	5.0	0.0
SB-5/KYW-189-7	5.0	5.4
SB-6	5.0	0.0
SB-7	4.0	4.4
SB-8	4.5	1.0
SB-9	4.5	1.0
SB-10/KYW-189-5	5.0	0.0
SB-11	5.0	0.0
SB-12	5.0	0.0
SB-13	5.0	1.0
KYW-189-2	5.0	46.0
KYW-189-3	5.0	2.0
KYW-189-6	5.0	0.0
KYW-189-8	5.0	0.2
KYW-189-9	5.0	2.0

Notes: ft= feet below land surface
ppm = parts per million

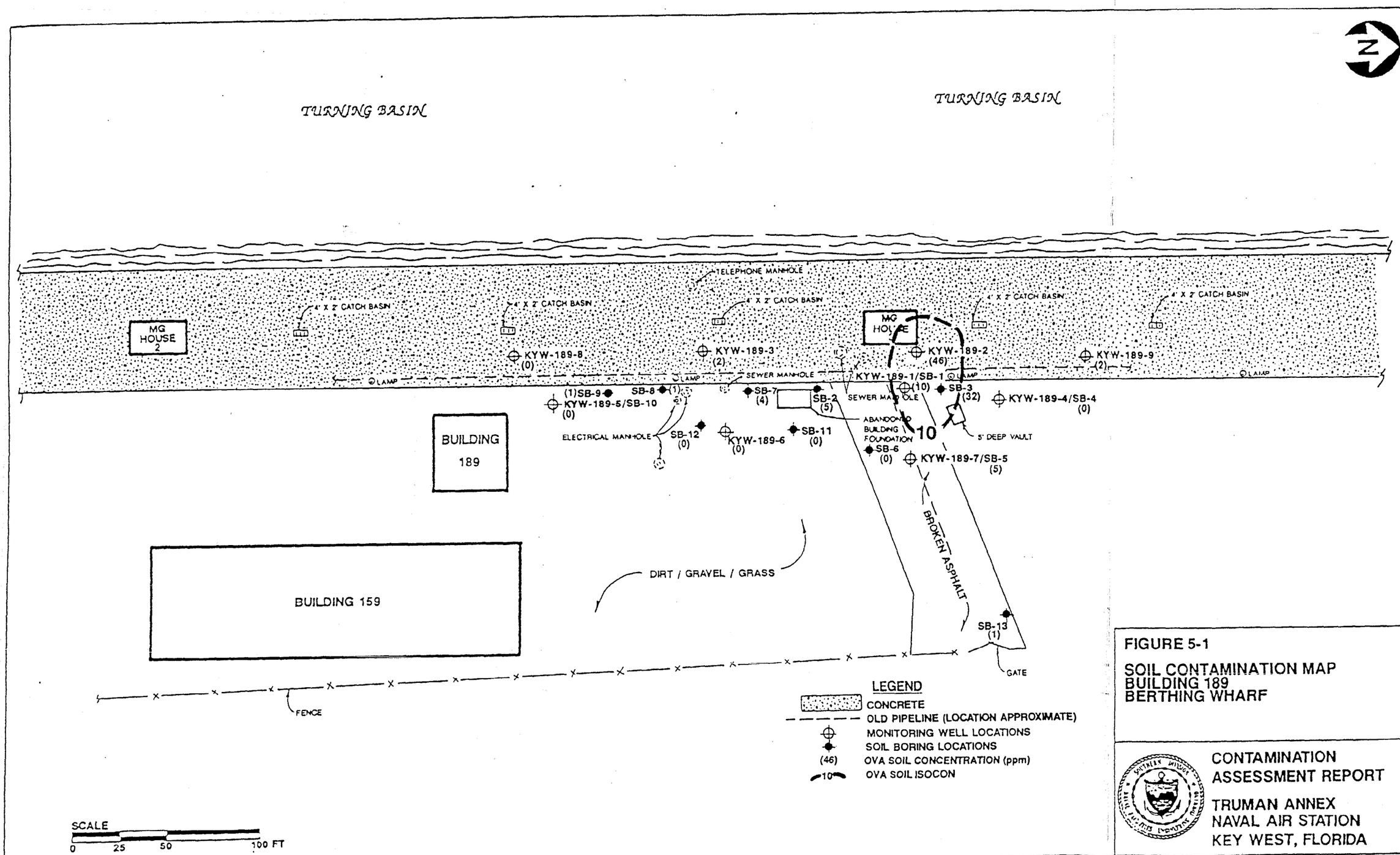


FIGURE 5-1

SOIL CONTAMINATION MAP
BUILDING 189
BERTHING WHARF

CONTAMINATION ASSESSMENT REPORT

TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

0020H04Z

and odor are not known. It is possible that the high viscosity of Bunker-C fuel oil may lessen the amount of volatilization of kerosene analytical group constituents, resulting in low OVA readings. If this is the case, discolored and odorous soils may be more contaminated than indicated by OVA headspace analysis.

5.2.2 Groundwater Assessment. Water quality field parameters were measured for each monitoring well installed during the field investigation. In summary, the pH ranged from 7.31 to 7.95 standard units, and the specific conductance ranged from 4,010 to 750,000 μmhos/cm.

Groundwater analytical results are attached in Appendix E. Pursuant to FDER Chapter 17-770, Florida Administrative Code (FAC), groundwater samples were collected from site monitoring wells and analyzed for United States Environmental Protection Agency (USEPA) Methods 418.1, 601, 602, 610, ethylene dibromide, and lead. (Note: USEPA Method 610 analyses are designated as EPA Method 625 in the analytical report. Also noteworthy is that laboratory sample designations differ from report sample designations. Laboratory samples are prefixed with "BWMW", and report samples are designated with a "KYW-189" prefix. Thus, laboratory sample BWMW-2 corresponds to the groundwater sample collected from monitoring well KYW-189-2.)

Table 5-2 summarizes groundwater analytical results. Contaminants identified in the groundwater are 1,1,-dichloroethene and 1,2-dichloroethene. These contaminants were found in only one well, KYW-189-8, and their concentrations were 2 parts per billion (ppb) and 1 ppb, respectively. Both contaminants are non-petroleum compounds commonly found in analytical laboratories. The presence of total recoverable petroleum hydrocarbons (TRPH) was detected in wells KYW-189-2, KYW-189-3, and KYW-189-9. The highest TRPH concentration was 41 ppm and was found in one of the samples from well KYW-189-3. The type of free product in well KYW-189-1 was not identified. No other contaminants were detected in any site wells.

Figure 5-2 shows the extent of groundwater contamination at the site. Groundwater contamination appears to be restricted to within 15 feet of the former north-south pipeline location. The area of highest groundwater contamination appears to be in the vicinity of well KYW-189-1, which contained 0.05 feet of free product.

5.2.3 Tidal Influence Study. On August 13, 1991, an 8-hour tidal influence study was conducted at the site. The purpose of the study was to observe water level fluctuations over a higher high water and lower low water tidal event and to determine the impact of the fluctuations on groundwater flow directions. Over the course of the study, water level measurements were obtained from each monitoring well that did not contain free product. Table 5-3 summarizes groundwater elevation data collected from onsite monitoring wells during the study. In summary, water level elevations and flow directions were shown to be affected by tidal fluctuations. Figures 5-3, 5-4, and 5-5 show the change in configuration of the surficial aquifer and the resulting reversal in the direction of groundwater flow from 0815 hours to 1350 hours and again at 1645 hours.

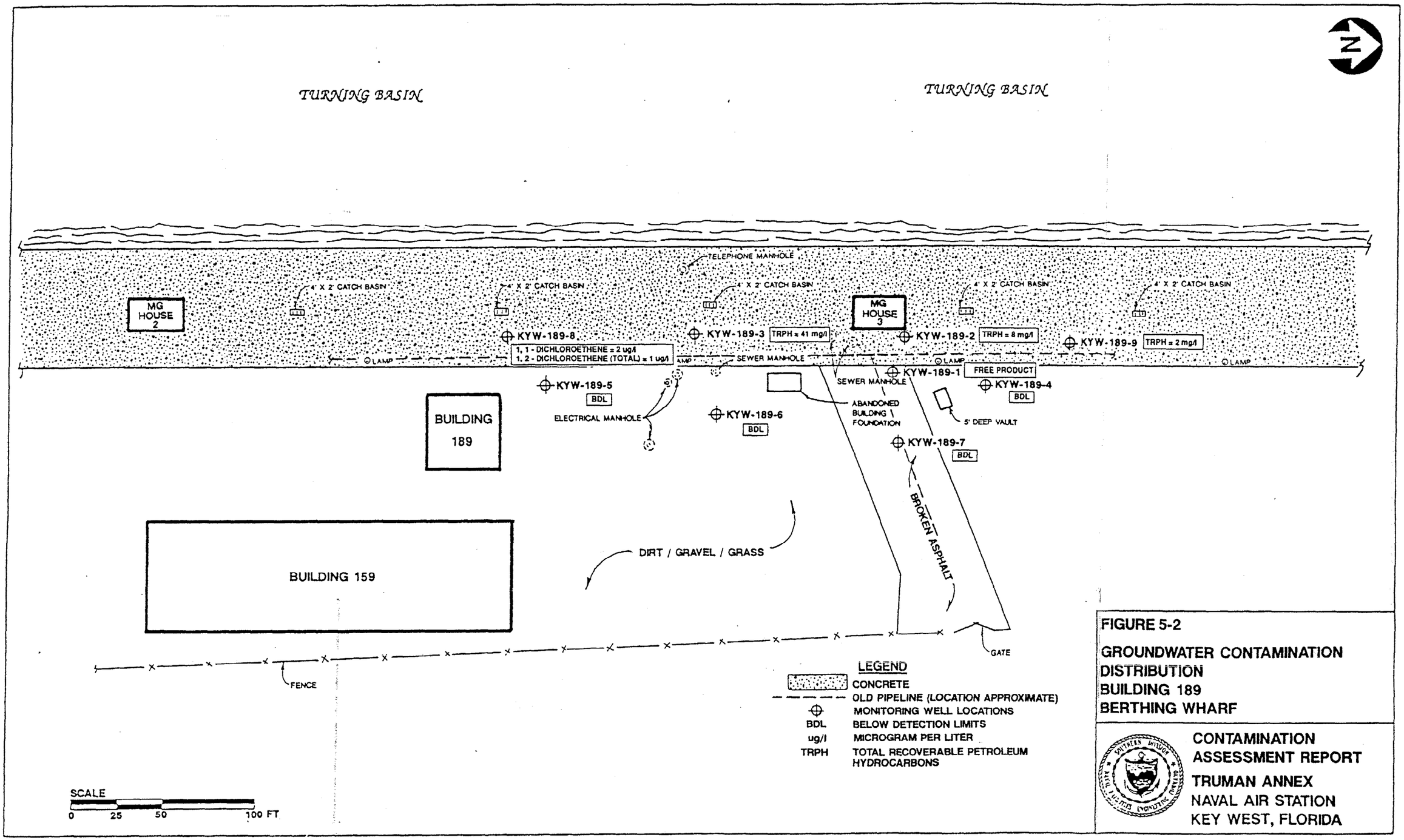


FIGURE 5-2

GROUNDWATER CONTAMINATION DISTRIBUTION BUILDING 189 BERTHING WHARF

CONTAMINATION ASSESSMENT REPORT

TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

0020HB5Z

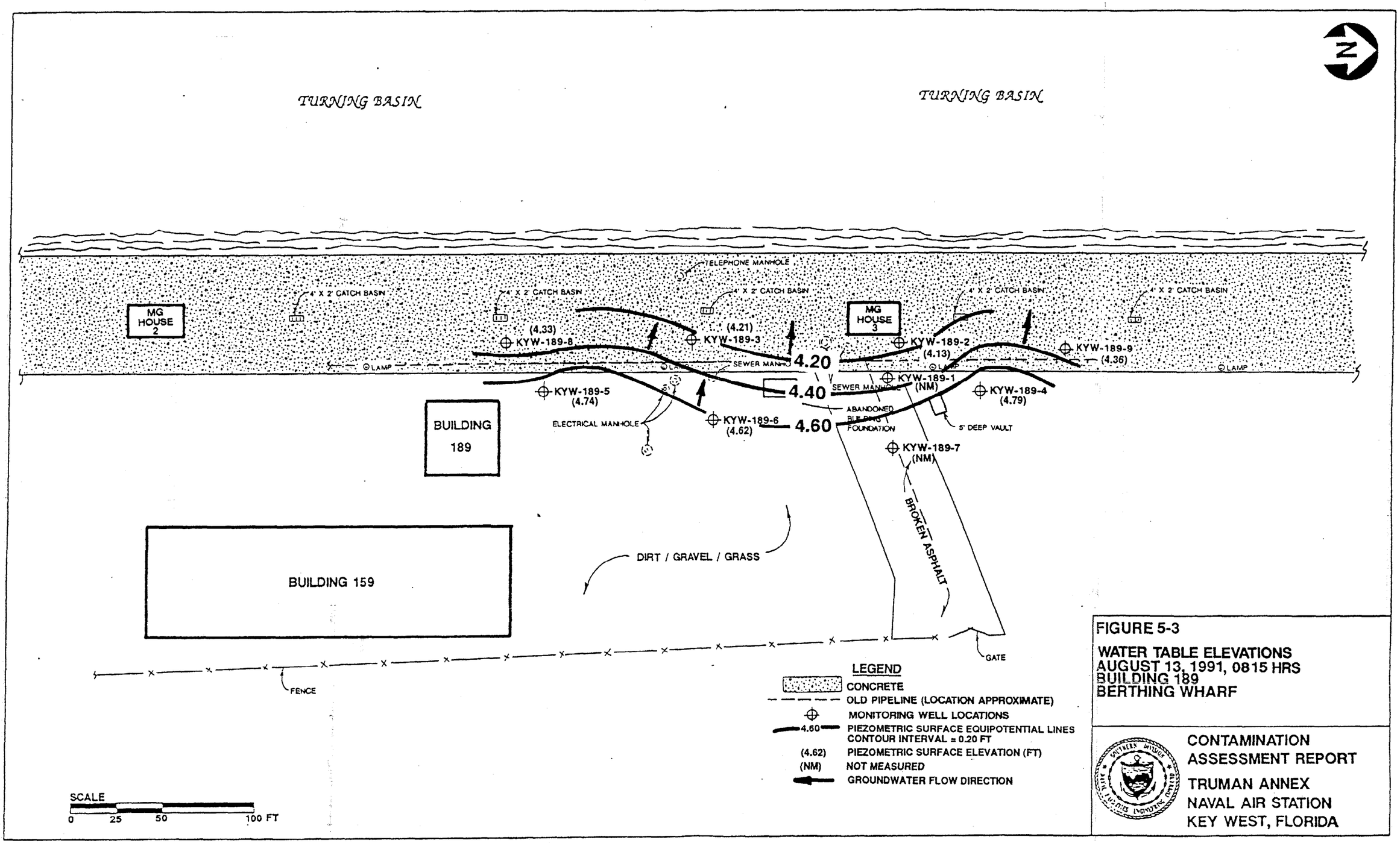


FIGURE 5-3

WATER TABLE ELEVATIONS
AUGUST 13, 1991, 0815 HRS
BUILDING 189
BERTHING WHARF

CONTAMINATION ASSESSMENT REPORT

TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

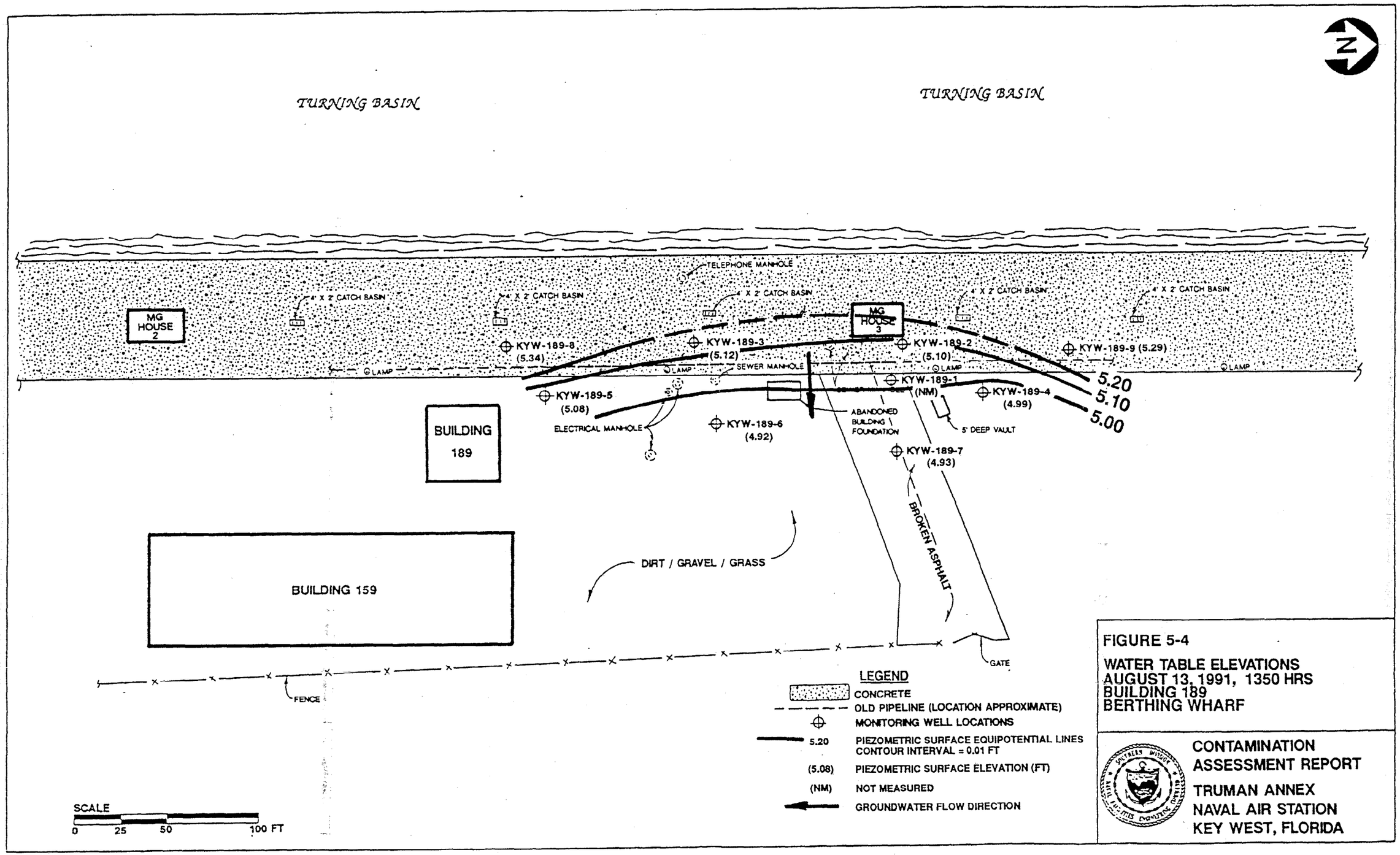


FIGURE 5-4

WATER TABLE ELEVATIONS
AUGUST 13, 1991, 1350 HRS
BUILDING 189
BERTHING WHARF

CONTAMINATION ASSESSMENT REPORT

TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

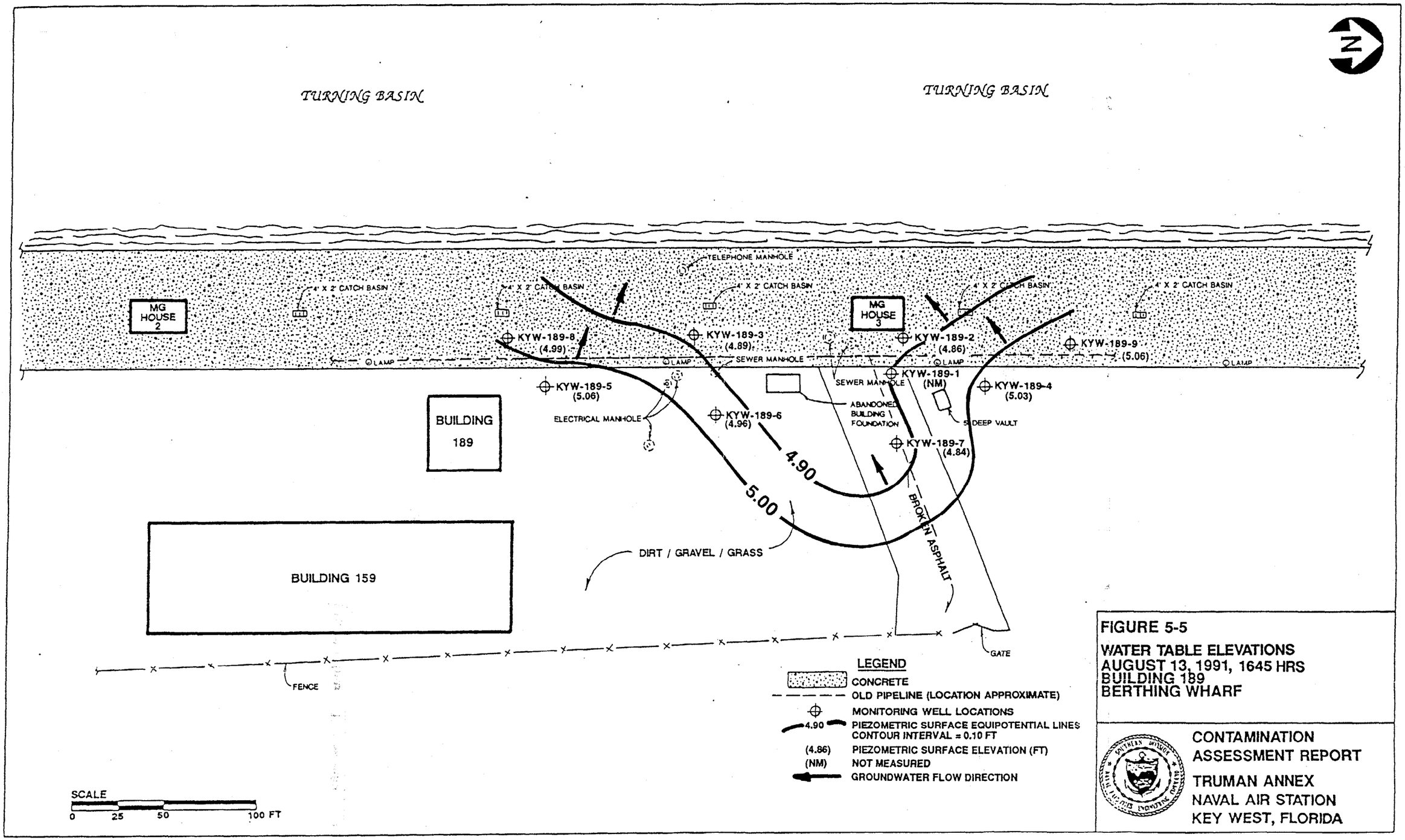


FIGURE 5-5

WATER TABLE ELEVATIONS
AUGUST 13, 1991, 1645 HRS
BUILDING 189
BERTHING WHARF

CONTAMINATION ASSESSMENT REPORT

TRUMAN ANNEX
NAVAL AIR STATION
KEY WEST, FLORIDA

TABLE 5-2
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS, AUGUST 14-15, 1991, SAMPLING EVENT

BERTHING WHARF, BUILDING 189, TRUMAN ANNEX

COMPOUND	MONITORING WELL IDENTIFICATION										
	KYW-189-2	KYW-189-3/*	KYW-189-4	KYW-189-5	KYW-189-6	KYW-189-7	KYW-189-8	KYW-189-9	TRIP BLANK	FIELD BLANK	EQUIP. BLANK
Laboratory Designation:	BWMW-2	BWMW-3	BWMW-4	BWMW-5	BWMW-6	BWMW-7	BWMW-8	BWMW-9			
VOLATILE ORGANICS (601/602), ug/L											
1,1-Dichloroethene	BDL	BDL/BDL	BDL	BDL	BDL	BDL	2	BDL	BDL	BDL	BDL
1,2-Dichloroethene (total)	BDL	BDL/BDL	BDL	BDL	BDL	BDL	1	BDL	BDL	BDL	BDL
Total Recoverable Petroleum Hydrocarbons (TRPH), mg/L	8	41/36	BDL	BDL	BDL	BDL	BDL	2	BDL	BDL	BDL

Notes:

* Second value represents duplicate sample.

Laboratory Data Sheets are included in Appendix A.

BDL = Below Detection Limit.

ug/L = micrograms per liter.

mg/L = miligrams per liter.

TABLE 5–3
TOP OF CASING ELEVATIONS, DEPTH TO GROUNDWATER, AND GROUNDWATER ELEVATIONS FROM TIDAL INFLUENCE STUDY OF AUGUST 13, 1991, 8–HOUR PERIOD
BERTHING WHARF, TRUMAN ANNEX BUILDING 189

	24–HOUR TIME:	0811		0915		1000		1115	
Well I.D.	TOC ELEV.	DEPTH TO WATER	WATER ELEV.	DEPTH TO WATER	WATER ELEV.	DEPTH TO WATER	WATER ELEV.	DEPTH TO WATER	WATER ELEV.
KYW–189–1	10.00	**	**	**	**	**	**	**	**
KYW–189–2	10.74	6.61	4.13	6.42	4.32	6.36	4.38	6.11	4.63
KYW–189–3	10.52	6.31	4.21	6.13	4.39	6.02	4.50	5.81	4.71
KYW–189–4	10.91	6.12	4.79	6.12	4.79	6.10	4.81	6.05	4.86
KYW–189–5	11.04	6.30	4.74	6.29	4.75	6.26	4.78	6.18	4.86
KYW–189–6	9.74	5.12	4.62	5.13	4.61	5.12	4.62	5.05	4.69
KYW–189–7	9.08	N/M	N/M	N/M	N/M	4.64	4.44	4.52	4.56
KYW–189–8	10.62	6.29	4.33	6.09	4.53	5.95	4.67	5.71	4.91
KYW–189–9	10.86	6.50	4.36	6.47	4.39	6.53	4.51	6.13	4.73

	24–HOUR TIME:	1350		1545		1645	
Well I.D.	TOC ELEV.	DEPTH TO WATER	WATER ELEV.	DEPTH TO WATER	WATER ELEV.	DEPTH TO WATER	WATER ELEV.
KYW–189–1	10.00	**	**	**	**	**	**
KYW–189–2	10.74	5.64	5.10	5.70	5.04	5.88	4.86
KYW–189–3	10.52	5.40	5.12	5.51	5.01	5.63	4.89
KYW–189–4	10.91	5.92	4.99	5.88	5.03	5.88	5.03
KYW–189–5	11.04	5.96	5.08	5.92	5.12	5.98	5.06
KYW–189–6	9.74	4.82	4.92	4.75	4.99	4.78	4.96
KYW–189–7	9.08	4.15	4.93	4.12	4.96	4.24	4.84
KYW–189–8	10.62	5.28	5.34	5.45	5.17	5.63	4.99
KYW–189–9	10.86	5.57	5.29	5.60	5.26	5.80	5.06

TOC = Top of Casing
N/M = Not Measured
High Tides: 0320 & 1711 o'clock
Low Tides: 1049 & 2123 o'clock

** KWY–189–1 was not sampled due to the presence of free product.

ALL MEASUREMENTS IN FEET.

Graphs of water level elevations versus time for each well monitored during the study are in Appendix F. The predicted high and low tides, based on information from tide table published by the U.S. Commerce National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (1990), are shown on each graph.

5.3 POTABLE WELL SURVEY AND GROUNDWATER CLASSIFICATION

There are no official potable wells in the Key West area. Potable water in the area is imported from mainland Florida through the Florida Keys Aqueduct. The volume of fresh groundwater in the Key West area is limited. Small lenses of fresh groundwater exist in the Key West area, but these lenses are subject to saltwater intrusion (Black, Crow, and Eidness, 1977).

Groundwater in the Key West area is classified as G-III groundwater for the following reasons.

- There are no official potable wells in the Key West area.
- Water quality data indicate that the surficial aquifer is an unlikely potable water source (McKenzie, 1990).
- Total dissolved solid (TDS) concentrations in the water table aquifer are often in excess of 10,000 parts per million (ppm) (McKenzie, 1990).
- TDS concentrations, calculated from specific conductivity measurements of groundwater at the site, were in excess of 10,000 ppm.

6.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

6.1 SUMMARY

Based on the results of the field investigations and the laboratory analytical results collected during the CA, the following is a summary of conditions at the site.

- The surficial aquifer in the Key West area is classified as a Class G-III groundwater source. There are no official potable wells in the Key West area. Groundwater from the surficial aquifer has been designated as an unlikely source of potable water (McKenzie, 1990).
- Surficial sediments are composed of fill material. This is underlain by a weathered limestone.
- Groundwater was found at depths of 5 to 7 feet bls.
- The direction of groundwater flow in the surficial aquifer is predominantly westerly toward the shoreline. Tidal fluctuations do not appear to significantly change the groundwater flow direction.
- The calculated hydraulic conductivity in the surficial aquifer varies from 2.9 ft/day to 81 ft/day.
- The average high and low tide hydraulic gradient is approximately 8.5×10^{-3}.
- Free product was found in only one monitoring well, KYW-189-1. The apparent thickness of free product in this well was 0.05 foot.
- No excessively petroleum contaminated soils were identified in the OVA headspace survey.
- Groundwater contaminants identified during the investigation include the non-petroleum compounds 1,1-dichloroethene, and 1,2-dichloroethene, at 2 μg/l and 1 μg/l, respectively.

6.2 CONCLUSIONS

- The source of petroleum contamination has been abated through the removal of the Bunker-C fuel pipeline during wharf reconstruction activities at the site. The source of 1,1-dichloroethene and 1,2-dichloroethene in well KYW-189-8 was not identified in this assessment.
- The extent of petroleum contaminated soils appears to be restricted to within 15 feet of the excavated pipeline area. Much of this area is

presently covered with concrete. Excavation of petroleum contaminated soils would require destruction of portions of the Berthing Wharf.

- Although relatively rapid groundwater flow velocities are indicated, suggesting potential groundwater contaminant migration, the highly viscous Bunker-C fuel oil is expected to be retained by soil adhesion.

- The principal area of concern appears to be in the immediate vicinity of monitoring well KYW-189-1. Free product was found in this well; however, the areal extent of the free product plume appears to be small because other nearby, downgradient wells contained no free product.

- The chance of contaminant contact with potential receptors appears to be minimal. Much of the area of concern is presently covered with concrete, and the remaining unpaved area is scheduled to be paved in the future. The presence of two seawalls at the site will hinder seaward contaminant migration.

- A previous contamination assessment was performed at an adjacent site in Truman Annex (Jordan, 1989). This site was contaminated with diesel and fuel oil constituents. The degree of soil and groundwater contamination at this site generally exceeded contamination levels detected in this assessment. A detailed risk assessment was conducted. Jordan (1989) concluded that risks associated with leaving the contamination in place were acceptable for human health and the environment. A No Further Action Plan (NFAP) for this site was submitted and accepted by FDER.

6.3 RECOMMENDATIONS

Based on the findings and interpretations of the CAR, a Monitoring Only Plan (MOP) is recommended. The results of the MOP is expected to demonstrate that the limited contamination at the site will not increase or migrate substantially from its present conditions. The MOP will require the following:

- quarterly groundwater sampling of wells KYW-189-1, KYW-189-2, and KYW-189-7,

- analyzing groundwater samples for USEPA Methods 418.1, 601, 602, 610, ethylene dibromide, and lead, and

- continuing the monitoring for a period of 1 year, or until contamination drops to levels acceptable to FDER.

7.0 PROFESSIONAL REVIEW CERTIFICATION

The CA contained in this report was prepared using sound hydrogeologic principles and judgment. This assessment is based on the geologic investigation and associated information detailed in the text and appended to this report. If conditions are revealed that differ from those described, the undersigned geologist should be notified to evaluate the effects of any additional information on the assessment described in this report. This CAR was developed for the NAS, Key West site near Building 189 at the Berthing Wharf, Truman Annex, and should not be construed to apply to any other site.

Kenneth L. Busen
Professional Geologist
P.G. No. 0000191

2/25/92
Date

8.0 REFERENCES

Black, Crow, and Eidness, 1977, Monroe County 201 Wastewater Facility Plan: Draft Copy No. 11.

Bouwer, H., and Rice, R.C., 1976, A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells: Water Resources Research, vol. 12, no. 3, p. 423-428.

Davis, S.N., and DeWiest, R.J.M., 1966, Hydrogeology: New York, John Wiley & Sons, Inc., 463 p.

Florida Department of Environmental Regulation, Division of Waste Management, October 1990, No further action and monitoring only guidelines for petroleum contaminated sites, 6 p.

Florida Department of Environmental Regulation, Division of Waste Management, February 1991: Guidelines for assessment and remediation of petroleum contaminated soils, 33 p.

Freeze, R.A., and Cherry, J.A., 1979, Groundwater: Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 604 p.

Geraghty and Miller, 1989, AQTESOLV, aquifer test design and analysis: version 1.00.

Hoffmeister, J.E., 1974, Land from the sea, the geologic story of south Florida: Coral Gables, University of Miami Press, 143 p.

Jordan, E. C., 1989, Contamination assessment report amendment: focused risk assessment, Truman Annex farm ite, Key West, Florida, 53 p.

McKenzie, D.J., 1990, Water resources potential of the freshwater lens at Key West, Florida: United States Geological Survey Water-Resources Investigations Report 90-4115, 24 p.

U.S. Commerce National Oceanic and Atmospheric Administration, National Ocean Service, 1990: East Cost of North and South America Tide Tables, 1991, High and Low Water Predictions.

White, W.A., 1970, The geomorphology of the Florida peninsula: Florida Bureau of Geology Bulletin No. 51, 164 p.

APPENDIX A

SITE CONDITIONS

Physiography

The State of Florida is divided into three geomorphic zones: the northern or proximal zone, the central or mid-peninsular zone, and the southern or distal zone (White, 1970). The Key West area is part of the Lower Keys and is located entirely within the southern or distal zone. This area is characterized by a sparse veneer of residual soil and surface vegetation overlying eroded limestone. The topography of the Lower Keys is generally smooth and flat in the center of the key and slopes gently downward toward the shoreline (White, 1970). Ground elevations at the site are approximately 10 feet above mean sea level.

Regional Hydrogeology

The Lower Keys are overlain by an oolitic member of the Pleistocene Miami Limestone. The Key Largo coral reef limestone underlies the Miami Limestone. Hoffmeister (1974) reported that the Miami Limestone is 27 feet thick and the Key Largo Limestone is greater than 270 feet thick in the western part of Key West. The Key Largo Limestone is generally more porous than the Miami Limestone. Surficial and shallow subsurface features in the area have often been altered by imported fill material.

The surficial aquifer in the Key West area is unconfined. The water table is found at shallow depths in the area, generally occurring from less than 1 foot to 10 feet below land surface. Water table elevations can be influenced by local rainfall and tidal fluctuations (McKenzie, 1990). The surficial aquifer is contained within the Miami Limestone, the underlying Key Largo Limestone, and surficial fill materials. The limestones generally contain brackish or saline water. Recharge to the aquifer is directly from precipitation, and infiltration rates are rapid. Groundwater flow discharge is to surrounding surface waters.

The surficial aquifer contains a small freshwater lens that floats on the saline groundwater. The lens, which is very thin (from less than 1 foot near the edge to an average of 5 feet near the center), is located below the center of the western half (Old Town) of the island. The lens contains about 20 million gallons of freshwater during the dry season and about 30 million gallons during the wet season.

The water table fluctuates and the configuration of the lens constantly changes, largely as a result of tidal action. On the average the lens is approximately 8,000 feet in length by 4,000 feet in width. Water quality data indicate that the lens is an unlikely source of potable water (McKenzie, 1990).

APPENDIX B

LITHOLOGIC LOGS

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: NAS Key West, Truman Annex	**LOG of WELL:** KYW-189-1		**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 7518-30
CONTRACTOR: Groundwater Protection Inc.		**DATE STARTED:** 7/18/91	**COMPLTD:** 7/18/91
METHOD: HSA	**CASE SIZE:** 2 Inch	**SCREEN INT.:** 3' to 13'	**PROTECTION LEVEL:** D
TOC ELEV.: 10.00 FT.	**MONITOR INST.:** OVA	**TOT DPTH:** 14FT.	**DPTH TO ▽** 5.87 FT.
LOGGED BY: A. DeSandro	**WELL DEVELOPMENT DATE:** 7/18/91		**SITE:** Berthing Wharf

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Fill: Tan to brown sand with limestone cobbles.				
5			1.2/2		Limestone: White, weathered. Saturated with heavy oil.			2-3-3-5	
			1.2/2		Limestone: Light gray, weathered, silty, little sand. Heavy oil contamination in the upper portion of the spoon.			3-2-2-4	
10			1.4/2		Limestone: Light gray, silty, sandy, some shell fragments. No sign of oil contaimination.			10-8-8-8	
15									

ABB ENVIRONMENTAL SERVICES, INC.

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: NAS Key West, Truman Annex		**LOG of WELL:** KYW-189-2	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 7518-30
CONTRACTOR: Groundwater Protection Inc.		**DATE STARTED:** 7/22/91	**COMPLTD:** 7/22/91
METHOD: HSA	**CASE SIZE:** 2 inch	**SCREEN INT.:** 3' to 13'	**PROTECTION LEVEL:** D
TOC ELEV.: 10.74 FT.	**MONITOR INST.:** OVA	**TOT DPTH:** 14FT.	**DPTH TO ▽** 8.81 FT.
LOGGED BY: A. DeSandro	**WELL DEVELOPMENT DATE:** 7/22/91		**SITE:** Berthing Wharf

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Concrete				
					Fill: Tan to brown sand with limerock cobbles.				
5			1.5/2		Limestone: White, weathered, silty. Moderate to strong petroleum odor.			10-8-13-29	
10									
15									

ABB ENVIRONMENTAL SERVICES, INC.

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: NAS Key West, Truman Annex		**LOG of WELL:** KYW-189-3	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 7518-30
CONTRACTOR: Groundwater Protection Inc.		**DATE STARTED:** 7/22/91	**COMPLTD:** 7/22/91
METHOD: HSA	**CASE SIZE:** 2 inch	**SCREEN INT.:** 3' to 13'	**PROTECTION LEVEL:** D
TOC ELEV.: 10.52 FT.	**MONITOR INST.:** OVA	**TOT DPTH:** 14FT.	**DPTH TO ▽** 8.31 FT.
LOGGED BY: A. DeSandro	**WELL DEVELOPMENT DATE:** 7/22/91		**SITE:** Berthing Wharf

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Concrete				
					Fill: Tan to light brown sand with limestone cobbles.				
5			1.5/2		Limestone: White to light gray, slightly weathered. Slight to moderate petroleum odor.			6-11-15-8	
10									
15									

ABB ENVIRONMENTAL SERVICES, INC.

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: NAS Key West, Truman Annex		**LOG of WELL:** KYW-189-4	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 7518-30
CONTRACTOR: Groundwater Protection Inc.		**DATE STARTED:** 7/22/91	**COMPLTD:** 7/22/91
METHOD: HSA	**CASE SIZE:** 2 inch	**SCREEN INT.:** 3' to 13'	**PROTECTION LEVEL:** D
TOC ELEV.: 10.81 FT.	**MONITOR INST.:** OVA	**TOT DPTH:** 14FT.	**DPTH TO ∇** 8.12 FT.
LOGGED BY: A. DeSandro	**WELL DEVELOPMENT DATE:** 7/22/91		**SITE:** Berthing Wharf

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Fill: Tan to brown sand with limestone cobbles.				
5					Limestone: Weathered, silty.				
10									
15									

ABB ENVIRONMENTAL SERVICES, INC.

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: NAS Key West, Truman Annex		**LOG of WELL:** KYW-188-5	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 7518-30
CONTRACTOR: Groundwater Protection Inc.		**DATE STARTED:** 7/22/91	**COMPLTD:** 7/22/91
METHOD: HSA	**CASE SIZE:** 2 inch	**SCREEN INT.:** 3' to 13'	**PROTECTION LEVEL:** D
TOC ELEV.: 11.04 FT.	**MONITOR INST.:** OVA	**TOT DPTH:** 14FT.	**DPTH TO ▽** 6.30 FT.
LOGGED BY: A. DeSandro	**WELL DEVELOPMENT DATE:** 7/22/91		**SITE:** Berthing Wharf

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Fill: Tan to brown sand with limestone cobbles.				
5									
					Limestone: Weathered, silty.				
10									
15									

ABB ENVIRONMENTAL SERVICES, INC.

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: NAS Key West, Truman Annex		**LOG of WELL:** KYW-188-6	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 7519-30
CONTRACTOR: Groundwater Protection Inc.		**DATE STARTED:** 7/22/91	**COMPLTD:** 7/22/91
METHOD: HSA	**CASE SIZE:** 2 inch	**SCREEN INT.:** 3' to 13'	**PROTECTION LEVEL:** D
TOC ELEV.: 8.74 FT.	**MONITOR INST.:** OVA	**TOT DPTH:** 14FT.	**DPTH TO ▽** 5.12 FT.
LOGGED BY: A. DeSandro	**WELL DEVELOPMENT DATE:** 7/22/91		**SITE:** Berthing Wharf

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
5			0.8/2		Fill: Tan to brown sand with limestone cobbles. Limestone: Tan with coarse shell fragments. No discoloration or odor.			3-11-15-10	
10									
15									

ABB ENVIRONMENTAL SERVICES, INC.

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: NAS Key West, Truman Annex		**LOG of WELL:** KYW-188-7	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 7518-30
CONTRACTOR: Groundwater Protection Inc.		**DATE STARTED:** 7/22/91	**COMPLTD:** 7/22/91
METHOD: HSA	**CASE SIZE:** 2 inch	**SCREEN INT.:** 3' to 13'	**PROTECTION LEVEL:** D
TOC ELEV.: 8.08 FT.	**MONITOR INST.:** OVA	**TOT DPTH:** 14FT.	**DPTH TO ▽** 6.69 FT.
LOGGED BY: A. DeSandro	**WELL DEVELOPMENT DATE:** 7/22/91		**SITE:** Berthing Wharf

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
5			0.8/2		Fill: Tan to brown sand with limestone cobbles.				
					Limestone: Tan with coarse shell fragments. Strong septic tank odor.			3-6-6-8	
10									
15									

ABB ENVIRONMENTAL SERVICES, INC.

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: NAS Key West, Truman Annex		**LOG of WELL:** KYW-188-8	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 7518-30
CONTRACTOR: Groundwater Protection Inc.		**DATE STARTED:** 7/22/91	**COMPLTD:** 7/23/91
METHOD: HSA	**CASE SIZE:** 2 inch	**SCREEN INT.:** 3' to 13'	**PROTECTION LEVEL:** D
TOC ELEV.: 10.82 FT.	**MONITOR INST.:** OVA	**TOT DPTH:** 14FT.	**DPTH TO ∇** 8.28 FT.
LOGGED BY: A. DeSandro	**WELL DEVELOPMENT DATE:** 7/23/91		**SITE:** Berthing Wharf

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Concrete				
					Fill: Tan to brown sand with limestone cobbles.				
5			0.8/2		Limestone: Tan with coarse shell fragments. No discoloration or odor.			6-11-10-10	
10									
15									

ABB ENVIRONMENTAL SERVICES, INC.

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: NAS Key West, Truman Annex		**LOG of WELL:** KYW-188-8	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 7518-30
CONTRACTOR: Groundwater Protection Inc.		**DATE STARTED:** 7/23/81	**COMPLTD:** 7/23/81
METHOD: HSA	**CASE SIZE:** 2 inch	**SCREEN INT.:** 3' to 13'	**PROTECTION LEVEL:** D
TOC ELEV.: 10.88 FT.	**MONITOR INST.:** OVA	**TOT DPTH:** 14FT.	**DPTH TO ▽** 8.50 FT.
LOGGED BY: A. DeSandro	**WELL DEVELOPMENT DATE:** 7/23/81		**SITE:** Berthing Wharf

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Concrete				
					Fill: Tan to brown sand with Limestone cobbles.				
5			1.2/2		Limestone: Weathered, silty. Slight petroleum and septic odor.			10-11-10-8	
10									
15									

ABB ENVIRONMENTAL SERVICES, INC.

APPENDIX C

INVESTIGATIVE METHODOLOGIES AND PROCEDURES

Soil borings

Soil borings were used to assess the degree of soil contamination at the site and to aid in the placement of subsequent monitoring wells. Soil borings were advanced into the water table using rotary drilling and hollow-stem augers. For each boring, a soil sample was collected immediately above the soil-groundwater interface. Samples were collected with a standard penetration test (SPT) split-spoon sampler. Samples were placed in 16-ounce glass jars, and headspace analysis was performed with an organic vapor analyzer (OVA) equipped with a flame ionization detector (FID).

Monitoring well construction

All monitoring wells were constructed of 2-inch diameter, schedule 40, polyvinyl chloride (PVC) casing. The bottom 10 feet of each well was screened with 2-inch diameter, 0.010-inch slotted, PVC well screen. The shallow water table conditions necessitated limiting the thickness of the sand filter pack, bentonite seal, and grout above the screened interval. A 6/20 grade silica sand filter pack was placed in the annular space around each well to approximately 7 inches above the top of the screen. A 4-inch thick bentonite seal was then placed on top of the filter pack. The remaining annular space was grouted to the surface with neat cement. A protective traffic-bearing vault was installed to complete each well. Each monitoring well was equipped with a locking well cap. Typical monitoring well construction details are presented in Figure C-1.

Groundwater elevation measurements and tidal influence study

The elevation of the water table was estimated by surveying the top of the well casing of each monitoring well to a common reference datum. No benchmark was located in the area; therefore, an arbitrary reference elevation of 10.00 feet was established. Groundwater levels were measured using an electronic water level indicator. Water level elevations were calculated by subtracting the measured depth to groundwater from the elevation at the top of the well casing. To assess the effect of tidal fluctuations on water level elevations, water elevations were measured over an 8 hour period.

Groundwater sampling

Groundwater samples were collected from site monitoring wells on August 15-16, 1991. Monitoring well KYW-189-1 contained 0.05 feet of free product and was not sampled. The groundwater samples were collected in accordance with ABB-ES' FDER-approved CompQAPP. Before sampling, monitoring wells were properly developed and purged with Teflon™ bailers. Purging continued until a minimum of five well volumes had been removed. Groundwater samples were then collected, and the samples were placed into appropriate containers. The containers were labeled,

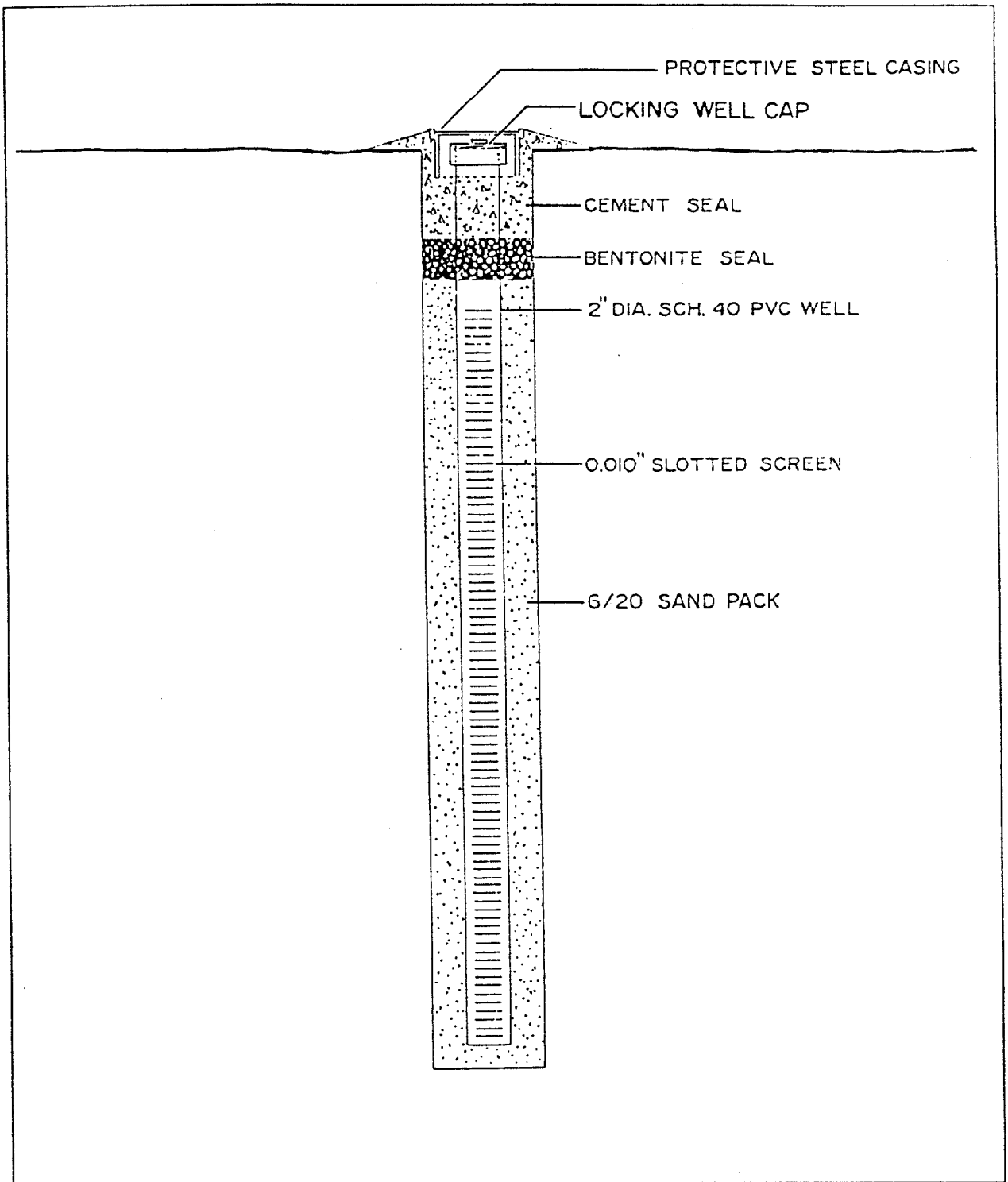


FIGURE C-1

TYPICAL MONITORING WELL CONSTRUCTION DIAGRAM

CONTAMINATION ASSESSMENT REPORT

NAVAL AIR STATION KEY WEST, FLORIDA

placed on ice, and shipped under chain of custody to Wadsworth/Alert Laboratories in Tampa, Florida, for analyses. Pursuant to FDER Chapter 17-770, FAC groundwater samples collected from monitoring wells underwent analyses for USEPA Methods 418.1, 601, 602, 610, ethylene dibromide (EDB), and lead. Monitoring well KYW-189-3 was sampled in duplicate. Field blanks, trip blanks, and equipment blanks were also analyzed.

Slug tests

Aquifer slug tests were performed on monitoring wells KYW-189-6 and KYW-189-9 to assess the hydraulic conductivity of the surficial aquifer. The slug was constructed of 1-inch outside diameter PVC pipe, 5 feet in length. The slug was filled with sand and capped watertight at both ends. Water level changes in the monitoring wells were recorded with a data logger and pressure transducer.

The pressure transducer was suspended less than 6 inches above the bottom of the well and the initial water level was recorded prior to beginning the test. The slug was then lowered into the well until it was totally submerged beneath the water table. Following recovery, the slug was quickly removed, and water level measurements were recorded until the water level recovered. Three rising head tests were conducted for each well in order to obtain an average recovery response. Slug test results are attached in Appendix G.

Hydraulic conductivities were calculated from slug test data based on the analytical method of Bouwer and Rice (1976) for partially penetrating wells screened in an unconfined aquifer. The computer program, AQTESOLV™ (Geraghty and Miller, 1989) was used to calculate a hydraulic conductivity (K) value based on linear regression of the data gathered during the slug test.

APPENDIX D

AQUIFER SLUG TEST RESULTS AND CALCULATIONS

AQUIFER SLUG TEST CALCULATIONS

Average pore water Velocity Calculations

Estimates of average pore water velocity were obtained using the following formula:

$$v = (KI_{av})/n$$

where

v = average pore water velocity (ft/day),
K = hydraulic conductivity (ft/day),
I_{av} = average hydraulic gradient across site = 8.5×10^{-3} ft/ft, and
n = estimated porosity.

Using an estimated porosity of 22 percent (Davis and DeWiest, 1966), the average hydraulic gradient across the site (I_{av},) and the hydraulic conductivity from well KYW-189-6 (K = 8.1×10^{1} ft/day), the calculated average pore water velocity is:

$$v = (8.1 \times 10^{1} \text{ ft/day})(8.5 \times 10^{-3}) / 0.22$$

$$v = 3.1 \text{ ft/day}.$$

Likewise, using the hydraulic conductivity calculated from well KYW-189-9 (K = 2.9 ft/day), the calculated average pore water velocity is:

$$v = (2.9 \text{ ft/day}) (8.5 \times 10^{-3} \text{ ft/ft})/0.22$$

$$v = 1.1 \times 10^{-1} \text{ ft/day}.$$

Based on the above calculations, average pore water velocity at the site varies from 1.1×10^{-1} to 3.1 ft/day.

Transmissivity

Transmissivity, T, for the surficial aquifer, was estimated by using the following formula:

$$T = K * b$$

where

T = transmissivity (ft^2/day),
K = hydraulic conductivity (ft/day), and
b = aquifer test interval or thickness (ft).

For monitoring well KYW-189-6, using a K value of 8.1×10^1 ft/day and a b value of 7.88 ft, the calculated transmissivity is as follows:

$T = 81 \text{ ft/day} \times 7.88 \text{ ft}$

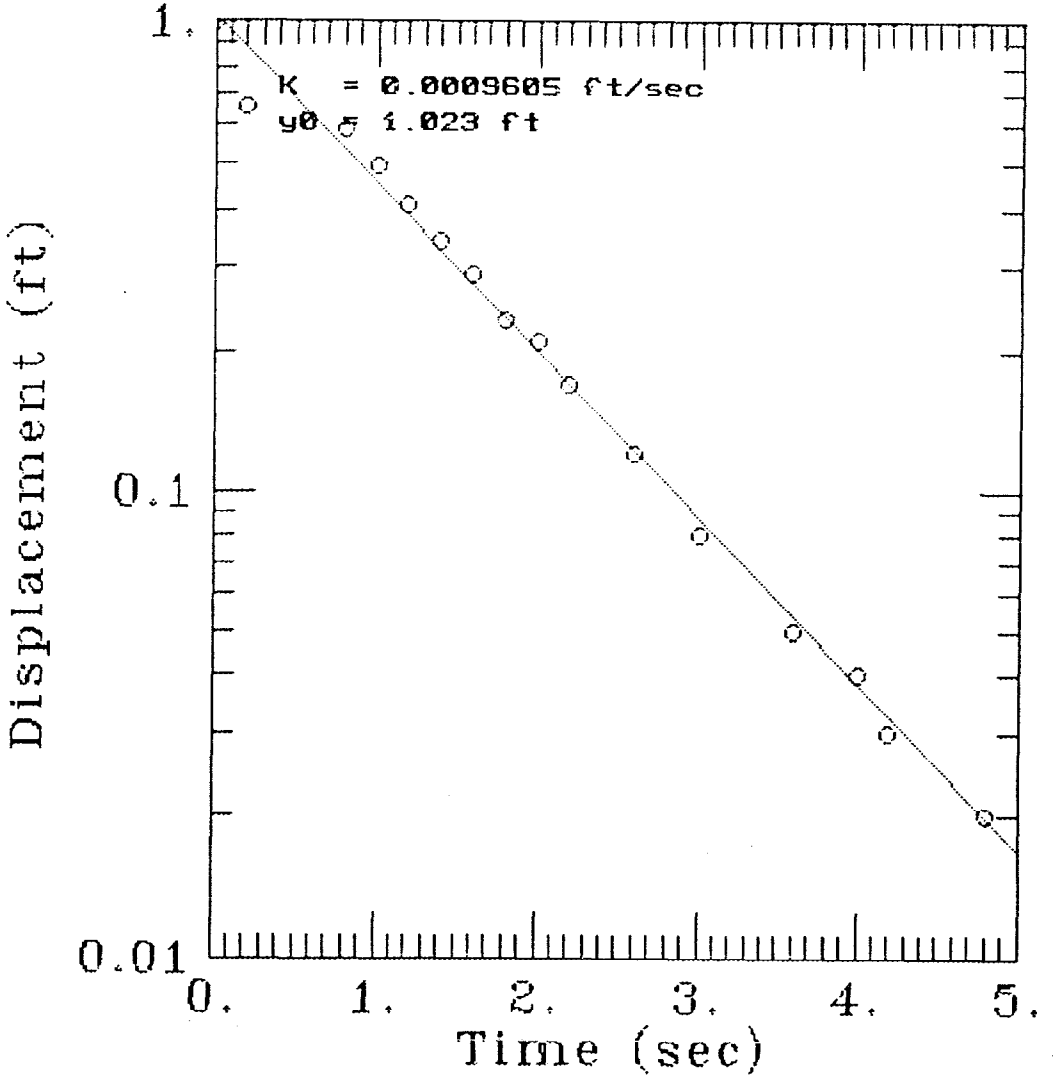
$T = 6.4 \times 10^2 \text{ ft}^2\text{/day}.$

Likewise, for monitoring well KYW-189-9, using a K value of 2.9 ft/day and a b value of 6.50 ft, the calculated transmissivity is as follows:

$T = 2.9 \text{ ft/day} \times 6.50 \text{ ft}$

$T = 18 \text{ ft}^2\text{/day}.$

NAS KEY WEST KYW-189-6 RUN NO. 1

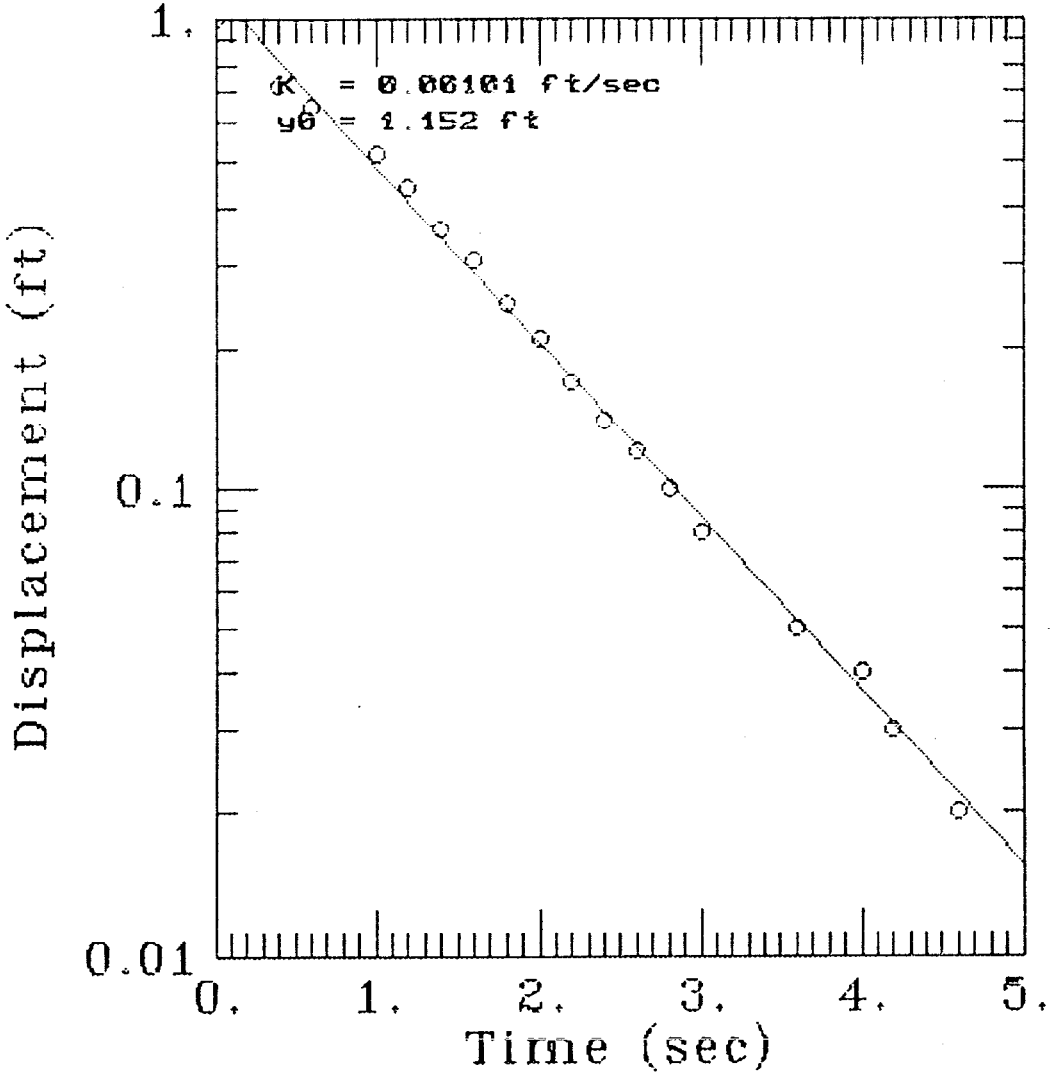


AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

NAS KEY WEST KYW-189-6 RUN NO. 2

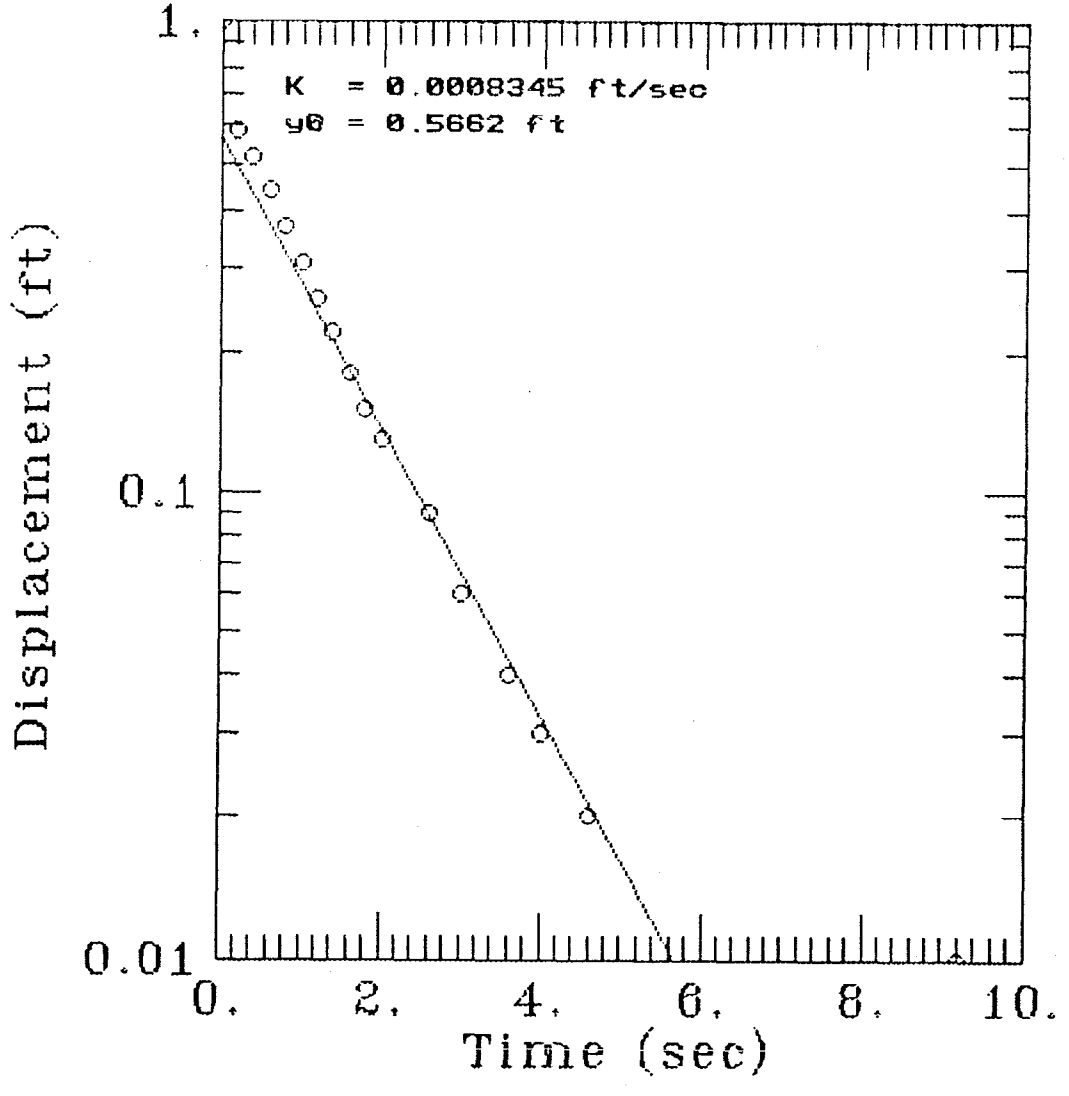


AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

NAS KEY WEST KYW-189-6 RUN NO. 3

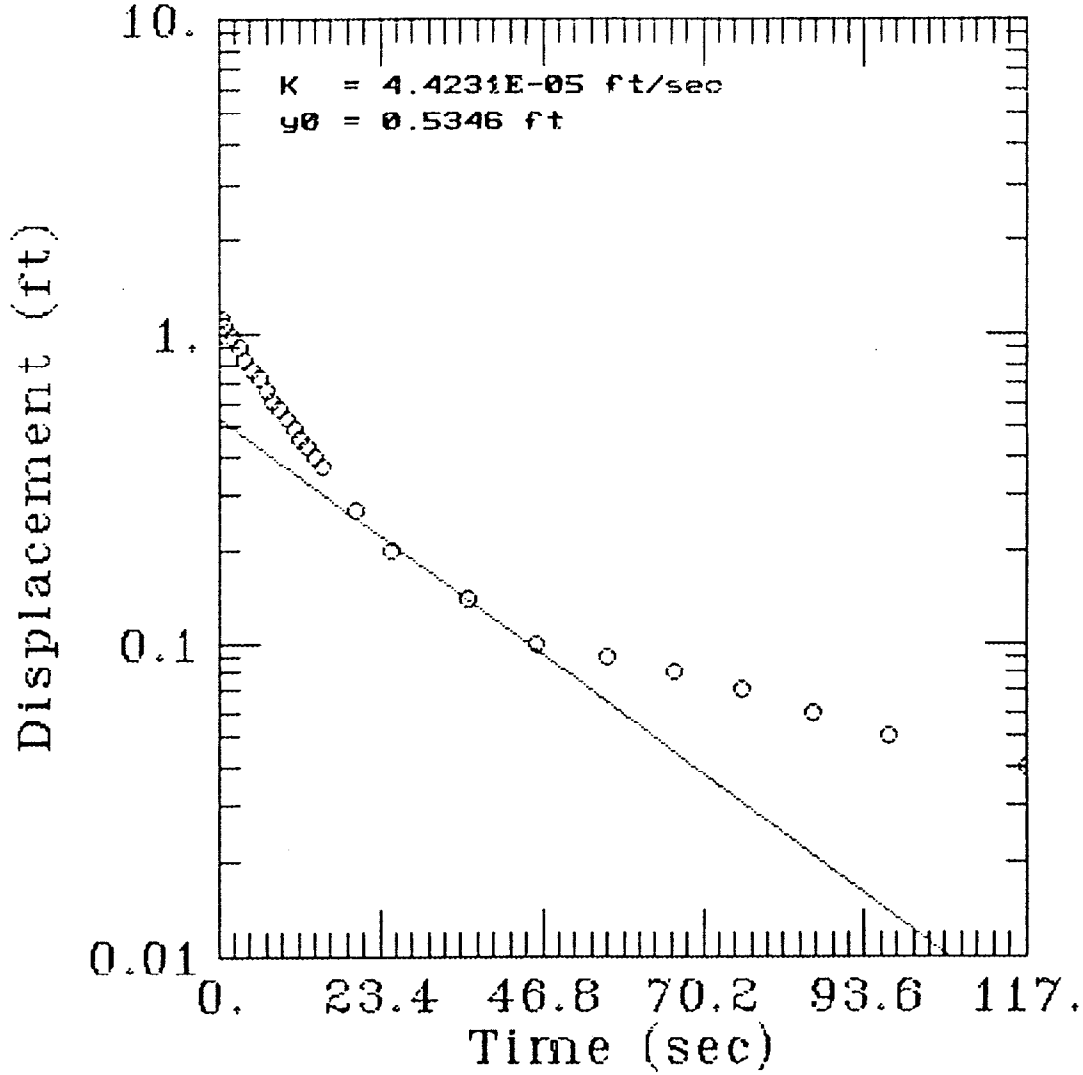


AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

NAS KEY WEST KYW-189-9 RUN NO. 1

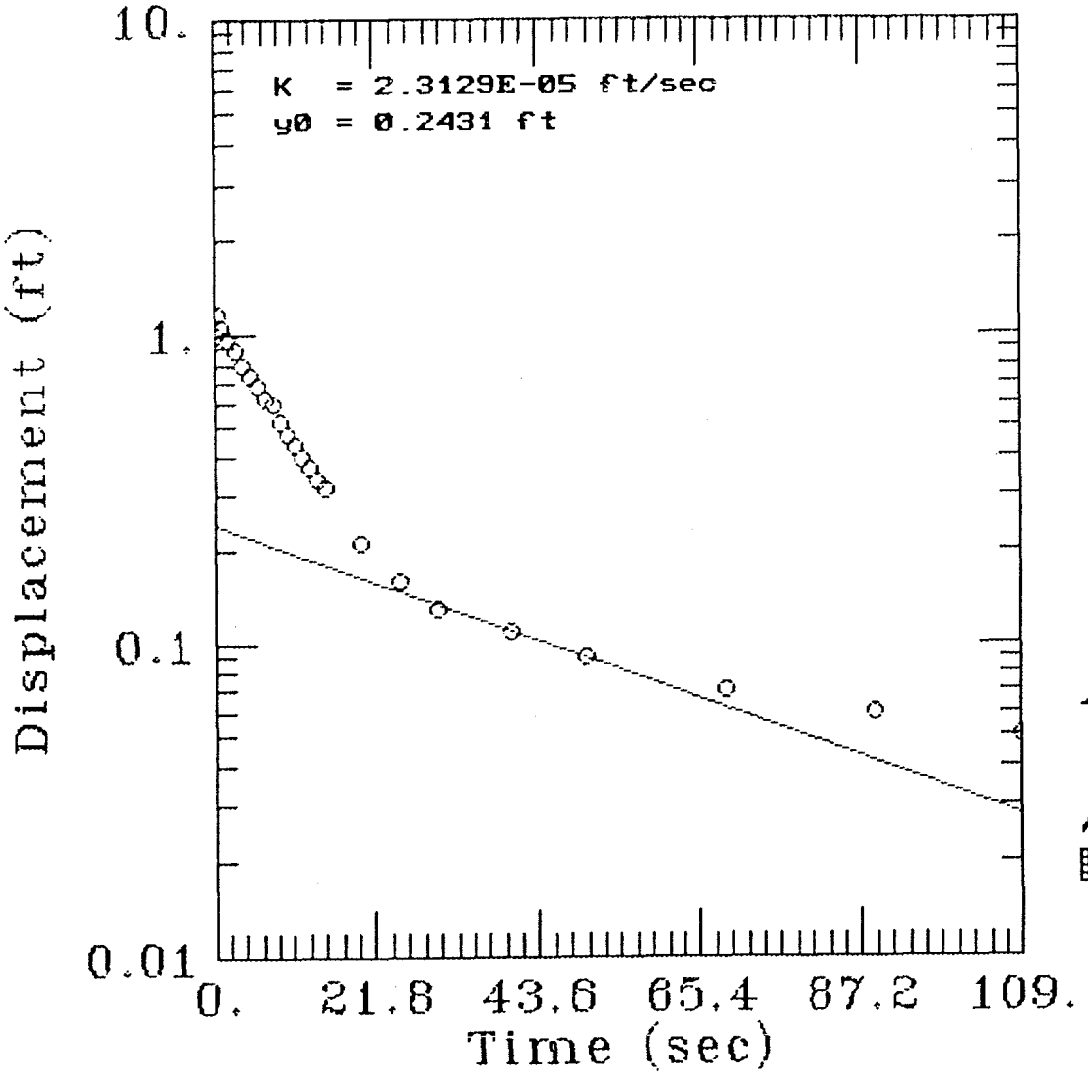


AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

NAS KEY WEST KYW-189-9 RUN NO. 2

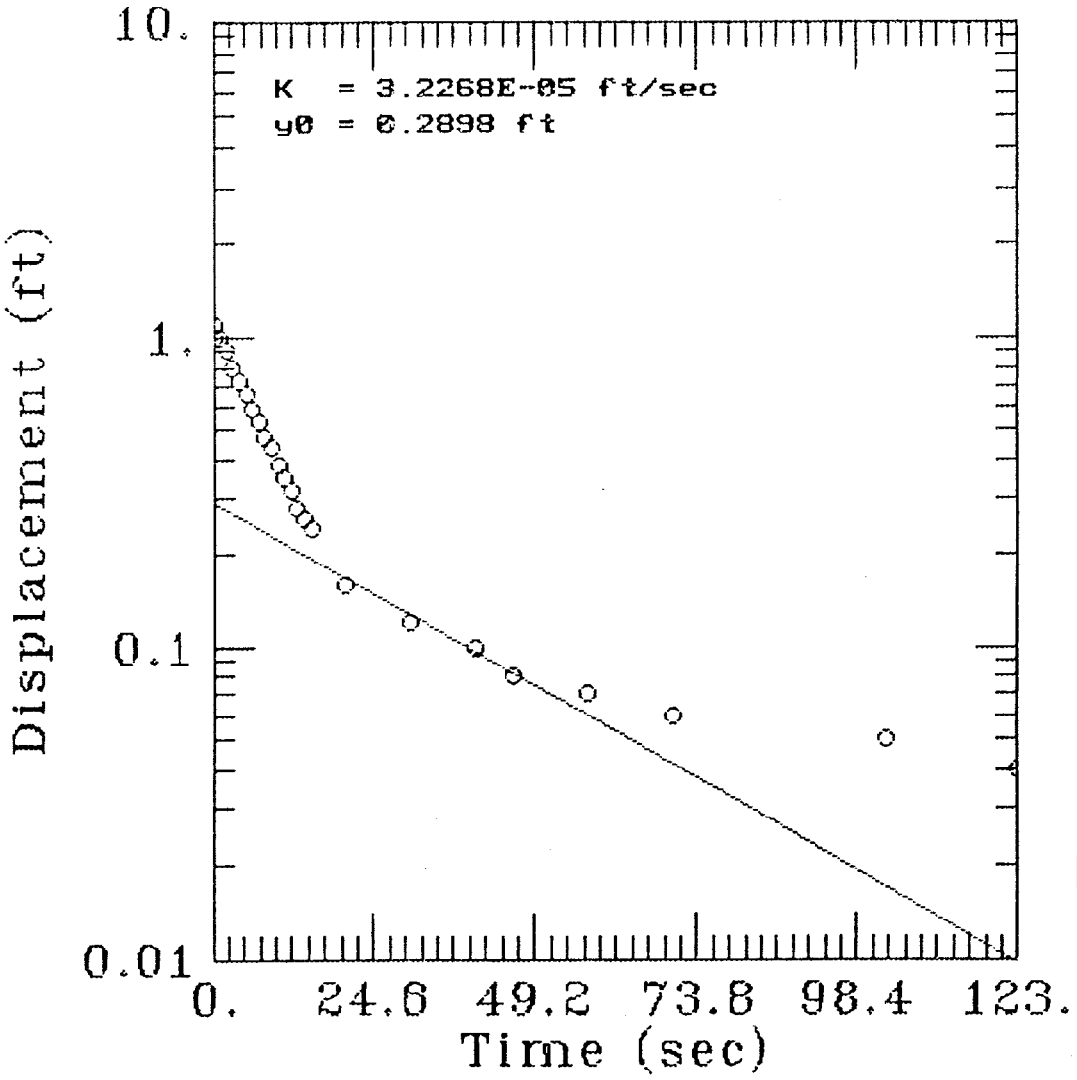


AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

NAS KEY WEST KYW-189-9 RUN NO. 3



AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

APPENDIX E

GROUNDWATER ANALYTICAL RESULTS

Laboratory Analytical Data
Conversion Table

Monitoring Well Designation	Laboratory Sample Designation
KYW-189-1	Not sampled (free product)
KYW-189-2	BWMW-2
KYW-189-3	BWMW-3
KYW-189-4	BWMW-4
KYW-189-5	BWMW-5
KYW-189-6	BWMW-6
KYW-189-7	BWMW-7
KYW-189-8	BWMW-8
KYW-189-9	BWMW-9

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB # 1H1906-10
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/28/91

SAMPLE ID: BWMW-2 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

VOLATILE ORGANICS
METHOD 601/602 - GC

Benzene	ND	1,2-Dichloroethane	ND
Bromodichloromethane	ND	1,1-Dichloroethene	ND
Bromoform	ND	1,2-Dichloroethene (Total)	ND
Bromomethane	ND	1,2-Dichloropropane	ND
Carbon tetrachloride	ND	cis-1,3-Dichloropropene	ND
Chlorobenzene	ND	trans-1,3-Dichloropropene	ND
Chloroethane	ND	Ethylbenzene	ND
2-Chloroethylvinyl ether	ND	Methylene chloride	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
Chloromethane	ND	Tetrachloroethene	ND
Dibromochloromethane	ND	Toluene	ND
1,2-Dichlorobenzene	ND	1,1,1-Trichloroethane	ND
1,3-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,4-Dichlorobenzene	ND	Trichloroethene	ND
Dichlorodifluoromethane	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND
		Xylenes	ND
		Methyl-tert-butylether	ND

NOTE: ND (None Detected, lower detectable limit = 1 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS**
Bromochloromethane (HECD)	114	(78-122)
Trifluorotoluene (PID)	99	(73-131)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-10
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/22/91

SAMPLE ID: BWMW-2 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

SELECTED ORGANIC COMPOUNDS ANALYTICAL REPORT

PARAMETER	RESULT (ug/L)	DETECTION LIMIT
Ethylene dibromide	ND	0.02

NOTE: ND (None Detected) as rec'd
J (Detected, but below quantitation limit; estimated value)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-10 **DATE EXTRACTED:** 8/21/91
MATRIX: WATER **DATE ANALYZED:** 8/24/91

SAMPLE ID: BWMW-2 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
POLYNUCLEAR AROMATIC HYDROCARBONS HRS84297
METHOD 625 HSL/TCL LIST - GC/MS

Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(ghi)perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
Fluoranthene	ND
Fluorene	ND
Indeno(1,2,3-cd)pyrene	ND
1-Methylnaphthalene	ND
2-Methylnaphthalene	ND
Naphthalene	ND
Phenanthrene	ND
Pyrene	ND

NOTE: ND (None Detected, lower detectable limit = 10 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
Nitrobenzene-d5	57	(22-135)	(10-155)
Fluorobiphenyl	60	(34-140)	(12-153)
Terphenyl-d14	83	(10-132)	(13-140)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-10
MATRIX : WATER

SAMPLE ID : BWMW-2 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
HRS84297

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Lead	8/27/91	ND	5	ug/L

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB ID: 1H1906-10 **DATE EXTRACTED:** 8/29/91
MATRIX : WATER **DATE ANALYZED:** 8/29/91

SAMPLE ID: BWMW-2 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
HRS84297

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS REPORT

	RESULT	UNITS	LOWER DETECTION LIMIT
Total Recoverable Petroleum Hydrocarbons	8	mg/L	5

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB # 1H1906-11
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/28/91

SAMPLE ID: BWMW-3 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

VOLATILE ORGANICS
METHOD 601/602 - GC

Benzene	ND	1,2-Dichloroethane	ND
Bromodichloromethane	ND	1,1-Dichloroethene	ND
Bromoform	ND	1,2-Dichloroethene (Total)	ND
Bromomethane	ND	1,2-Dichloropropane	ND
Carbon tetrachloride	ND	cis-1,3-Dichloropropene	ND
Chlorobenzene	ND	trans-1,3-Dichloropropene	ND
Chloroethane	ND	Ethylbenzene	ND
2-Chloroethylvinyl ether	ND	Methylene chloride	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
Chloromethane	ND	Tetrachloroethene	ND
Dibromochloromethane	ND	Toluene	ND
1,2-Dichlorobenzene	ND	1,1,1-Trichloroethane	ND
1,3-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,4-Dichlorobenzene	ND	Trichloroethene	ND
Dichlorodifluoromethane	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND
		Xylenes	ND
		Methyl-tert-butylether	ND

NOTE: ND (None Detected, lower detectable limit = 1 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS**
Bromochloromethane (HECD)	102	(78-122)
Trifluorotoluene (PID)	99	(73-131)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-11
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/23/91

SAMPLE ID: BWMW-3 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

SELECTED ORGANIC COMPOUNDS ANALYTICAL REPORT

PARAMETER	RESULT (ug/L)	DETECTION LIMIT
Ethylene dibromide	ND	0.02

NOTE: ND (None Detected) as rec'd
J (Detected, but below quantitation limit; estimated value)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-11 **DATE EXTRACTED:** 8/21/91
MATRIX: WATER **DATE ANALYZED:** 8/24/91

SAMPLE ID: BWMW-3 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
POLYNUCLEAR AROMATIC HYDROCARBONS HRS84297
METHOD 625 HSL/TCL LIST - GC/MS

Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(ghi)perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
Fluoranthene	ND
Fluorene	ND
Indeno(1,2,3-cd)pyrene	ND
1-Methylnaphthalene	ND
2-Methylnaphthalene	ND
Naphthalene	ND
Phenanthrene	ND
Pyrene	ND

NOTE: ND (None Detected, lower detectable limit = 10 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
Nitrobenzene-d5	79	(22-135)	(10-155)
Fluorobiphenyl	62	(34-140)	(12-153)
Terphenyl-d14	72	(10-132)	(13-140)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-11
MATRIX : WATER

SAMPLE ID : BWMW-3 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
HRS84297

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Lead	8/27/91	ND	5	ug/L

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB ID: 1H1906-11
MATRIX : WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/29/91
DATE ANALYZED: 8/29/91

SAMPLE ID: BWMW-3 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS REPORT

	RESULT	UNITS	LOWER DETECTION LIMIT
Total Recoverable Petroleum Hydrocarbons	41	mg/L	10

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB # 1H1906-19 **DATE EXTRACTED:** NA
MATRIX: WATER **DATE ANALYZED:** 8/24/91

SAMPLE ID: DUPLICATE #2 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
HRS84297

VOLATILE ORGANICS
METHOD 601/602 - GC

Benzene	ND	1,2-Dichloroethane	ND
Bromodichloromethane	ND	1,1-Dichloroethene	ND
Bromoform	ND	1,2-Dichloroethene (Total)	ND
Bromomethane	ND	1,2-Dichloropropane	ND
Carbon tetrachloride	ND	cis-1,3-Dichloropropene	ND
Chlorobenzene	ND	trans-1,3-Dichloropropene	ND
Chloroethane	ND	Ethylbenzene	ND
2-Chloroethylvinyl ether	ND	Methylene chloride	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
Chloromethane	ND	Tetrachloroethene	ND
Dibromochloromethane	ND	Toluene	ND
1,2-Dichlorobenzene	ND	1,1,1-Trichloroethane	ND
1,3-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,4-Dichlorobenzene	ND	Trichloroethene	ND
Dichlorodifluoromethane	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND
		Xylenes	ND
		Methyl-tert-butylether	ND

NOTE: ND (None Detected, lower detectable limit = 1 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS**
Bromochloromethane (HECD)	100	(78-122)
Trifluorotoluene (PID)	100	(73-131)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-19
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/24/91

SAMPLE ID: DUPLICATE #2 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

SELECTED ORGANIC COMPOUNDS ANALYTICAL REPORT

PARAMETER	RESULT (ug/L)	DETECTION LIMIT
Ethylene dibromide	ND	0.02

NOTE: ND (None Detected) as rec'd
J (Detected, but below quantitation limit; estimated value)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-19 **DATE EXTRACTED:** 8/21/91
MATRIX: WATER **DATE ANALYZED:** 8/24/91

SAMPLE ID: DUPLICATE #2 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059

POLYNUCLEAR AROMATIC HYDROCARBONS HRS84297
METHOD 625 HSL/TCL LIST - GC/MS

Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(ghi)perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
Fluoranthene	ND
Fluorene	ND
Indeno(1,2,3-cd)pyrene	ND
1-Methylnaphthalene	ND
2-Methylnaphthalene	ND
Naphthalene	ND
Phenanthrene	ND
Pyrene	ND

NOTE: ND (None Detected, lower detectable limit = 10 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	%	**ACCEPTABLE LIMITS** WATER	SOLID
Nitrobenzene-d5	59	(22-135)	(10-155)
Fluorobiphenyl	58	(34-140)	(12-153)
Terphenyl-d14	66	(10-132)	(13-140)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-19
MATRIX : WATER

SAMPLE ID : DUPLICATE #2 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
HRS84297

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Lead	8/27/91	ND	5	ug/L

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB ID: 1H1906-19
MATRIX : WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/29/91
DATE ANALYZED: 8/29/91

SAMPLE ID: DUPLICATE #2 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS REPORT

	RESULT	UNITS	LOWER DETECTION LIMIT
Total Recoverable Petroleum Hydrocarbons	36	mg/L	10

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB # 1H1906-12
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/28/91

SAMPLE ID: BWMW-4 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

VOLATILE ORGANICS
METHOD 601/602 - GC

Benzene	ND	1,2-Dichloroethane	ND
Bromodichloromethane	ND	1,1-Dichloroethene	ND
Bromoform	ND	1,2-Dichloroethene (Total)	ND
Bromomethane	ND	1,2-Dichloropropane	ND
Carbon tetrachloride	ND	cis-1,3-Dichloropropene	ND
Chlorobenzene	ND	trans-1,3-Dichloropropene	ND
Chloroethane	ND	Ethylbenzene	ND
2-Chloroethylvinyl ether	ND	Methylene chloride	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
Chloromethane	ND	Tetrachloroethene	ND
Dibromochloromethane	ND	Toluene	ND
1,2-Dichlorobenzene	ND	1,1,1-Trichloroethane	ND
1,3-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,4-Dichlorobenzene	ND	Trichloroethene	ND
Dichlorodifluoromethane	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND
		Xylenes	ND
		Methyl-tert-butylether	ND

NOTE: ND (None Detected, lower detectable limit = 1 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS**
Bromochloromethane (HECD)	111	(78-122)
Trifluorotoluene (PID)	100	(73-131)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-12
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/23/91

SAMPLE ID: BWMW-4 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

SELECTED ORGANIC COMPOUNDS ANALYTICAL REPORT

PARAMETER	RESULT (ug/L)	DETECTION LIMIT
Ethylene dibromide	ND	0.02

NOTE: ND (None Detected) as rec'd
J (Detected, but below quantitation limit; estimated value)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-12
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/21/91
DATE ANALYZED: 8/24/91

SAMPLE ID: BWMW-4 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059

POLYNUCLEAR AROMATIC HYDROCARBONS HRS84297
METHOD 625 HSL/TCL LIST - GC/MS

Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(ghi)perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
Fluoranthene	ND
Fluorene	ND
Indeno(1,2,3-cd)pyrene	ND
1-Methylnaphthalene	ND
2-Methylnaphthalene	ND
Naphthalene	ND
Phenanthrene	ND
Pyrene	ND

NOTE: ND (None Detected, lower detectable limit = 10 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
Nitrobenzene-d5	49	(22-135)	(10-155)
Fluorobiphenyl	52	(34-140)	(12-153)
Terphenyl-d14	86	(10-132)	(13-140)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-12
MATRIX : WATER

SAMPLE ID : BWMW-4 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
HRS84297

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Lead	8/27/91	ND	5	ug/L

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB ID: 1H1906-12
MATRIX : WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/29/91
DATE ANALYZED: 8/29/91

SAMPLE ID: BWMW-4 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS REPORT

	RESULT	UNITS	LOWER DETECTION LIMIT
Total Recoverable Petroleum Hydrocarbons	ND	mg/L	1

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB # 1H1906-13
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/24/91

SAMPLE ID: BWMW-5 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

VOLATILE ORGANICS
METHOD 601/602 - GC

Benzene	ND	1,2-Dichloroethane	ND
Bromodichloromethane	ND	1,1-Dichloroethene	ND
Bromoform	ND	1,2-Dichloroethene (Total)	ND
Bromomethane	ND	1,2-Dichloropropane	ND
Carbon tetrachloride	ND	cis-1,3-Dichloropropene	ND
Chlorobenzene	ND	trans-1,3-Dichloropropene	ND
Chloroethane	ND	Ethylbenzene	ND
2-Chloroethylvinyl ether	ND	Methylene chloride	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
Chloromethane	ND	Tetrachloroethene	ND
Dibromochloromethane	ND	Toluene	ND
1,2-Dichlorobenzene	ND	1,1,1-Trichloroethane	ND
1,3-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,4-Dichlorobenzene	ND	Trichloroethene	ND
Dichlorodifluoromethane	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND
		Xylenes	ND
		Methyl-tert-butylether	ND

NOTE: ND (None Detected, lower detectable limit = 1 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS**
Bromochloromethane (HECD)	115	(78-122)
Trifluorotoluene (PID)	100	(73-131)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-13
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/23/91

SAMPLE ID: BWMW-5 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

SELECTED ORGANIC COMPOUNDS ANALYTICAL REPORT

PARAMETER	RESULT (ug/L)	DETECTION LIMIT
Ethylene dibromide	ND	0.02

NOTE: ND (None Detected) as rec'd
J (Detected, but below quantitation limit; estimated value)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-13 **DATE EXTRACTED:** 8/21/91
MATRIX: WATER **DATE ANALYZED:** 8/24/91

SAMPLE ID: BWMW-5 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
POLYNUCLEAR AROMATIC HYDROCARBONS HRS84297
METHOD 625 HSL/TCL LIST - GC/MS

Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(ghi)perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
Fluoranthene	ND
Fluorene	ND
Indeno(1,2,3-cd)pyrene	ND
1-Methylnaphthalene	ND
2-Methylnaphthalene	ND
Naphthalene	ND
Phenanthrene	ND
Pyrene	ND

NOTE: ND (None Detected, lower detectable limit = 10 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
Nitrobenzene-d5	22	(22-135)	(10-155)
Fluorobiphenyl	26	(34-140)	(12-153)
Terphenyl-d14	75	(10-132)	(13-140)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-13
MATRIX : WATER

SAMPLE ID : BWMW-5 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059

METALS ANALYTICAL REPORT HRS84297
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Lead	8/27/91	ND	5	ug/L

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB ID: 1H1906-13
MATRIX : WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/29/91
DATE ANALYZED: 8/29/91

SAMPLE ID: BWMW-5 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS REPORT

	RESULT	UNITS	LOWER DETECTION LIMIT
Total Recoverable Petroleum Hydrocarbons	ND	mg/L	1

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB # 1H1906-14
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/24/91

SAMPLE ID: BWMW-6 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

VOLATILE ORGANICS
METHOD 601/602 - GC

Benzene	ND	1,2-Dichloroethane	ND
Bromodichloromethane	ND	1,1-Dichloroethene	ND
Bromoform	ND	1,2-Dichloroethene (Total)	ND
Bromomethane	ND	1,2-Dichloropropane	ND
Carbon tetrachloride	ND	cis-1,3-Dichloropropene	ND
Chlorobenzene	ND	trans-1,3-Dichloropropene	ND
Chloroethane	ND	Ethylbenzene	ND
2-Chloroethylvinyl ether	ND	Methylene chloride	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
Chloromethane	ND	Tetrachloroethene	ND
Dibromochloromethane	ND	Toluene	ND
1,2-Dichlorobenzene	ND	1,1,1-Trichloroethane	ND
1,3-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,4-Dichlorobenzene	ND	Trichloroethene	ND
Dichlorodifluoromethane	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND
		Xylenes	ND
		Methyl-tert-butylether	ND

NOTE: ND (None Detected, lower detectable limit = 1 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS**
Bromochloromethane (HECD)	105	(78-122)
Trifluorotoluene (PID)	99	(73-131)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-14
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/23/91

SAMPLE ID: BWMW-6 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

SELECTED ORGANIC COMPOUNDS ANALYTICAL REPORT

PARAMETER	RESULT (ug/L)	DETECTION LIMIT
Ethylene dibromide	ND	0.02

NOTE: ND (None Detected) as rec'd
J (Detected, but below quantitation limit; estimated value)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-14 **DATE EXTRACTED:** 8/21/91
MATRIX: WATER **DATE ANALYZED:** 8/24/91

SAMPLE ID: BWMW-6 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
POLYNUCLEAR AROMATIC HYDROCARBONS HRS84297
METHOD 625 HSL/TCL LIST - GC/MS

Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(ghi)perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
Fluoranthene	ND
Fluorene	ND
Indeno(1,2,3-cd)pyrene	ND
1-Methylnaphthalene	ND
2-Methylnaphthalene	ND
Naphthalene	ND
Phenanthrene	ND
Pyrene	ND

NOTE: ND (None Detected, lower detectable limit = 10 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
Nitrobenzene-d5	34	(22-135)	(10-155)
Fluorobiphenyl	37	(34-140)	(12-153)
Terphenyl-d14	61	(10-132)	(13-140)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-14
MATRIX : WATER

SAMPLE ID : BWMW-6 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Lead	8/27/91	ND	5	ug/L

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB ID: 1H1906-14
MATRIX : WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/29/91
DATE ANALYZED: 8/29/91

SAMPLE ID: BWMW-6 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS REPORT

	RESULT	UNITS	LOWER DETECTION LIMIT
Total Recoverable Petroleum Hydrocarbons	ND	mg/L	1

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB # 1H1906-15
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/24/91

SAMPLE ID: BWMW-7 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

VOLATILE ORGANICS
METHOD 601/602 - GC

Benzene	ND	1,2-Dichloroethane	ND
Bromodichloromethane	ND	1,1-Dichloroethene	ND
Bromoform	ND	1,2-Dichloroethene (Total)	ND
Bromomethane	ND	1,2-Dichloropropane	ND
Carbon tetrachloride	ND	cis-1,3-Dichloropropene	ND
Chlorobenzene	ND	trans-1,3-Dichloropropene	ND
Chloroethane	ND	Ethylbenzene	ND
2-Chloroethylvinyl ether	ND	Methylene chloride	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
Chloromethane	ND	Tetrachloroethene	ND
Dibromochloromethane	ND	Toluene	ND
1,2-Dichlorobenzene	ND	1,1,1-Trichloroethane	ND
1,3-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,4-Dichlorobenzene	ND	Trichloroethene	ND
Dichlorodifluoromethane	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND
		Xylenes	ND
		Methyl-tert-butylether	ND

NOTE: ND (None Detected, lower detectable limit = 1 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS**
Bromochloromethane (HECD)	102	(78-122)
Trifluorotoluene (PID)	100	(73-131)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-15
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/23/91

SAMPLE ID: BWMW-7 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

SELECTED ORGANIC COMPOUNDS ANALYTICAL REPORT

PARAMETER	RESULT (ug/L)	DETECTION LIMIT
Ethylene dibromide	ND	0.02

NOTE: ND (None Detected) as rec'd
J (Detected, but below quantitation limit; estimated value)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-15
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/21/91
DATE ANALYZED: 8/24/91

SAMPLE ID: BWMW-7 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059

POLYNUCLEAR AROMATIC HYDROCARBONS HRS84297
METHOD 625 HSL/TCL LIST - GC/MS

Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(ghi)perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
Fluoranthene	ND
Fluorene	ND
Indeno(1,2,3-cd)pyrene	ND
1-Methylnaphthalene	ND
2-Methylnaphthalene	ND
Naphthalene	ND
Phenanthrene	ND
Pyrene	ND

NOTE: ND (None Detected, lower detectable limit = 10 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
Nitrobenzene-d5	54	(22-135)	(10-155)
Fluorobiphenyl	44	(34-140)	(12-153)
Terphenyl-d14	80	(10-132)	(13-140)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-15
MATRIX : WATER

SAMPLE ID : BWMW-7 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
HRS84297

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Lead	8/27/91	ND	5	ug/L

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB ID: 1H1906-15
MATRIX : WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/29/91
DATE ANALYZED: 8/29/91

SAMPLE ID: BWMW-7 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS REPORT

	RESULT	UNITS	LOWER DETECTION LIMIT
Total Recoverable Petroleum Hydrocarbons	ND	mg/L	1

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB # 1H1906-16
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/24/91

SAMPLE ID: BWMW-8 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

VOLATILE ORGANICS
METHOD 601/602 - GC

Benzene	ND	1,2-Dichloroethane	ND
Bromodichloromethane	ND	1,1-Dichloroethene	2
Bromoform	ND	1,2-Dichloroethene (Total)	1
Bromomethane	ND	1,2-Dichloropropane	ND
Carbon tetrachloride	ND	cis-1,3-Dichloropropene	ND
Chlorobenzene	ND	trans-1,3-Dichloropropene	ND
Chloroethane	ND	Ethylbenzene	ND
2-Chloroethylvinyl ether	ND	Methylene chloride	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
Chloromethane	ND	Tetrachloroethene	ND
Dibromochloromethane	ND	Toluene	ND
1,2-Dichlorobenzene	ND	1,1,1-Trichloroethane	ND
1,3-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,4-Dichlorobenzene	ND	Trichloroethene	ND
Dichlorodifluoromethane	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND
		Xylenes	ND
		Methyl-tert-butylether	ND

NOTE: ND (None Detected, lower detectable limit = 1 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS**
Bromochloromethane (HECD)	103	(78-122)
Trifluorotoluene (PID)	100	(73-131)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-16
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/23/91

SAMPLE ID: BWMW-8 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

SELECTED ORGANIC COMPOUNDS ANALYTICAL REPORT

PARAMETER	RESULT (ug/L)	DETECTION LIMIT
Ethylene dibromide	ND	0.02

NOTE: ND (None Detected) as rec'd
J (Detected, but below quantitation limit; estimated value)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-16
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/21/91
DATE ANALYZED: 8/24/91

SAMPLE ID: BWMW-8 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059

POLYNUCLEAR AROMATIC HYDROCARBONS HRS84297
METHOD 625 HSL/TCL LIST - GC/MS

Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(ghi)perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
Fluoranthene	ND
Fluorene	ND
Indeno(1,2,3-cd)pyrene	ND
1-Methylnaphthalene	ND
2-Methylnaphthalene	ND
Naphthalene	ND
Phenanthrene	ND
Pyrene	ND

NOTE: ND (None Detected, lower detectable limit = 10 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
Nitrobenzene-d5	49	(22-135)	(10-155)
Fluorobiphenyl	50	(34-140)	(12-153)
Terphenyl-d14	85	(10-132)	(13-140)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-16
MATRIX : WATER

SAMPLE ID : BWMW-8 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
METALS ANALYTICAL REPORT HRS84297
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Lead	8/27/91	ND	5	ug/L

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB ID: 1H1906-16
MATRIX : WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/29/91
DATE ANALYZED: 8/29/91

SAMPLE ID: BWMW-8 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS REPORT

	RESULT	UNITS	LOWER DETECTION LIMIT
Total Recoverable Petroleum Hydrocarbons	ND	mg/L	1

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB # 1H1906-17
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/24/91

SAMPLE ID: BWMW-9 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

VOLATILE ORGANICS
METHOD 601/602 - GC

Benzene	ND	1,2-Dichloroethane	ND
Bromodichloromethane	ND	1,1-Dichloroethene	ND
Bromoform	ND	1,2-Dichloroethene (Total)	ND
Bromomethane	ND	1,2-Dichloropropane	ND
Carbon tetrachloride	ND	cis-1,3-Dichloropropene	ND
Chlorobenzene	ND	trans-1,3-Dichloropropene	ND
Chloroethane	ND	Ethylbenzene	ND
2-Chloroethylvinyl ether	ND	Methylene chloride	ND
Chloroform	ND	1,1,2,2-Tetrachloroethane	ND
Chloromethane	ND	Tetrachloroethene	ND
Dibromochloromethane	ND	Toluene	ND
1,2-Dichlorobenzene	ND	1,1,1-Trichloroethane	ND
1,3-Dichlorobenzene	ND	1,1,2-Trichloroethane	ND
1,4-Dichlorobenzene	ND	Trichloroethene	ND
Dichlorodifluoromethane	ND	Trichlorofluoromethane	ND
1,1-Dichloroethane	ND	Vinyl chloride	ND
		Xylenes	ND
		Methyl-tert-butylether	ND

NOTE: ND (None Detected, lower detectable limit = 1 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS**
Bromochloromethane (HECD)	100	(78-122)
Trifluorotoluene (PID)	122	(73-131)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-17
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: NA
DATE ANALYZED: 8/24/91

SAMPLE ID: BWMW-9 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

SELECTED ORGANIC COMPOUNDS ANALYTICAL REPORT

PARAMETER	RESULT (ug/L)	DETECTION LIMIT
Ethylene dibromide	ND	0.02

NOTE: ND (None Detected) as rec'd
J (Detected, but below quantitation limit; estimated value)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB #: 1H1906-17
MATRIX: WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/22/91
DATE ANALYZED: 8/24/91

SAMPLE ID: BWMW-9 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

POLYNUCLEAR AROMATIC HYDROCARBONS
METHOD 625 HSL/TCL LIST - GC/MS

Acenaphthene	ND
Acenaphthylene	ND
Anthracene	ND
Benzo(a)anthracene	ND
Benzo(a)pyrene	ND
Benzo(b)fluoranthene	ND
Benzo(ghi)perylene	ND
Benzo(k)fluoranthene	ND
Chrysene	ND
Dibenz(a,h)anthracene	ND
Fluoranthene	ND
Fluorene	ND
Indeno(1,2,3-cd)pyrene	ND
1-Methylnaphthalene	ND
2-Methylnaphthalene	ND
Naphthalene	ND
Phenanthrene	ND
Pyrene	ND

NOTE: ND (None Detected, lower detectable limit = 10 ug/L) as rec'd
ND* (None Detected, lower detectable limit = ug/L) as rec'd
-- (Not Analyzed)

SURROGATE RECOVERY:	**%**	**ACCEPTABLE LIMITS** WATER	SOLID
Nitrobenzene-d5	66	(22-135)	(10-155)
Fluorobiphenyl	71	(34-140)	(12-153)
Terphenyl-d14	83	(10-132)	(13-140)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY : ABB ENVIRONMENTAL SERVICES, INC. **DATE RECEIVED:** 8/17/91
LAB #: 1H1906-17
MATRIX : WATER

SAMPLE ID : BWMW-9 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30
CERTIFICATION #: E84059
HRS84297

METALS ANALYTICAL REPORT
SELECTED LIST

Total metals analysis results - as received

ELEMENT	PREPARATION - ANALYSIS DATE	RESULT	DETECTION LIMIT	
Lead	8/27/91	ND	5	ug/L

NOTE: ND (None Detected)

WADSWORTH/ALERT
LABORATORIES, INC.

COMPANY: ABB ENVIRONMENTAL SERVICES, INC.
LAB ID: 1H1906-17
MATRIX : WATER

DATE RECEIVED: 8/17/91
DATE EXTRACTED: 8/29/91
DATE ANALYZED: 8/29/91

SAMPLE ID: BWMW-9 TRUMAN ANNEX/NAS KEY WEST PROJ.#0715.30

CERTIFICATION #: E84059
HRS84297

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS REPORT

	RESULT	UNITS	LOWER DETECTION LIMIT
Total Recoverable Petroleum Hydrocarbons	2	mg/L	1

NOTE: ND (None Detected)

APPENDIX F

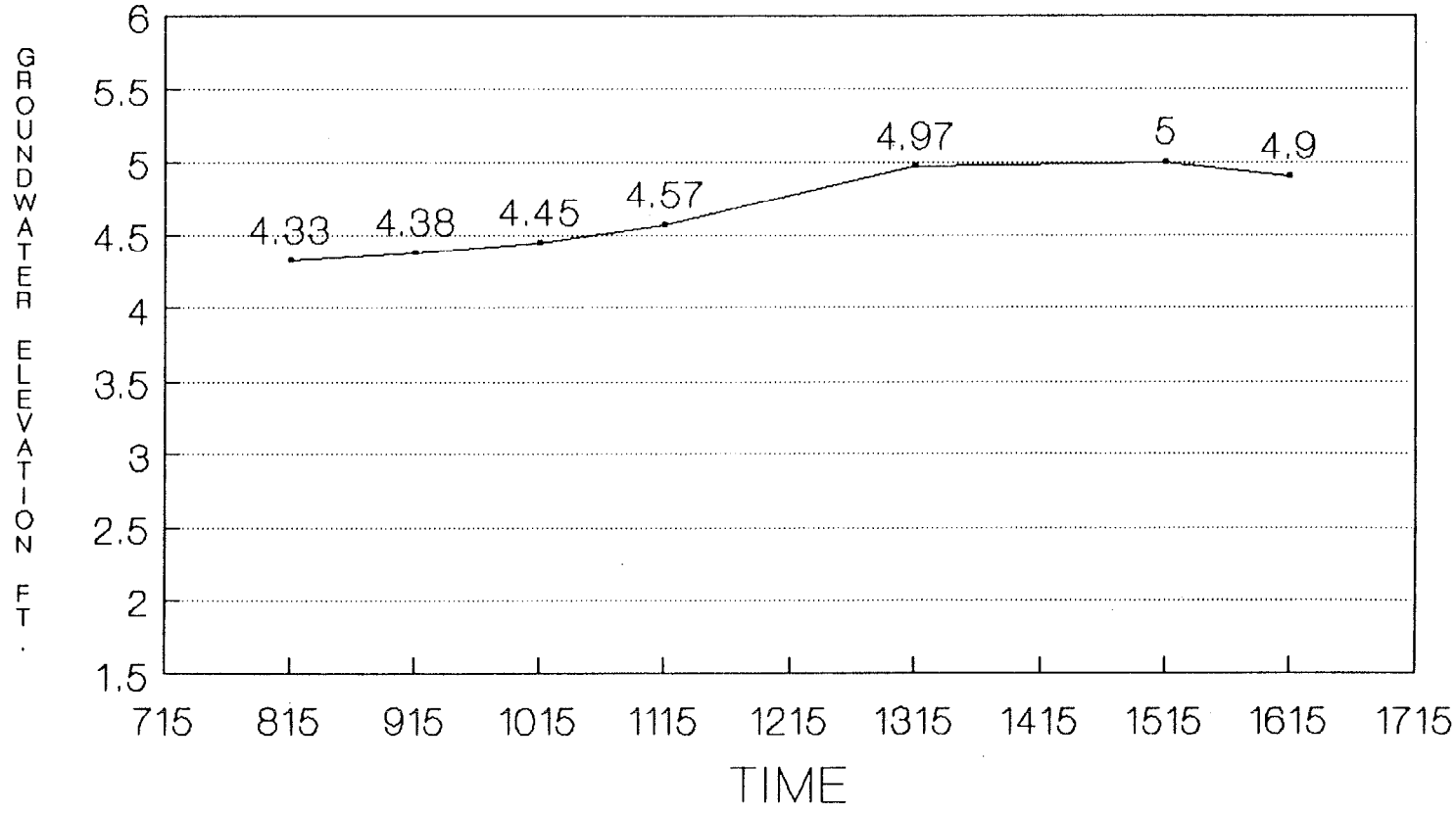
GROUNDWATER ELEVATION GRAPHS FROM TIDAL INFLUENCE STUDY

AUGUST 13, 1991 (8 HOUR PERIOD)

TIDAL INFLUENCE STUDY, BUILDING 189

TRUMAN ANNEX BERTHING WHARF-AUG 13, 1991

KYW-189-1

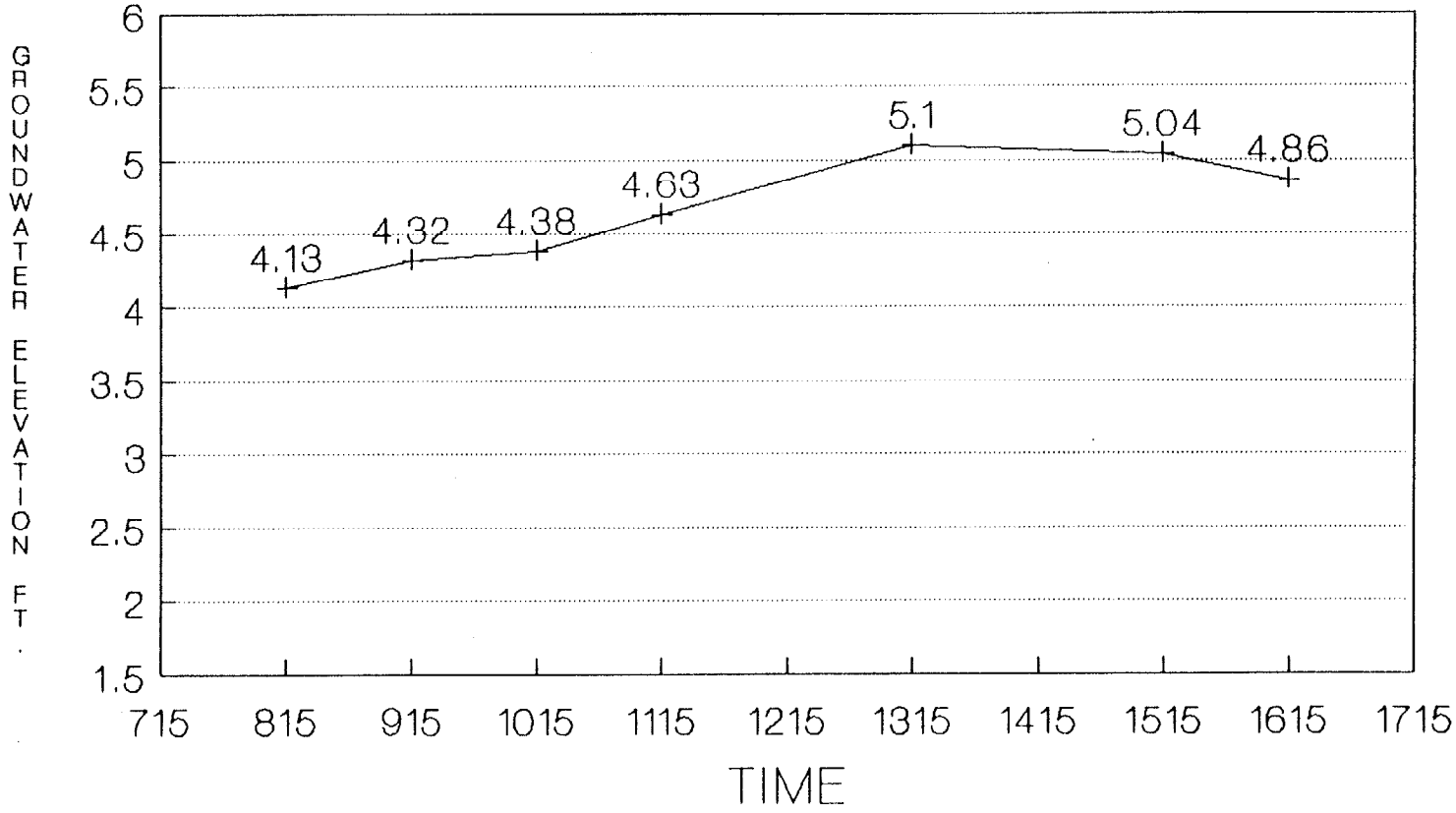


HIGH TIDES: 0320 & 1711
LOW TIDES: 1049 & 2123
TRUMAN ANNEX BERTHING WHARF

TIDAL INFLUENCE STUDY, BUILDING 189

TRUMAN ANNEX BERTHING WHARF-AUG 13, 1991

KYW-189-2

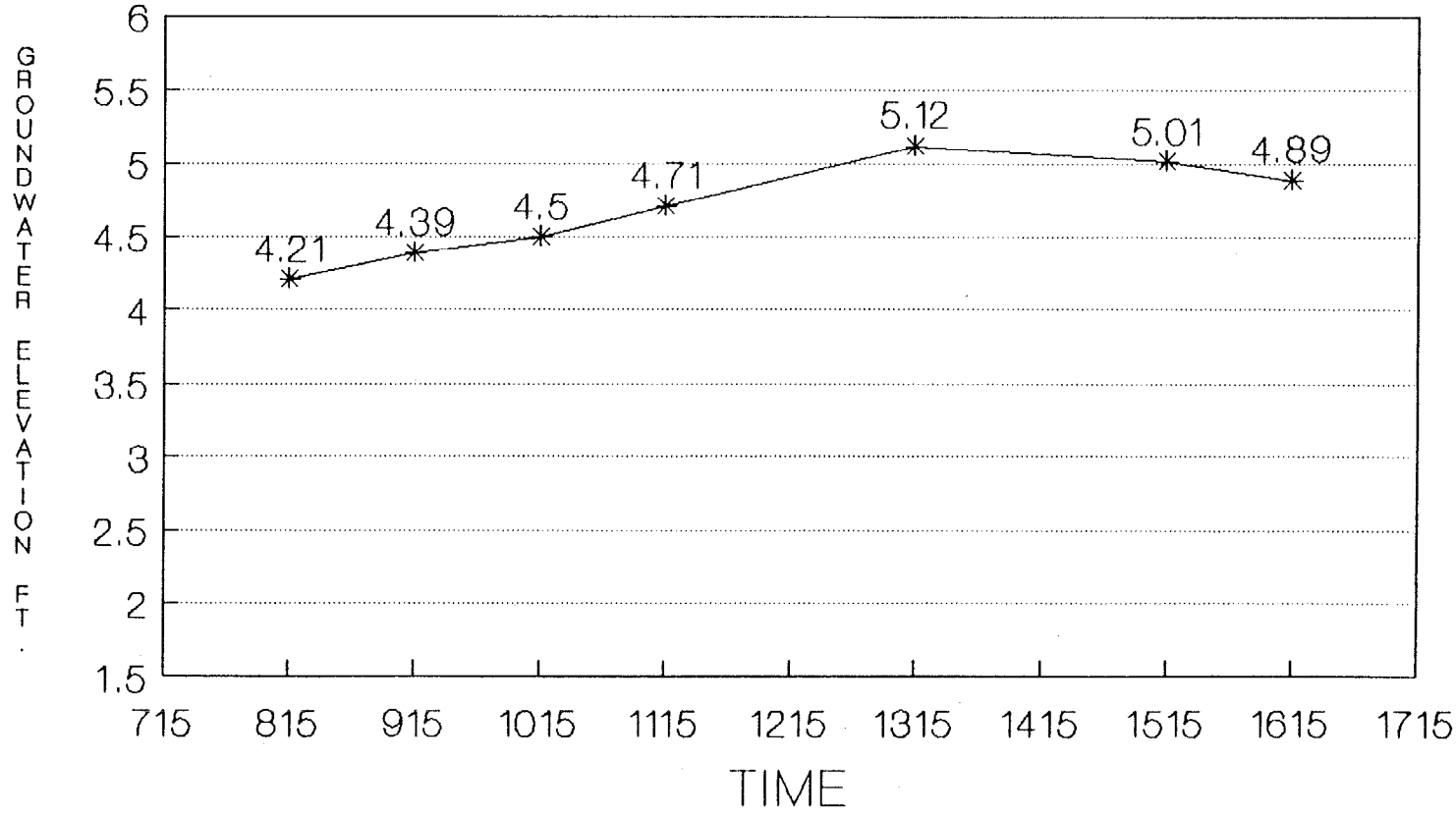


HIGH TIDES: 0320 & 1711
LOW TIDES: 1049 & 2123
TRUMAN ANNEX BERTHING WHARF

TIDAL INFLUENCE STUDY, BUILDING 189

TRUMAN ANNEX BERTHING WHARF-AUG 13, 1991

KYW-189-3

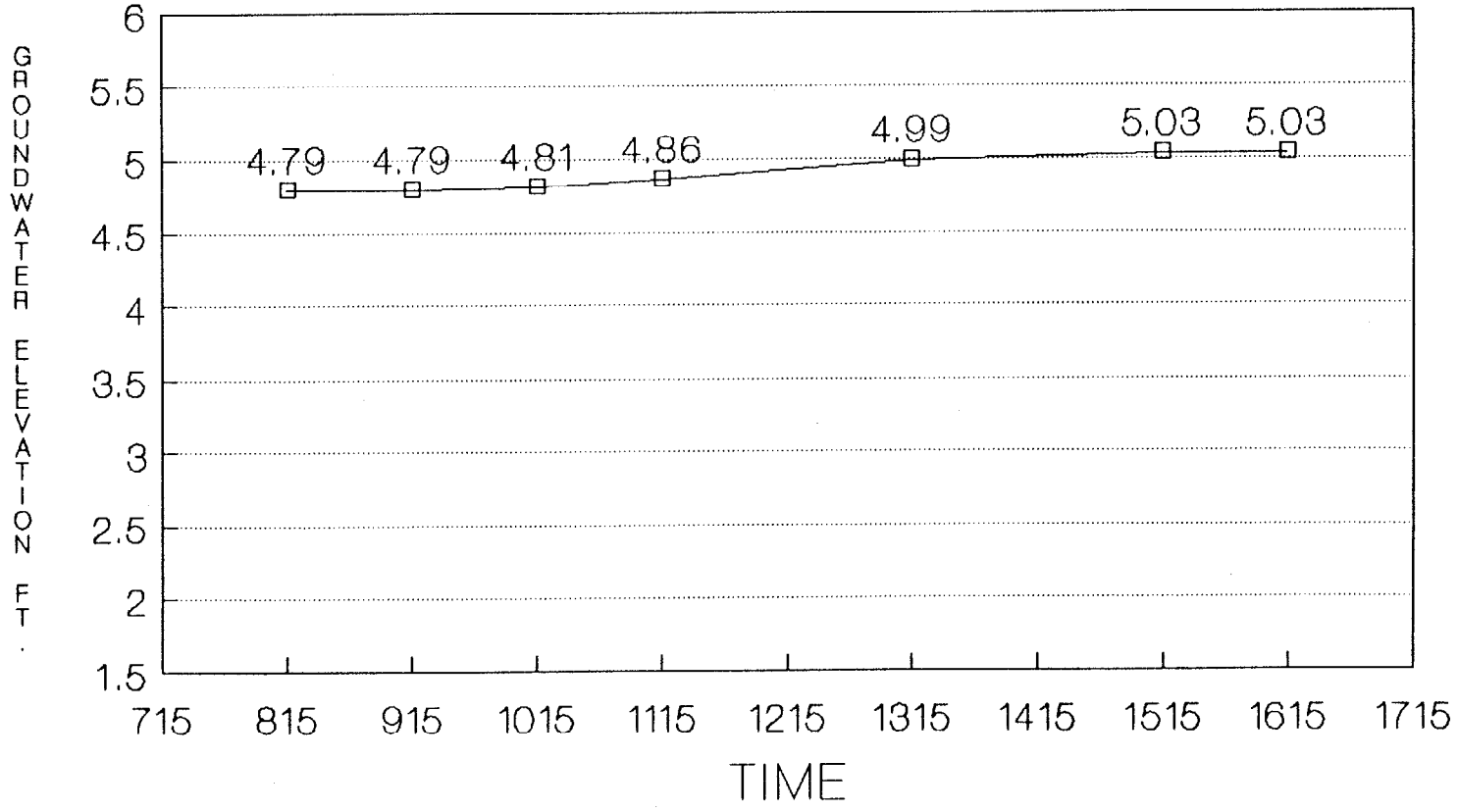


HIGH TIDES: 0320 & 1711
LOW TIDES: 1049 & 2123
TRUMAN ANNEX BERTHING WHARF

TIDAL INFLUENCE STUDY, BUILDING 189

TRUMAN ANNEX BERTHING WHARF-AUG 13, 1991

KYW-189-4

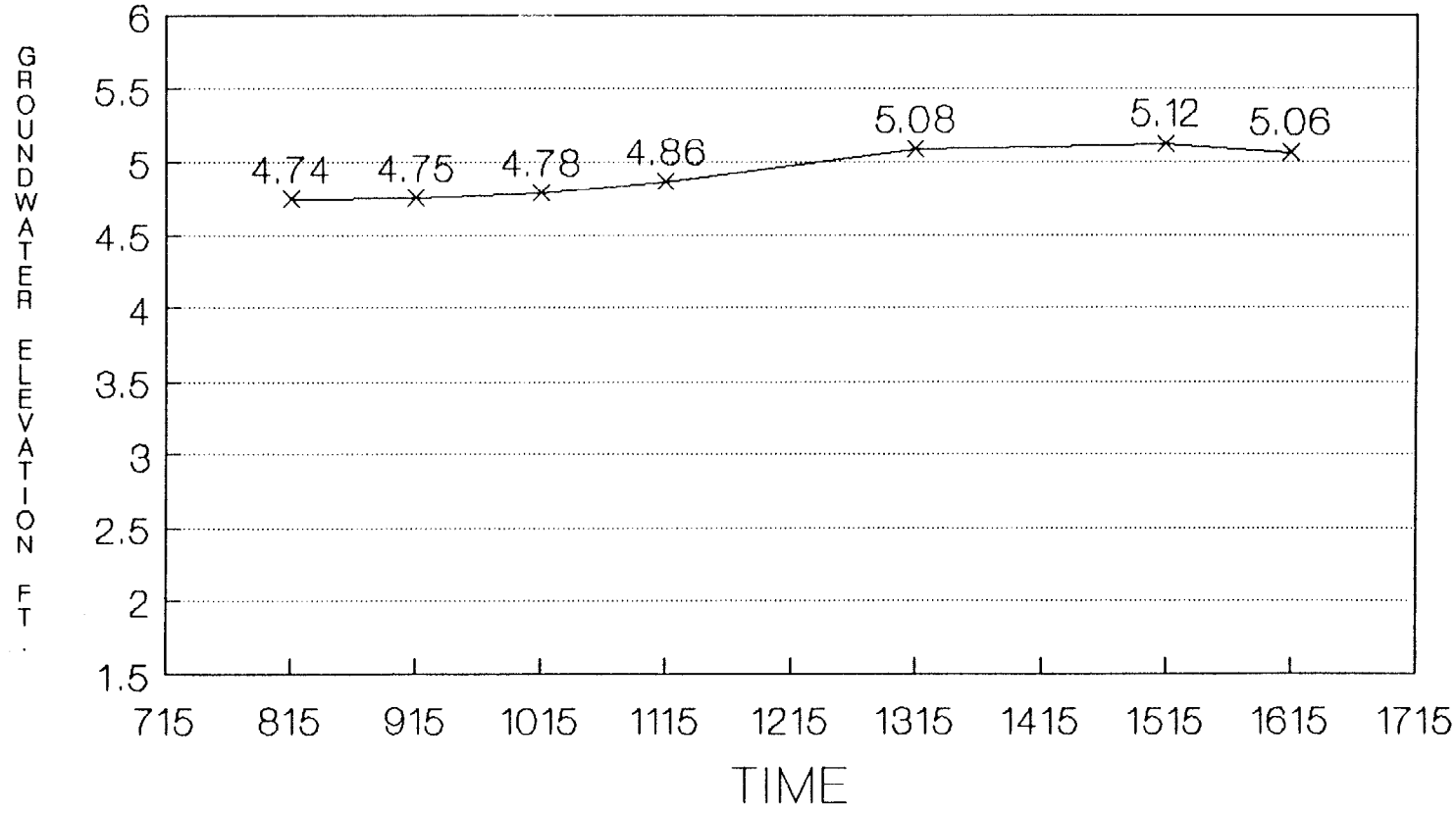


HIGH TIDES: 0320 & 1711
LOW TIDES: 1049 & 2123
TRUMAN ANNEX BERTHING WHARF

TIDAL INFLUENCE STUDY, BUILDING 189

TRUMAN ANNEX BERTHING WHARF-AUG 13, 1991

KYW-189-5

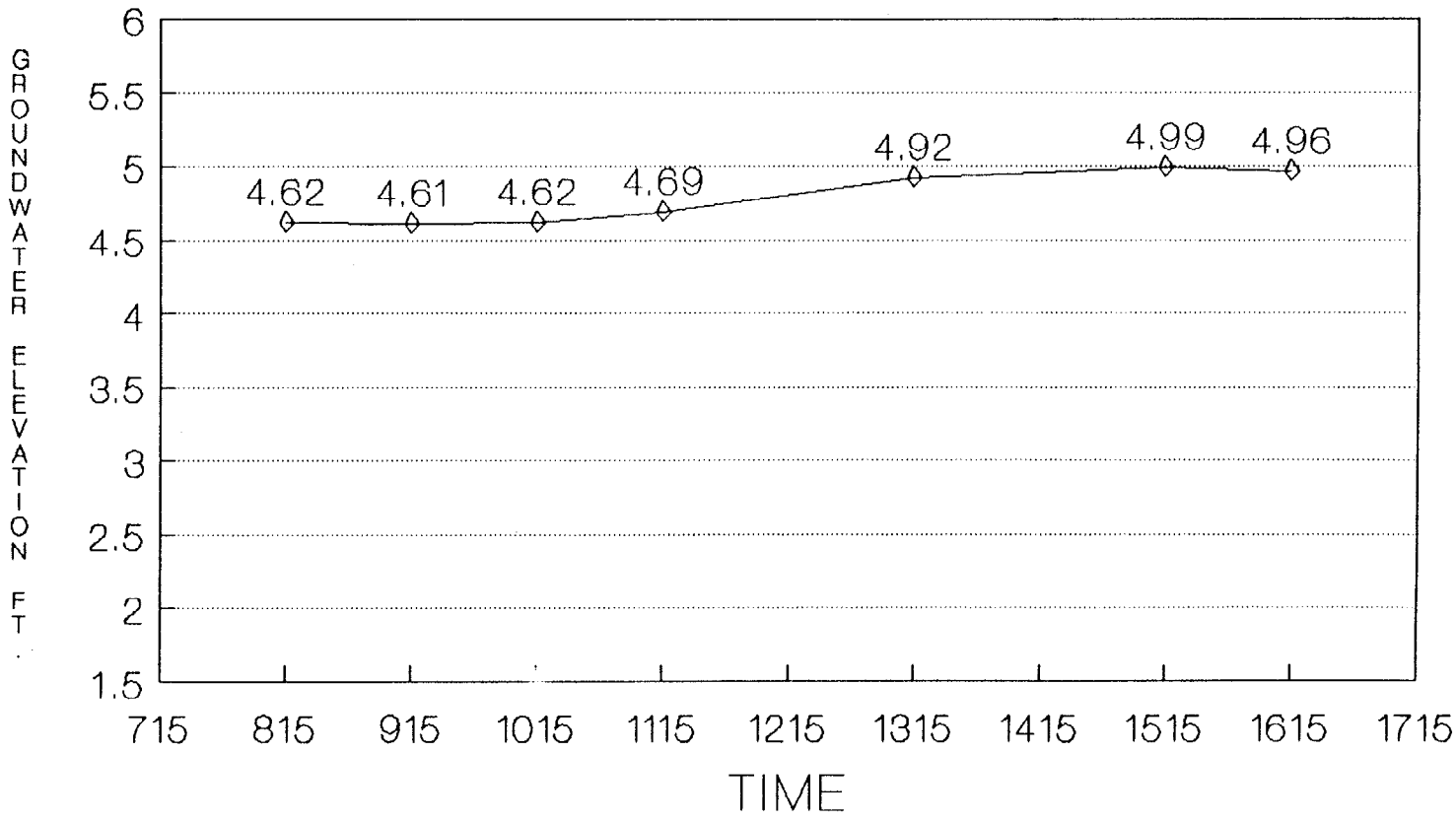


HIGH TIDES: 0320 & 1711
LOW TIDES: 1049 & 2123
TRUMAN ANNEX BERTHING WHARF

TIDAL INFLUENCE STUDY, BUILDING 189

TRUMAN ANNEX BERTHING WHARF-AUG 13, 1991

KYW-189-6

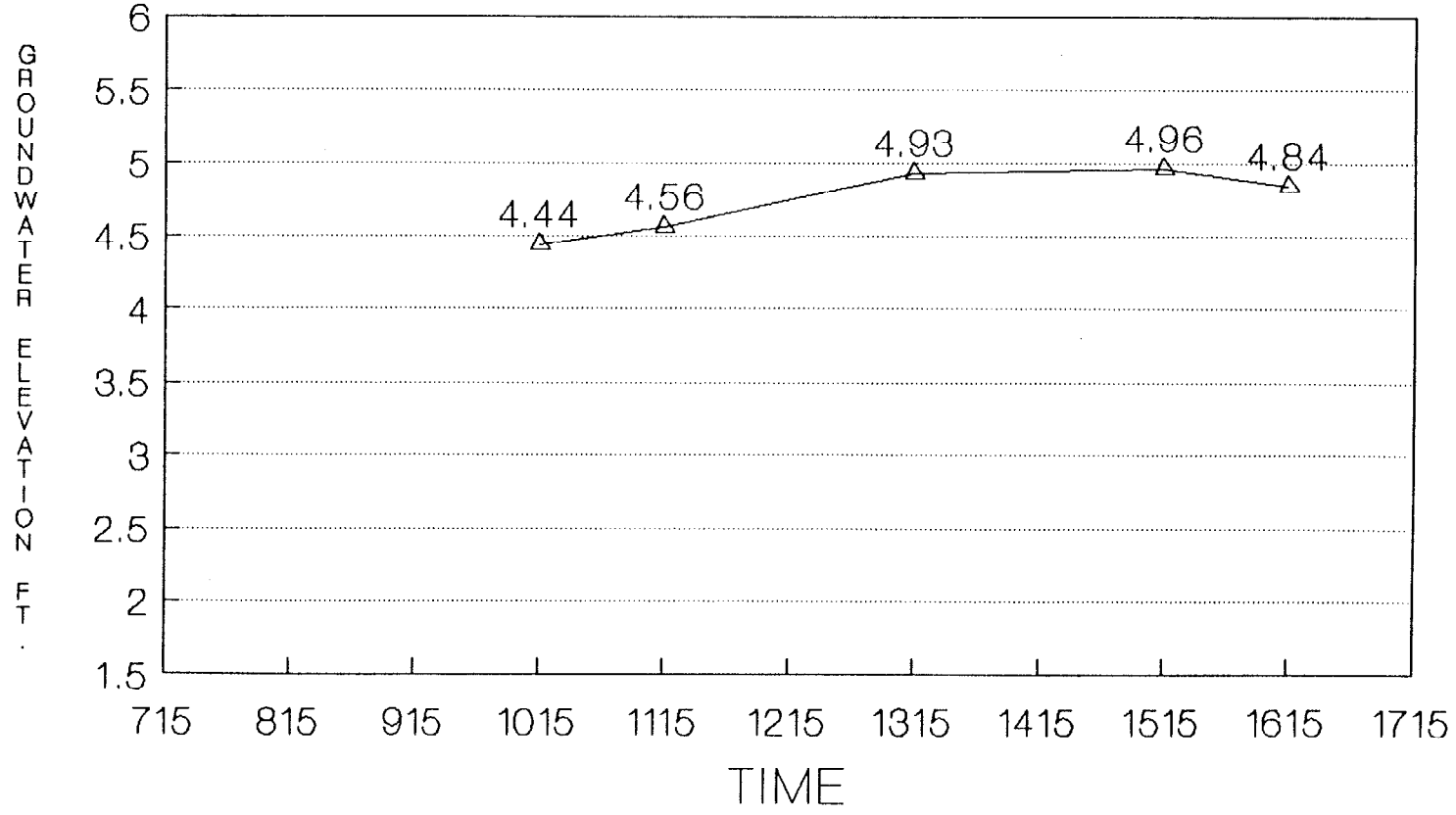


HIGH TIDES: 0320 & 1711
LOW TIDES: 1049 & 2123
TRUMAN ANNEX BERTHING WHARF

TIDAL INFLUENCE STUDY, BUILDING 189

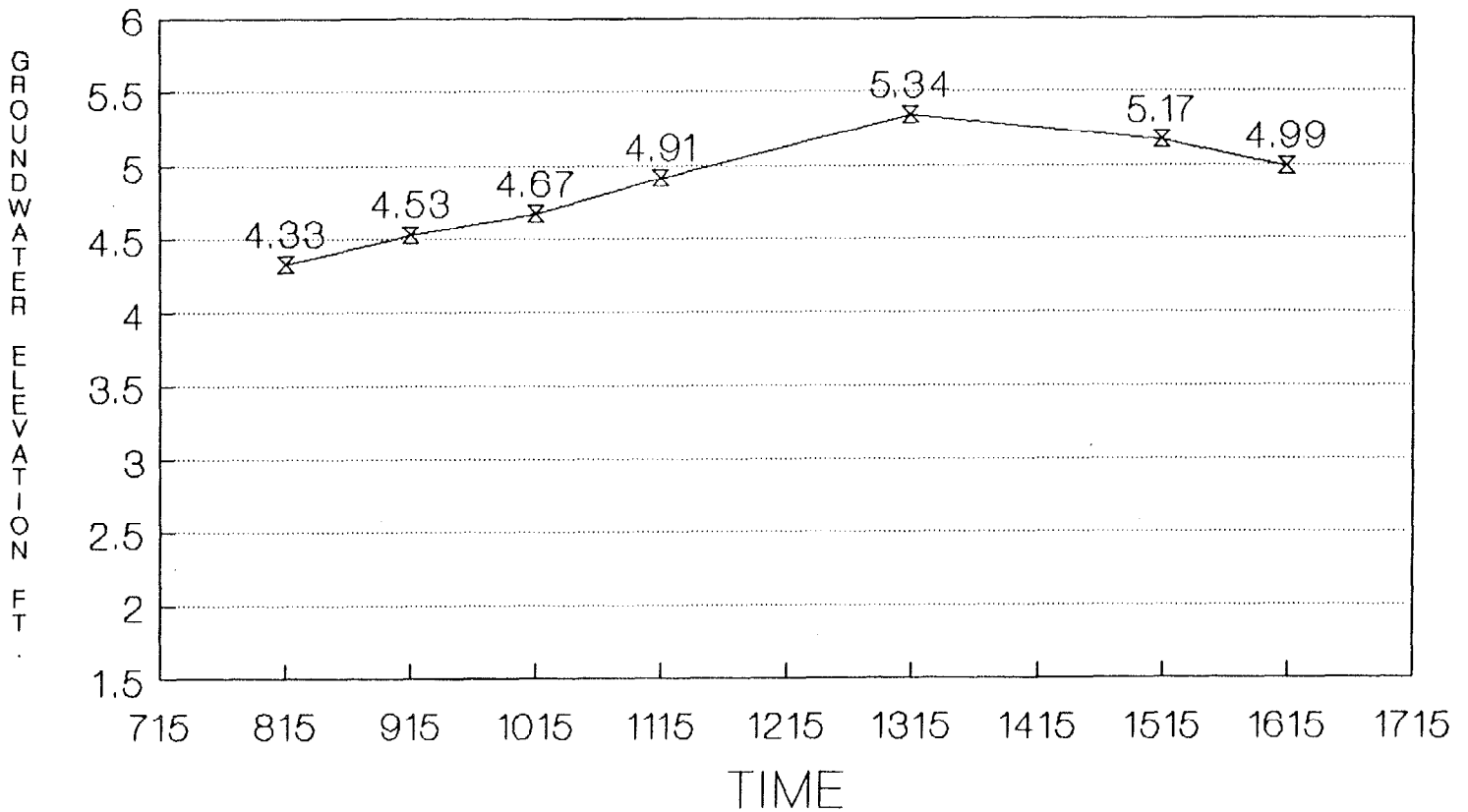
TRUMAN ANNEX BERTHING WHARF-AUG 13, 1991

KYW-189-7



HIGH TIDES: 0320 & 1711
LOW TIDES: 1049 & 2123
TRUMAN ANNEX BERTHING WHARF

TIDAL INFLUENCE STUDY, BUILDING 189
TRUMAN ANNEX BERTHING WHARF-AUG 13, 1991
KYW-189-8

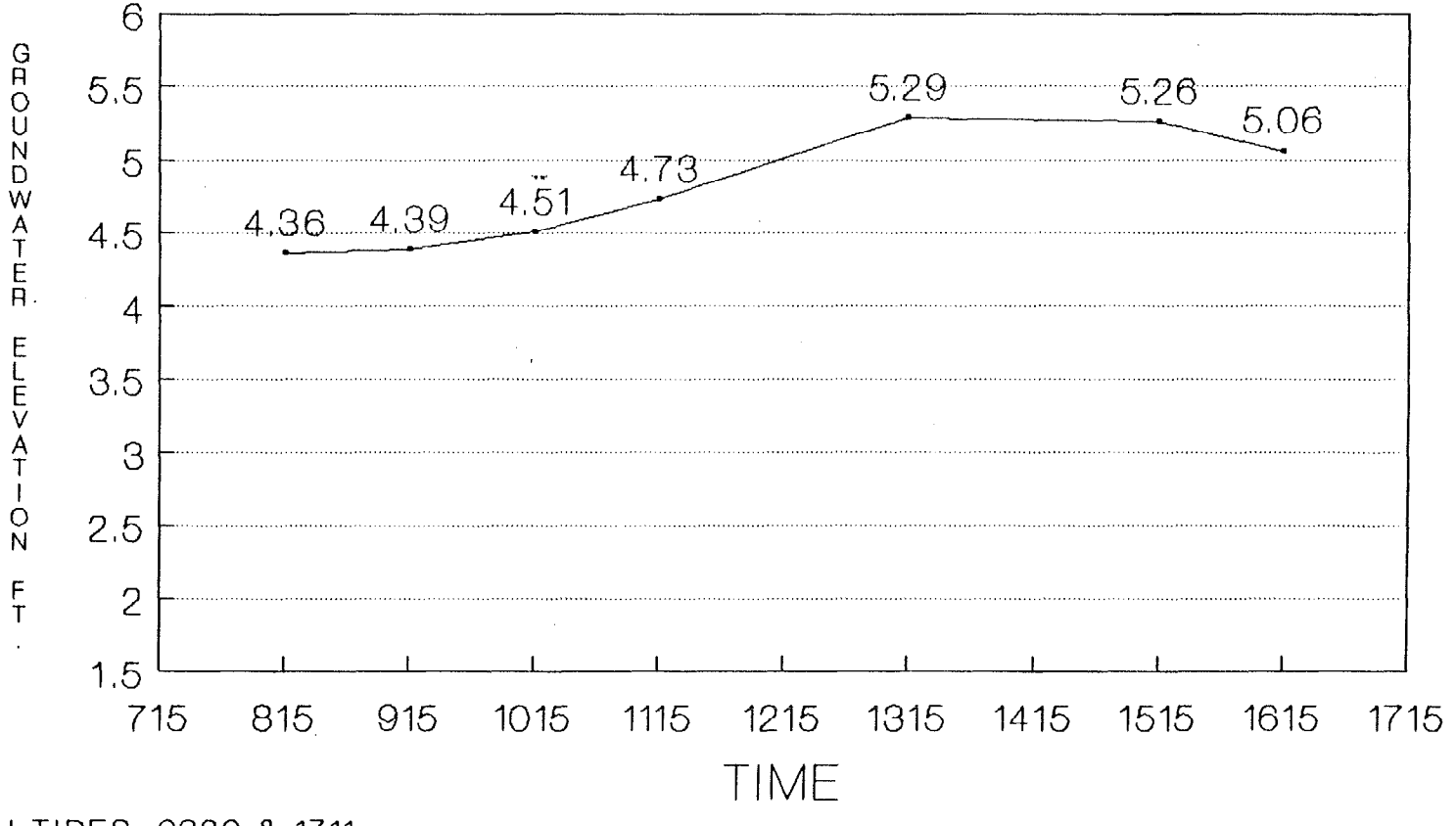


HIGH TIDES: 0320 & 1711
LOW TIDES: 1049 & 2123
TRUMAN ANNEX BERTHING WHARF

TIDAL INFLUENCE STUDY, BUILDING 189

TRUMAN ANNEX BERTHING WHARF-AUG 13, 1991

KYW-189-9



HIGH TIDES: 0320 & 1711
LOW TIDES: 1049 & 2123
TRUMAN ANNEX BERTHING WHARF