N00129.AR.001232
NSB NEW LONDON
5090.3a

MONTHLY OPERATIONS SUMMARY FOR THE NAVAL EXCHANGE (NEX) AND DOLPHIN MART AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEMS AND OT-8 PASSIVE FREE PRODUCT RECOVERY SYSTEM

NEW LONDON SUBMARINE BASE
GROTON, CONNECTICUT

Month: January 1997

Prepared By:

Fluor Daniel GTI, Inc.
Prepared by:

Barry Kline, P.E.
Lead Engineer

Foster Wheeler Environmental Corporation
Reviewed by:

Kirti Shah, P.E.
Environmental Site Technical Manager

grsubbas\wp\gr1.79

OPERATIONAL SUMMARY

DOLPHIN MART AIR SPARGE/SVE SYSTEM

System Status - The remediation system at the site has been operating since June 29, 1996. As of January 27, 1997 thirteen (13) horizontal trenches (VET-1, VET-2, VET-3, VET-4, VET-5, VET-6, VET-7, VET-8, VET-9, VET-10, VET-11, VET-12, and VET-17) and seven (7) air sparge points (ASP-A, ASP-B, ASP-C, ASP-D, ASP-E, ASP-F, and ASP-G were operating. VET-13 through VET-16 are not operating due to flooding of the lower section of the main trunk line. Air sparge points ASP-H through ASP-Q cannot be operated without VET-13 through VET-16 operating. The SVE system is currently extracting subsurface air at a flow rate of approximately 450 scfm. The air sparge system is currently injecting air at a flow rate of approximately 30 scfm. The Hersey air flow meters are currently inoperable, pending repair. A site map has been included as **Figure 1**. The site visit forms for O&M conducted during the month of January, 1997 are included in **Attachment 1**. A weekly break-down of the monthly field activities has been included as **Attachment 2**.

Mass Removal - The total hydrocarbon mass removal rate, based on the SVE system influent sample collected January 27, 1997, was 0.12 lbs/hour. During the period from December 17, 1996 to January 27, 1997 approximately 66 lbs of hydrocarbons were extracted by the remediation system. The total hydrocarbon mass extracted by the remediation system, as of January 27, 1997, was approximately 1,176 lbs. The system database has been included in **Attachment 3**. Mass removal graphs have been included as **Figures 3 and 4**. Based on the hydrocarbon mass removal rate, no exceedance of CTDEP air quality guidelines was observed.

Carbon Usage - A summary of the historical carbon usage at the site has been included as **Attachment 4**. The last carbon change at the site occurred August 27, 1996.

Discharge Monitoring Sampling - Discharge monitoring sampling was completed January 27, 1997. The Discharge Monitoring Report (DMR) will be generated pending receipt of the laboratory analytical data.

Monitoring Well Gauging - The site monitoring wells were gauged January 27, 1997. Depth to groundwater at the site ranged from 1.53 feet in WE-6 to 7.94 feet in WE-3. Historical well gauging data has been included in **Attachment 5**.

Monitoring Well Sampling - The next quarterly sampling event is scheduled for February, 1997. The historical groundwater sampling results have been summarized in **Attachment 6**.

Additional Activities - No out of scope activities were performed during January 1997.

NEX AIR SPARGE/SVE SYSTEM

System Status - The remediation system at the site has been operating since July 31, 1996. As of January 27, 1997, twenty-one (21) horizontal trenches (VEA-13, VEA-14, VEA-15, VEA-16, VEA-18, VEA-20, VEB-1, VEB-2, VEB-3, VEB-4, VEB-5, VEB-6, VEB-7, VEB-8, VEB-9, VEB-10, VEB-11, VEB-12, VEB-13, VEB-14, and VEB-15) were operating. The remainder of the vapor extraction points are not operating due to high groundwater table elevations limiting the well effectiveness. The air sparge system is not currently operating. The SVE system is currently extracting subsurface air at a flow rate of

approximately 322 scfm (253 scfm from the east system and 69 scfm from the west system). A site map has been included as **Figure 2**. The site visit forms for O&M conducted during the month of January, 1997 are included in **Attachment 1**. A weekly break-down of the monthly field activities has been included in **Attachment 2**.

Mass Removal - The total hydrocarbon mass removal rate, based on the SVE system influent sample collected January 27, 1997, was 0.04 lbs/hour. During the period from December 17, 1996 to January 27, 1997 approximately 50 lbs of hydrocarbons were extracted by the remediation system. The total hydrocarbon mass extracted by the remediation system, as of January 27, 1997, is approximately 829 lbs. The system database has been included in **Attachment 3**. Mass removal graphs have been included as **Figures 5 and 6**. Based on the hydrocarbon mass removal rate, no exceedance of CTDEP air quality guidelines was observed.

Discharge Monitoring Sampling - Discharge monitoring sampling was completed January 27, 1997. The Discharge Monitoring Report (DMR) will be generated pending receipt of the laboratory analytical data.

Carbon Usage - A summary of the historical carbon usage at the site has been included as **Attachment 4**. The carbon units at the site were taken off-line September 4, 1996.

Monitoring Well Gauging - The site monitoring wells were last gauged on December 16, 1996. Depth to groundwater at the site ranged from 3.10 feet in ERM-5 to 7.83 feet in ERM-12. Historical well gauging data has been included in **Attachment 5**.

Monitoring Well Sampling - The next quarterly sampling event is scheduled for February, 1997. The historical groundwater sampling results have been summarized in **Attachment 6**.

Additional Activities - Due to the reduction in the SVE system influent concentrations, start-up of the air sparge system is scheduled for February, 1997.

OT-8 PASSIVE FREE PRODUCT RECOVERY SYSTEM

System Status - The OT-8 passive free product recovery system was activated on September 28, 1996. During the month of December the system had remained deactivated due to a high groundwater table which prohibited system operation. The system was reactivated January 13, 1997. The system was deactivated on January 27, 1997 due to a high groundwater table.

Product Recovery - No light non-aqueous phase liquid (LNAPL) petroleum was recovered during the month of January, 1997. As of January 27, 1997 a total of approximately 4 gallons of LNAPL have been recovered by the system. The fluctuating groundwater table around MW-7 may lead to smearing of the LNAPL. It is anticipated that during periods of extended lower water table elevations, LNAPL may accumulate within the well and allow recovery to resume.

Monitoring Well Gauging - MW-7 was gauged on January 27, 1997. At that time the depth to LNAPL was 7.76 feet below grade and the depth to groundwater was 7.86 feet below grade. Historical gauging data for MW-7 is included in **Attachment 5**.

Additional Activities - No out of scope activities were performed during January 1997.

FIGURES

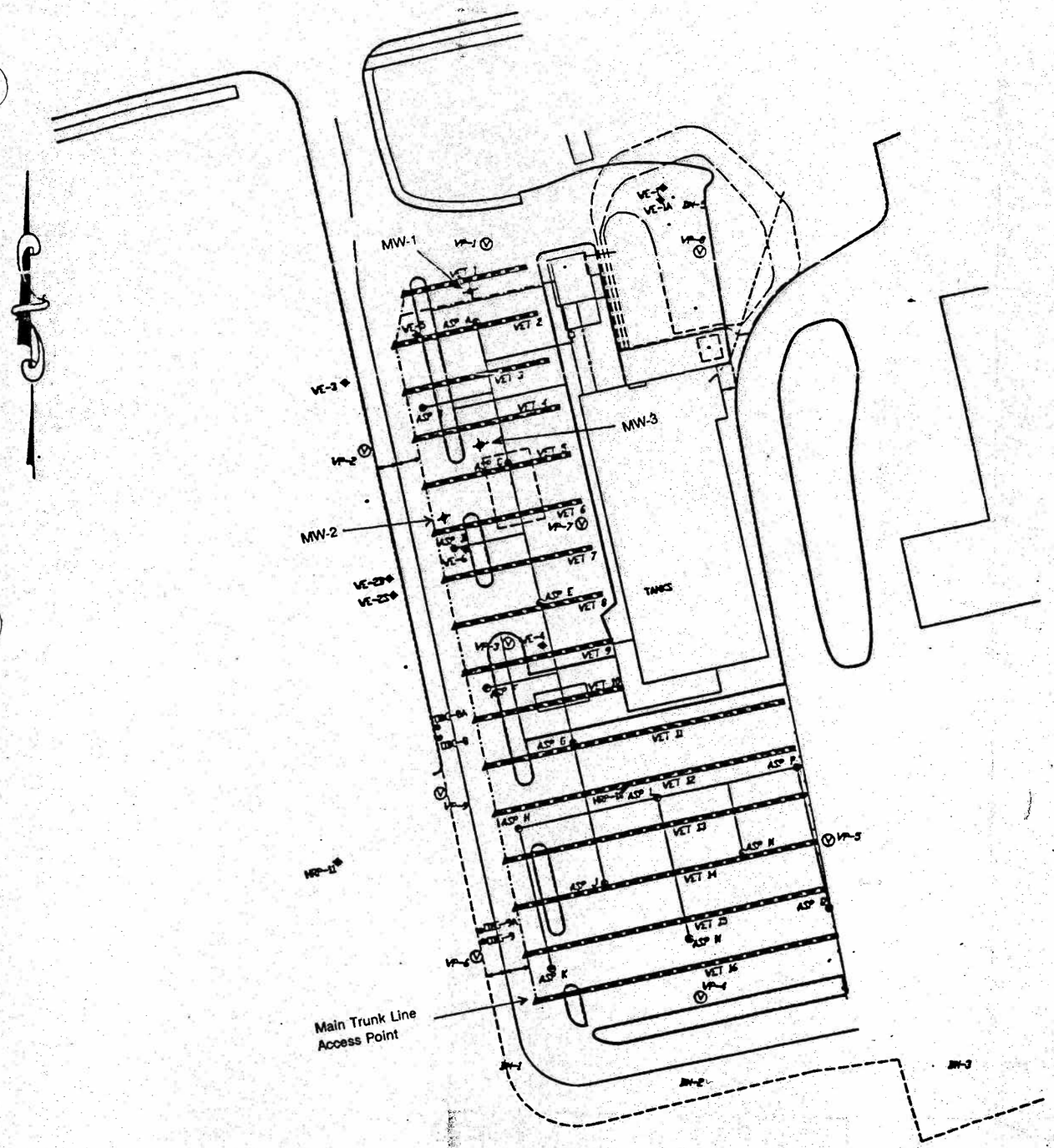


Figure 1

GRAPHIC SCALES

CHECK GRAPHIC SCALES BEFORE USING

20 0 20 40

SCALE IN FEET
1"=20'

NORTHERN DIVISION

NAVAL SUBMARINE BASE NEW LONDON, CONNECTICUT

REMEDIATION OF CONTAMINATED SOIL/GROUND WATER

SITE PLAN
SOUTHERN SHEET

F	80091	2166440	C2

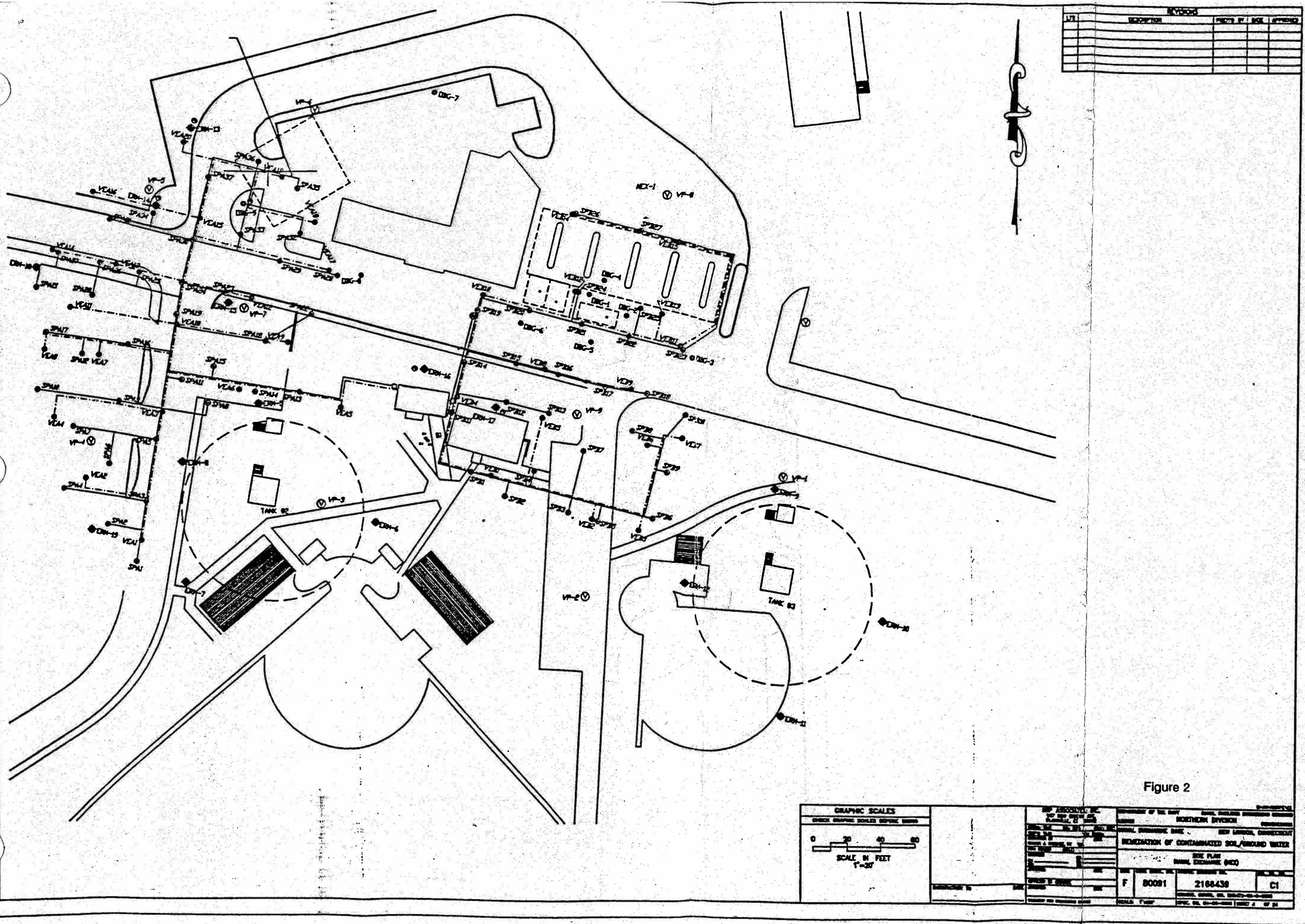
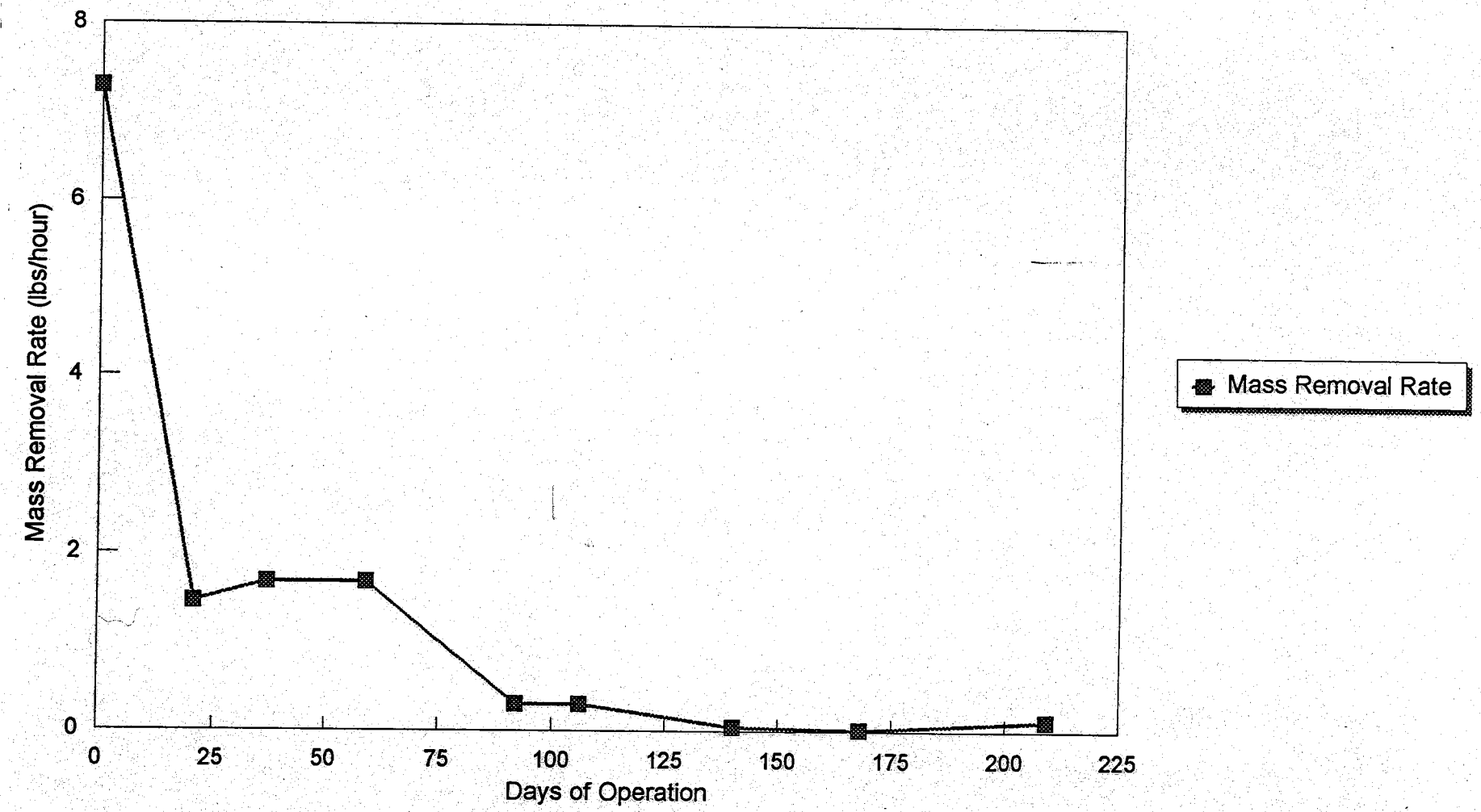

TANK 82
TANK 83
GRAPHIC SCALES
0 20 40 60
SCALE IN FEET
1"=20'
NORTHERN DIVISION
REMEDIATION OF CONTAMINATED SOIL/GROUND WATER
SITE PLAN
NAVAL EXCHANGE (NEX)
F
80091
2166439
C1

Figure 2

Figure 3 - Mass Removal Rate

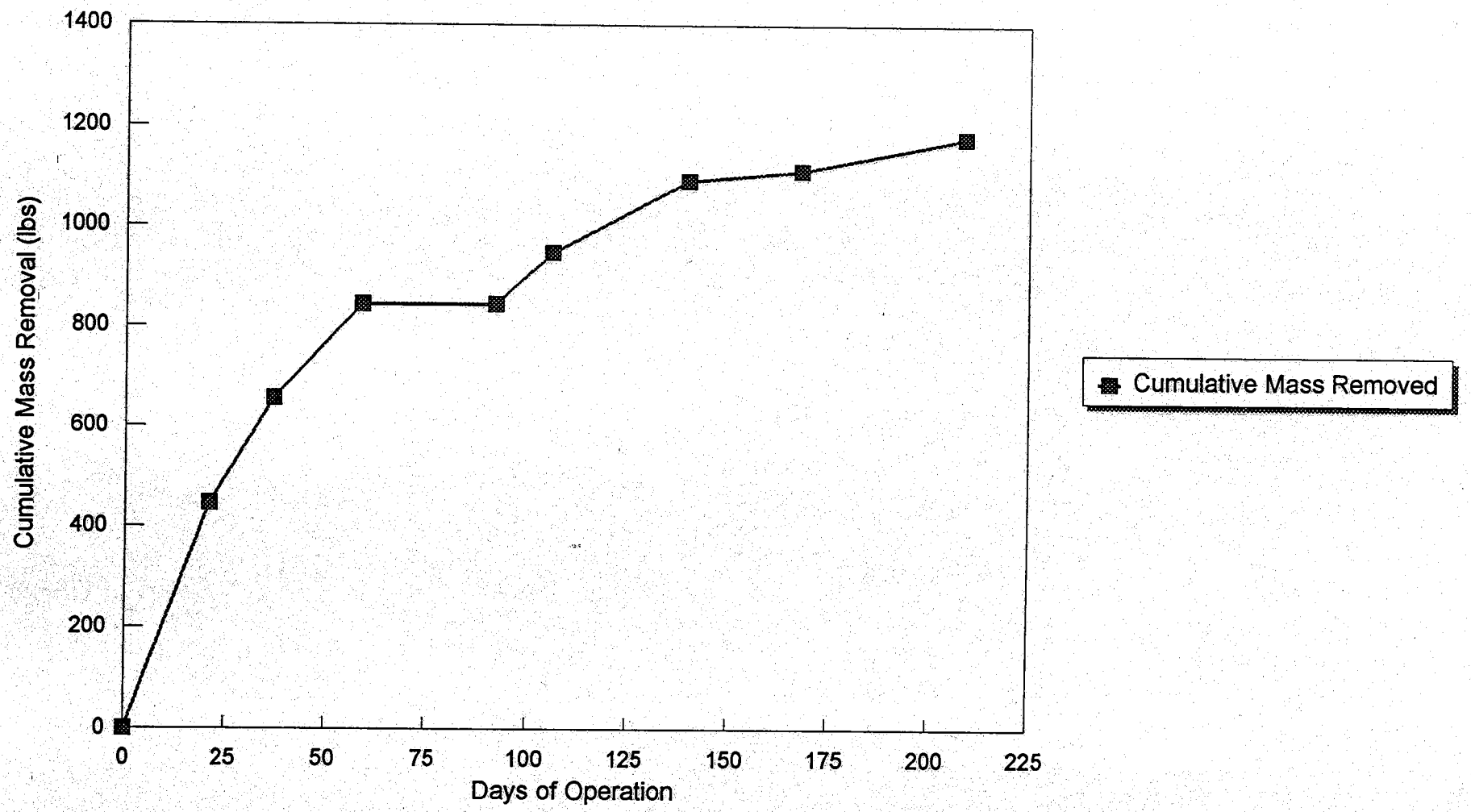
Dolphin Mart Site, New London Naval Submarine Base, Groton, CT



MASSREM.WK4

Figure 4 - Cumulative Mass Removed versus Time

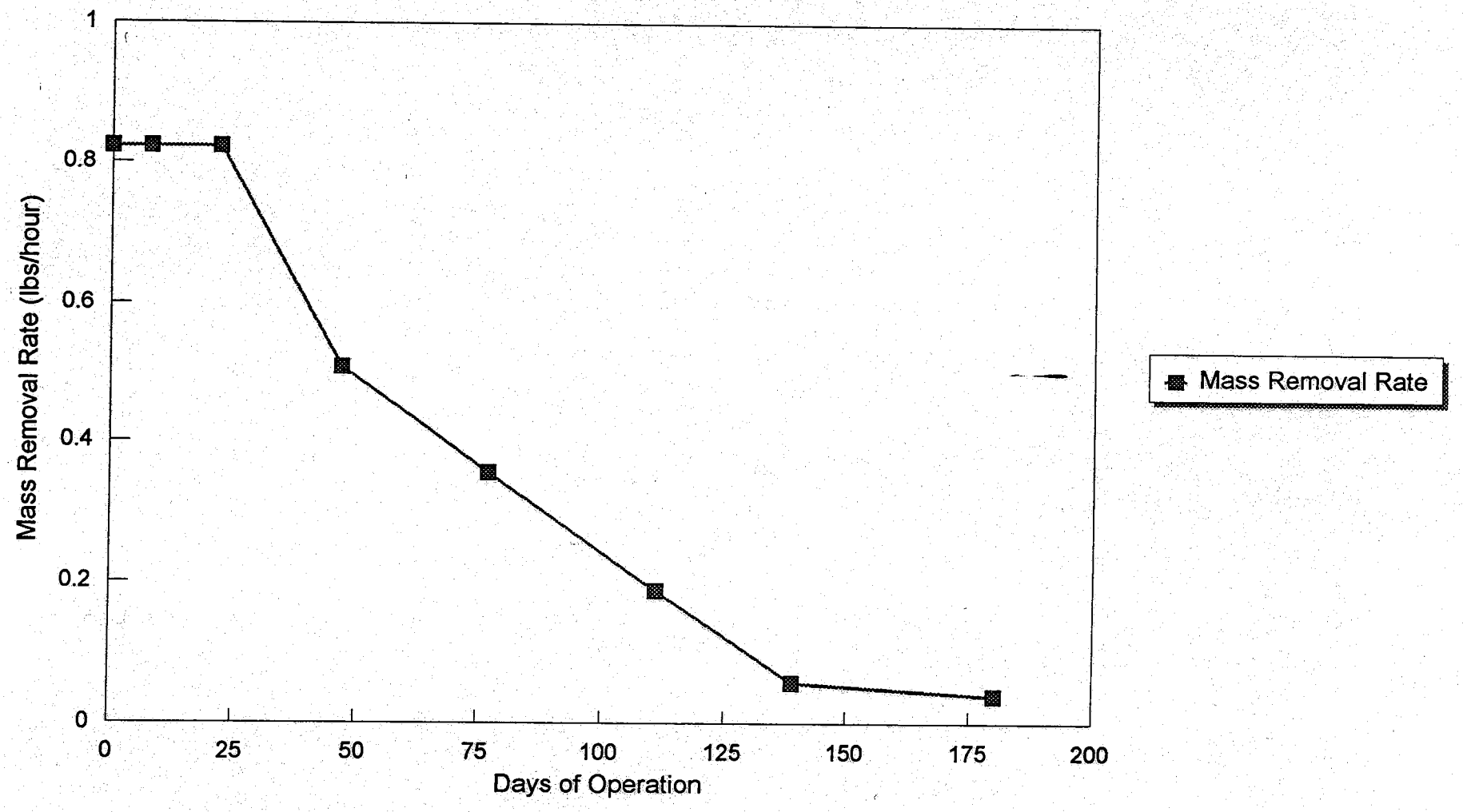
Dolphin Mart Site, New London Naval Submarine Base, Groton, CT



MASSREM.WK4

Figure 5 - Mass Removal Rate

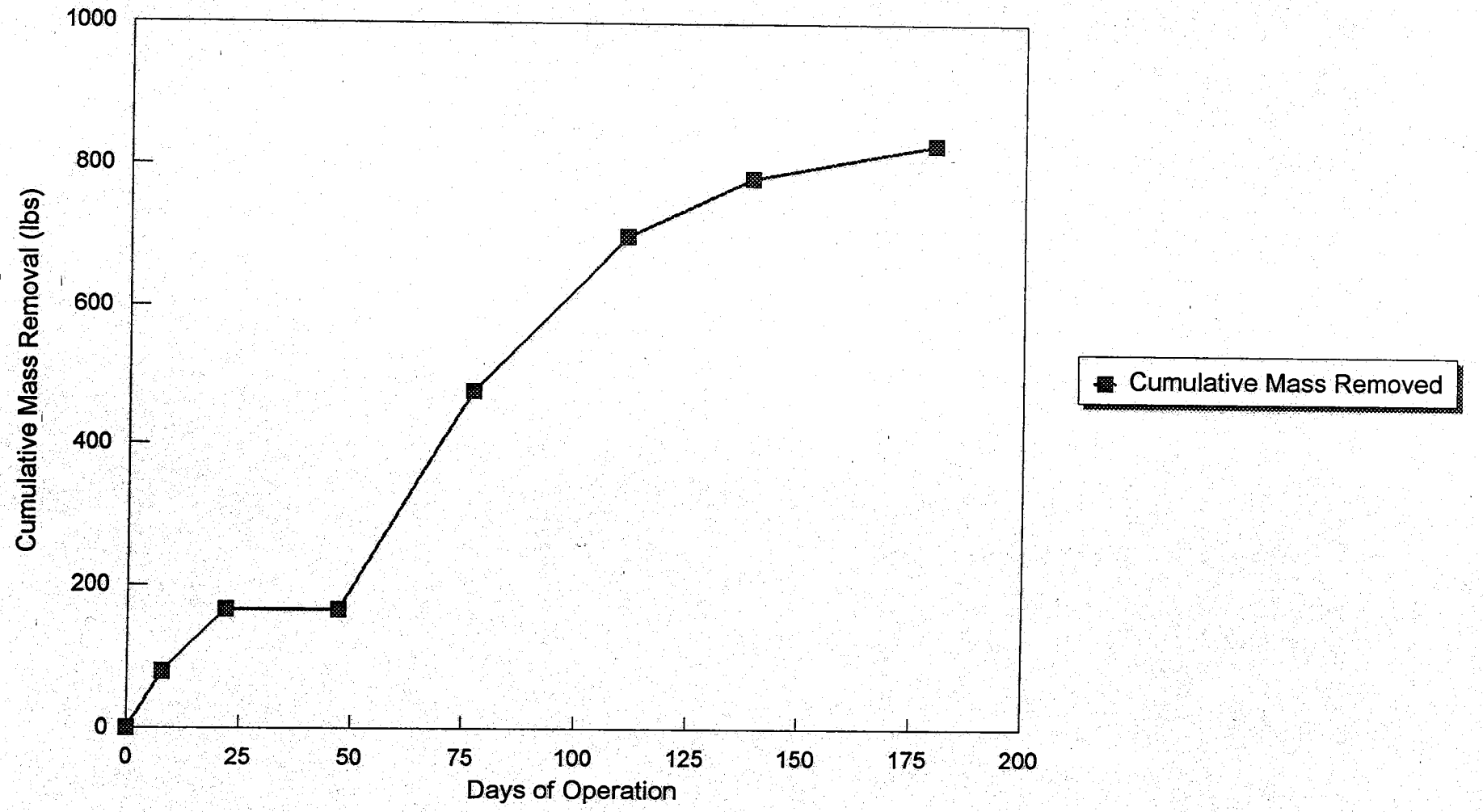
NEX Site, New London Naval Submarine Base, Groton, CT



MASSREM.WK4

Figure 6 - Cumulative Mass Removed versus Time

NEX Site, New London Naval Submarine Base, Groton, CT



MASSREM.WK4

ATTACHMENT 1

SITE VISIT FORMS

NAVAL SUBMARINE BASE
GROTON, CT.
87260014

Date Requested: 1-27-97
Project Number: 83001-9999
Site Arrival Time: 11:20
Total Hours on Site: 6.2 X 2

Staff Requested: WCD | JKJR.
Task Number:
Site Departure Time: 17:30 pm
Total Hours Billed: 20.1

1/28/97 - 4.3 J.K.JR. 1/27/97 - 7.9 X 2

Work Description:

☐ **Complete Weekly schedule.**
- HASP
- PPE
- FID
- Tedlar Bags
- Sorbent Pads

☐ **Complete Bi-Monthly schedule.**
- HASP
- PPE
- FID
- Tedlar Bags
- Velocity Meter
- Magnehelics
- IP
- DMR sampling equip.
- Sorbent Pads

☒ **Complete Monthly schedule.**
- HASP
- PPE
- FID
- Tedlar Bags
- Velocity Meter
- Magnehelics
- IP
- Grdwtr sampling equip.
- Sorbent Pads

PH METER

Additional task:

1. Open all doors in shed to ventilate area. ☒ Yes ☐ No
2. Calibrate air monitoring equipment. ☒ Yes ☐ No Equip # FID 3 Cal. To: _____ ppm
3. Conduct air monitoring within shed. ☐ Yes ☒ No NEX _____ ppm Dolphin _____ ppm

Task #'s: **Weekly tasks = 056**
Bi-Monthly = 045
Quarterly = 055
Unscheduled Maint. = 057
OT-8 = 140
~~MONTHLY = 150~~

* INCREASE SPARGE AT DOLPHIN MART, TO 5 CFM (240 fpm) AT POINTS: A, [redacted], E, + F. ADJUST ASP-B+G SO WATER DOESN'T BLOW OUT NEAR BY MONITORING WELLS.
* TAKE (2) FID'S AND A PID JUST IN CASE.
* PLEASE CALL WITH QUESTIONS.

240 FPM = 5 C.FM

(60 MEADOW ST. FEDEX)

In addition to the monitoring and maintenance, please complete the following forms:

☐ Operational Data Form (Dolphin Site)
☐ Operational Data Form (NEX Site)
☐ Daily Report to Inspector
☐ PH Form

Talked with Craig on 1/28/97 about DMR. Sampling for 1.0 hours, Sent samples out and met with Craig and Barry 1.5

Dolphin mart

GROUNDWATER TECHNOLOGY, INC.

PROJECT: Groton Naval Subbase
PROJECT #: 872600 14
DATE: 1/27/97

LOCATION: Groton, CT
OPERATOR: WCD / J.K. Jr.
EQUIPMENT #: ors 8

PROBE CORRECTION:
☐ CORR. ☒ UNCORR.

COMMENTS:

☐ WELL ___ NEEDS GRIPPER
☐ WELL ___ NEEDS ROADBOX
☐ WELL ___ NEEDS REPAIR

WELL MONITORING FORM

WELL ID	WELL DEPTH	PID ~~TOC ELEV.~~	DEPTH TO WATER	DEPTH TO PETROLEUM	PETROLEUM THICKNESS	H2O ~~PETROLEUM GRAVITY~~	HYDRO. EQUIV.	CORRECTED DTW	CORRECTED WATER TABLE ELEV
VP1		0	.	.		2.	VAC		
VP2		0	.	.		.26	VAC		
VP9		0	.	.		0			
VP4		50.	.	.		Pressure			
VP3		0	.	.		0			
VP7		0	.	.		1.	VAC.		
			.	.					
			.	.					
			.	.					
			.	.					
			.	.					
MW1			2.98 ✓	.					
WE5			3.26 ✓	.					
WE3			7.94 ✓	.					
WE2S			6.24 ✓	.					
WE2D			5.73 ✓	.					
BM1			✓1.91	.					
BM3			✓1.89	.					
HRP10			✓3.29	.					
WE4			✓3.08	.					
WE6			1.53	.					
MW2			2.13	.					
D[illegible]5			✓4.26	.					
~~WE1~~			.	.					
WE1A			.	.					

OPERATIONAL DATA FORM
Air Sparging/Soil Vapor Extraction System
DOLPHIN SITE
Naval Submarine Base
Groton, CT.

Date: 1-27-97
Time: 11:40
Technician: [illegible]

SOIL VAPOR EXTRACTION TRENCHES
820. scfm total
SET VET-7 through VET-10 +VET-17 AT: 1787. ft/m.
VET-11 through VET-16 AT: 3575. ft/m

LOCATION	FLOW (FT/M)	VALVE SETTING	VACUUM ("H2O)	COMMENTS
VET-1	6000 +	50 %	4" Hg	
VET-2	6000+	50 %	5.2	
VET-3	6000 +	100	9.2	
VET-4	6000	50	6.5	
VET-5	6000	100	13	
VET-6	6000	100	12	
VET-7	6000	100	10.5	
VET-8	6000	50	4.8	
VET-9	5800	50	4.6	
VET-10	6000	100	2.8	
VET-11	600	100	.4	water in Line
VET-12	- 0	100	.4	visually see Line 1/2 Full with water
VET-13	—	—	—	Closed
VET-14	—	—	—	closed
VET-15	—	—	—	closed
VET-16	—	—	—	closed
VET-17	6000	100	12	

OPERATIONAL DATA FORM
Air Sparging/Soil Vapor Extraction System
DOLPHIN SITE
Naval Submarine Base
Groton, CT.

Date: 2-27-97
Time:
Technician: JKSE

AIR SPARGE WELLS
75. scfm total
916. ft/m at each point

LOCATION	FLOW (FT/M)	VALVE SETTING	VACUUM ("H2O)	COMMENTS
ASP-A	6000	100	9.5	
ASP-B	250-400	50	7.5	
ASP-C	6000	50	7	
ASP-D	6000	25	5.5	
ASP-E	- 0	50	4.5	
ASP-F	- 0	25	5.5	
ASP-G	6000	50	7.5	
ASP-H	—	—	—	closed
ASP-J	—	—	—	" "
ASP-K	—	—	—	" "
ASP-L	—	—	—	" "
ASP-M	—	—	—	" "
ASP-N	—	—	—	" "
ASP-P	—	—	—	" "
ASP-Q	—	—	—	" "

OPERATIONAL DATA FORM
Air Sparging/Soil Vapor Extraction System
Dolphin Mart
Naval Submarine Base -Groton, CT
Project #83001-9999

Date: 1-27-97
Time: 15:00
Technician: L. C.O / T. KSR

AIR COMPRESSOR SYSTEM

Flow Rate	SCFM	Total Flow	SCFM
Air Compressor C-1		**Air Compressor C-2**	
Pressure	8.5 psi	Pressure	psi
Temperature	173 °F	Temperature	°F
Flow Control Valve Setting	100	Flow Control Valve Setting	
Bleed Valve	50	Bleed Valve	
Radiator	ON / OFF	Radiator	ON / OFF

SOIL VAPOR EXTRACTION SYSTEM

Flow Rate	SCFM	Total Flow	SCFM
Vacuum Pump V-1		**Vacuum Pump V-2**	
Vacuum	0 "Hg	Vacuum	1.5 "Hg
Temperature	120 °F	Temperature	115 °F
Particulate Filter	O/K	Particulate Filter	OK
Flow Control Valve Setting	100	Flow Control Valve Setting	100
Bleed Air Valve Setting	50 %	Bleed Air Valve Setting	50-100
Liquid Level		Liquid Level	
Vacuum Pump V-3		**Vacuum Pump V-4**	
Vacuum	"Hg	Vacuum	"Hg
Temperature	°F	Temperature	°F
Particulate Filter		Particulate Filter	
Flow Control Valve Setting		Flow Control Valve Setting	
Bleed Air Valve Setting		Bleed Air Valve Setting	
Liquid Level		Liquid Level	

ACTIVATED CARBON ADSORPTION SYSTEM

Carbon Adsorber A/B		Carbon Adsorber C/D	
Inf. VOC Level	ppm	Inf. VOC Level	12 ppm (FID)
Inf Pressure	psi	Inf Pressure	psi
Mid. VOC Level	ppm	Mid. VOC Level	9 ppm
Mid Pressure	psi	Mid Pressure	10 psi
Eff. VOC Level	ppm	Eff. VOC Level	X ppm
Change out Date		Change out Date	8/22/96

WATER TREATMENT

Flowmeter Reading _____ Gallons

COMMENTS

Flow meter before taking samples
2163.8
Gauge on V-1 is possibl broken
Flow meter Reading upon departure 2285.7

OPERATIONAL DATA FORM
Air Sparging/Soil Vapor Extraction System
Naval Exchange
Naval Submarine Base -Groton, CT
Project #83001-9999

Date: 1-27-97
Time: 17:10
Technician: WCD! J & SR.

AIR COMPRESSOR SYSTEM

Flow Rate	SCFM	Total Flow	SCFM

Air Compressor C-1		Air Compressor C-2	
Pressure	psi	Pressure	psi
Temperature	°F	Temperature	°F
Flow Control Valve Setting		Flow Control Valve Setting	
Bleed Valve		Bleed Valve	
Radiator	ON / OFF	Radiator	ON / OFF

SOIL VAPOR EXTRACTION SYSTEM

Eastern Flow Rate	252-253 SCFM	Total Flow	3278 6515 SCFM
Western Flow Rate	69-70 SCFM	Total Flow	1143 1108 SCFM

Vacuum Pump V-1		Vacuum Pump V-2	
Vacuum	0 °Hg	Vacuum	0 °Hg
Temperature	104 °F	Temperature	120 °F
Particulate Filter	OK	Particulate Filter	OK
Flow Control Valve Setting	100 %	Flow Control Valve Setting	100 %
Bleed Air Valve Setting	50 %	Bleed Air Valve Setting	50 %
Liquid Level		Liquid Level	

Vacuum Pump V-3		Vacuum Pump V-4	
Vacuum	°Hg	Vacuum	°Hg
Temperature	°F	Temperature	°F
Particulate Filter		Particulate Filter	
Flow Control Valve Setting		Flow Control Valve Setting	
Bleed Air Valve Setting		Bleed Air Valve Setting	
Liquid Level		Liquid Level	

ACTIVATED CARBON ADSORPTION SYSTEM

Carbon Adsorber A/B		Carbon Adsorber C/D	
Inf. VOC Level	ppm	Inf. VOC Level	15 ppm FID
Inf Pressure	psi	Inf Pressure	35 psi
Mid. VOC Level	ppm	Mid. VOC Level	— ppm
Mid Pressure	psi	Mid Pressure	— psi
Eff. VOC Level	ppm	Eff. VOC Level	15 ppm
Change out Date		Change out Date	8-22-96

WATER TREATMENT

Flowmeter Reading _____ Gallons

COMMENTS

1187.8

MITKEM CORPORATION
5 Metro Center Boulevard ● Warwick, Rhode Island 02886-1755
(401) 732-3400 ● Fax (401) 732-3499
1232 East Broadway Road, Suite 210 ● Tempe, Arizona 85282
(602 303-9535 ● Fax (602) 921-2883

CHAIN-OF-CUSTODY RECORD

REPORT TO		INVOICE TO		LAB REFERENCE #:
COMPANY Flor Daniel GTI	PHONE 860-688-1151	COMPANY Foster wheeler	PHONE 215-702-4079	
NAME Barry Kline	FAX 860-688-8031	NAME Kirti Shah	FAX 215-702-4047	
ADDRESS 431 F. Hayden Station Rd.		ADDRESS one oxford valley, Suite 200		TURNAROUND TIME: Standard
CITY/ST/ZIP Windsor, CT 06095		CITY/ST/ZIP Langhorne, PA		

CLIENT PROJECT NAME: Groton Naval Sub base Dolphin Maint Area Sites
CLIENT PROJECT #: 8300-4999
CLIENT P.O.#:

REQUESTED ANALYSES: EPA TO 8 BTEX/MTBE Misc. Aromatics & Aliphatics

SAMPLE IDENTIFICATION	DATE/TIME SAMPLED	COMPOSITE	GRAB	WATER	SOIL	OTHER	LAB ID	# OF CONTAINERS	EPA TO 8 BTEX/MTBE Misc. Aromatics & Aliphatics	COMMENTS
DM-MW-INF	1/27/7 15:20		1			X		1	1	
DM-MW-EFF	1/27/7 15:20		1			X		1	1	X Air Samples
MEX-MW-EFF	1/27/7 17:00		1			X		1	1	

TSF#	RELINQUISHED BY	DATE/TIME	ACCEPTED BY	DATE/TIME
1st	[illegible]	1/27/7 19:30		
2nd				
3rd				

ADDITIONAL REMARKS:

COOLER TEMP:

WHITE: LABORATORY COPY YELLOW: REPORT COPY PINK: CLIENT'S COPY

NAVAL SUBMARINE BASE GROTON, CT. (NEX SITE)

Monitoring:		
Component:	**Frequency:**	**Record Data for/By:**
Carbon Adsorbors: A/B (Inf. / Eff.) C/D (Inf. / Eff.)	Monthly	Air Sample for: EPA T03 BTEX,MTBE Misc.aromatics/aliphatics
Water Sump:	Prior to discharging	Flowmeter reading EPA 624+MTBE+xylenes (2-40ml.Voa/HCL) TPH EPA 418.1 (1-1 lt./H2S04) Total Lead EPA 239.2 (1-500ml./HN03) PH (Field test) ~~Aquatic Toxicity (Minnows+Water Fleas)~~
Monitoring Wells: ERM-5 - ERM-19	Quarterly	EPA 8010 (3-40ml./HCL) EPA 8020 +MTBE (" ") TPH 418.1 (2-1lt.) TPH as gasoline,CG/FID hydrocarbon screen (" ") TPH as Diesel,GC/FID hydrocarbon screen (" ")

EFF

OPERATIONAL DATA FORM OT-9 MW-7 PRODUCT RECOVERY SYSTEM Naval Submarine Base, Groton, Ct Project # 67260014 Task #140	Date: 1/25/07 Time: 11:30 AM Technician: J.K.Sp.

Check compressor, pressure should be 80 psi.
Check air dryer panel, pressure should be 60 psi.
Drain moisture trap on panel dryer.
Gauge recovery tank: Total depth:_____
DTW:_____
DTP:_____

Additional comments:
Shut OT9 System down due to high water Table. The water was above the well cover in the ground.

Groton Naval sub base

83001-9999

1/27/97

Dolphin Mart

Arrived on site, checked on system, found V-2 blower was down on arrival. Shut system down and drained the water out of the system. Restarted system and began to check Vet points and Asp points. The road boxes had water in them, and an inch to two inches of ice in them.

On Vet 11 and Vet 12 you could visually see water in the lines. We also had to restart V-2 a couple of times, due to the fact that it was drawing water into the system and was shuting down. There was a car parked over well Dm 4, so we could not get to it today. VP-5 had a van parked over it, and we could not get that one also. Called and spoke to Craig Goulet about the DMR Samples. We found out that there were 2 extra 250 mL bottles sent, that we did not need. The temperature was 43 °F, and the ph was (EFF. READING) 6.25. We took all the DMR samples and also took an influent and Effluent air samples. Secured shed and departed site.

Arrived at Nex and found V-2 blower down. Shut system down and drained water out of the system. Restarted the system and completed the system check. Then took an effluent air sample. Could not take DMR Samples due to the fact that the effluent line from the liquid carbon unit to the flow meter. Secured the shed and departed site.

John Kazen, Jr.

MITKEM Corporation
...tro Center Boulevard • Warwick, Rhode Island 02886-1755
(401) 732-3400 • Fax (401) 732-3499
1232 East Broadway Road, Suite 210 • Tempe, Arizona 85282
(602 303-9535 • Fax (602) 921-2883

CHAIN-OF-CUSTODY RECORD

REPORT TO		INVOICE TO	
COMPANY FLUOR DANIEL GTI	PHONE 860-6881151	COMPANY FOSTER WHEELER	PHONE 215-7024032
NAME BARRY KLINE	FAX 860-6888239	NAME KIRTI SHAH	FAX 215-7024045
ADDRESS 431-F HAYDEN STATION RD.		ADDRESS ONE OXFORD VALLEY, SUITE 200	
CITY/ST/ZIP WINDSOR, CT. 06095		CITY/ST/ZIP LANGHORNE, PA. 19047	

LAB REFERENCE #:

TURNAROUND TIME: Standard

CLIENT PROJECT NAME: NAVAL SUB BASE, GROTON, CT. 87260014.50

CLIENT PROJECT #:

CLIENT P.O.#:

REQUESTED ANALYSES

SAMPLE IDENTIFICATION	DATE/TIME SAMPLED	COMPOSITE	GRAB	WATER	SOIL	OTHER	LAB ID	# OF CONTAINERS	EPA 624+MTBE+XYLENES	EPA 418.1	EPA 239.2 TOTAL LEAD	COMMENTS
NEX -MON-EFF	1/28/97 11:00		X	X				2	2			
NEX -MON-EFF	1/28/97 11:00		X	X				1		1		
NEX -MON-EFF	1/28/97 11:00		X	X				1			1	
	/											
	/											
	/											
	/											
	/											
	/											
	/											
	/											
	/											

TSF#	RELINQUISHED BY	DATE/TIME	ACCEPTED BY	DATE/TIME
1st	[illegible]	1/28/97 15:40		/
2nd		/		/
3rd		/		/

ADDITIONAL REMARKS:

COOLER TEMP:

MITKEM Corporation
etro Center Boulevard • Warwick, Rhode Island 02886-1755
(401) 732-3400 • Fax (401) 732-3499
1232 East Broadway Road, Suite 210 • Tempe, Arizona 85282
(602 303-9535 • Fax (602) 921-2883

CHAIN-OF-CUSTODY RECORD

REPORT TO:

COMPANY: FLUOR DANIEL GTI
PHONE: 860-6881151
NAME: BARRY KLINE
FAX: 860-6888239
ADDRESS: 431-F HAYDEN STATION RD.
CITY/ST/ZIP: WINDSOR, CT. 06095

INVOICE TO:

COMPANY: FOSTER WHEELER
PHONE: 215-7024032
NAME: KIRTI SHAH
FAX: 215-7024045
ADDRESS: ONE OXFORD VALLEY, SUITE 200
CITY/ST/ZIP: LANGHORNE, PA. 19047

LAB REFERENCE #:

TURNAROUND TIME:

CLIENT PROJECT NAME: NAVAL SUB BASE, GROTON, CT. 8/260014.50

CLIENT PROJECT #:

CLIENT P.O.#:

REQUESTED ANALYSES

SAMPLE IDENTIFICATION	DATE/TIME SAMPLED	COMPOSITE	GRAB	WATER	SOIL	OTHER	LAB ID	# OF CONTAINERS	EPA 160.2TSS	CHROMIUM +6	EPA 340.2FLUORIDE	EPA 624+MTBE+XYLENES	TPH 418.1	TOTAL LEAD 239.2	EPA 335.1	EPA 8020	EPA 6010 TOTAL METALS				COMMENTS
DM-MON-INF	1/27/97 15:20		X	X				1		1											
DM-MON-EFF	1/28/97 12:00		X	X				1		1											
DM-MON-EFF	1/27/97 15:00		X	X				2			2										
DM-MON-INF	1/27/97 15:00		X	X				1				1									
DM-MON-EFF	1/27/97 15:00		X	X				1				1									
DM-MON-EFF	1/27/97 15:00		X	X				1					1								
DM-MON-INF	1/27/97 15:20		X	X				1						1							
DM-MON-EFF	1/27/97 15:20		X	X				1						1							
DM-MON-INF	1/27/97 15:20		X	X				2							2						
DM-MON-EFF	1/27/97 15:20		X	X				2							2						
DM-MON-INF	1/27/97 15:20		X	X				1								1					
DM-MON-EFF	1/27/97 15:20		X	X				1								1					

TSF#	RELINQUISHED BY	DATE/TIME	ACCEPTED BY	DATE/TIME
1st	John Kenyon Jr.	1/28/97 15:40		/
2nd		/		/
3rd		/		/

ADDITIONAL REMARKS:

COOLER TEMP:

NAVAL SUBMARINE BASE
GROTON, CT.
87260014

Date Requested: 1-13-97
Project Number: 83001-9999
Site Arrival Time: 9:50 AM
Total Hours on Site: 6.0 X 2

Staff Requested: JKJR, JMB
Task Number:
Site Departure Time: 15:50
Total Hours Billed: 19.00

J.K. JR - 9.5 hrs. J.B. - 9.5 hours.

Work Description:

☐ **Complete Weekly schedule.**
- HASP
- PPE
- FID
- Tedlar Bags
- Sorbent Pads

☒ **Complete Bi-Monthly schedule.**
- HASP
- PPE
- FID
- Tedlar Bags
- Velocity Meter
- Magnehelics
- IP
- ~~DMR sampling equip.~~
- Sorbent Pads

☐ **Complete Monthly schedule.**
- HASP
- PPE
- FID
- Tedlar Bags
- Velocity Meter
- Magnehelics
- IP
- Grdwtr sampling equip.
- Sorbent Pads

Additional task:

1. Open all doors in shed to ventilate area. ☒ Yes ☐ No
2. Calibrate air monitoring equipment. ☒ Yes ☐ No Equip # microTip #3 Cal. To: 100 ppm
3. Conduct air monitoring within shed. ☒ Yes ☐ No NEX 0 ppm Dolphin 0 ppm

Task #'s: **Weekly tasks = 056**
Bi-Monthly = 045
Quarterly = 055
Unscheduled Maint. = 057
OT-8 = 140

In addition to the monitoring and maintenance, please complete the following forms:

☐ Operational Data Form (Dolphin Site)
☐ Operational Data Form (NEX Site)
☐ Daily Report to Inspector
☐ PH Form

TAILGATE MEETING FORM

Pr[illegible] Name: 87260014

Date: 1-13-97

Project Number: 83001-9999

Presented by: J.K. JR. / J.B

Check the Topics/Information Reviewed:

- [x] safety glasses, hard hat, safety boots
- [x] site safety plan review and location
- [ ] equipment and machinery familiarization
- [x] employee Right-To-Know/MSDS location
- [ ] open pits, excavations, and site hazards
- [ ] vehicle safety and driving/road conditions
- [ ] portable tool safety and awareness
- [ ] overhead utility locations and clearance
- [x] first aid, safety, and PPE location
- [ ] sharp object, rebar, and scrap metal hazards
- [x] safety is everyone's responsibility
- [x] latex gloves inner/nitrile gloves outer
- [ ] excavation/trenching inspections/documentation
- [ ] full face respirators with proper cartridges
- [x] upgrade to level c at: FID/PID (10 eV) >25 ppm
- [x] work stoppage at: FID/PID(__ eV) >250 ppm, % LEL > 10%

- [x] slips, trips, and falls
- [x] directions to hospital
- [x] anticipated visitors
- [ ] electrical ground fault
- [ ] public safety and fences
- [ ] excavator swing and loading
- [ ] orderly site and housekeeping
- [ ] smoking in designated areas
- [ ] leather gloves for protection
- [ ] effects of the night before
- [ ] vibration related injuries
- [x] fire extinguisher locations
- [x] eye wash station locations
- [x] decontamination procedures

- [x] daily work scope
- [ ] emergency protocol
- [ ] parking and laydown
- [ ] hot work permits
- [x] strains and sprains
- [x] noise hazards
- [x] no horseplay
- [x] heat and cold stress
- [x] backing up hazards
- [x] accidents are costly
- [ ] dust and vapor control
- [ ] refueling procedures
- [ ] confined space entry
- [ ] flying debris hazards

Discussion/Comments/Follow-up Actions:

NAME	SIGNATURE	COMPANY
John Kowzon, Jr.	John Kowzon Jr.	FDGTI
John Bartlett	John M Bartlett	FDGTI

In[illegible]ns:

- Conduct a daily safety meeting prior to beginning each day's site activities.
- Complete form by checking off specific topics and/or hazards.
- Obtain signatures from all GTI staff and GTI subcontractors.
- Follow-up on any noted items and document resolution of any action items.

FLUOR DANIEL GTI
Kennedy Business Park II
431 (F) Hayden Station Road
Windsor, CT 06095 USA

OPERATIONAL DATA FORM
Air Sparging/Soil Vapor Extraction System
Dolphin Mart
Naval Submarine Base -Groton, CT
Project #83001-9999

Date: 1/13/97
Time: 13:50 PM
Technician: J.K. JR. / J.B

AIR COMPRESSOR SYSTEM

Flow Rate	SCFM	Total Flow	SCFM
Air Compressor C-1		**Air Compressor C-2**	
Pressure	8.5 psi	Pressure	psi
Temperature	188 °F	Temperature	°F
Flow Control Valve Setting	100%	Flow Control Valve Setting	
Bleed Valve	30	Bleed Valve	
Radiator	(ON) OFF	Radiator	ON / OFF

SOIL VAPOR EXTRACTION SYSTEM

Flow Rate	SCFM	Total Flow	SCFM
Vacuum Pump V-1		**Vacuum Pump V-2**	
Vacuum	1.5 "Hg	Vacuum	1.5 "Hg
Temperature	134 °F	Temperature	124 °F
Particulate Filter	OK	Particulate Filter	OK
Flow Control Valve Setting	100	Flow Control Valve Setting	100
Bleed Air Valve Setting	50	Bleed Air Valve Setting	
Liquid Level		Liquid Level	
Vacuum Pump V-3		**Vacuum Pump V-4**	
Vacuum	"Hg	Vacuum	"Hg
Temperature	°F	Temperature	°F
Particulate Filter		Particulate Filter	
Flow Control Valve Setting		Flow Control Valve Setting	
Bleed Air Valve Setting		Bleed Air Valve Setting	
Liquid Level		Liquid Level	

ACTIVATED CARBON ADSORPTION SYSTEM

Carbon Adsorber A/B		**Carbon Adsorber C/D**	
Inf. VOC Level	ppm	Inf. VOC Level	5.0 ppm
Inf Pressure	psi	Inf Pressure	60 psi
Mid. VOC Level	ppm	Mid. VOC Level	2.5 ppm
Mid Pressure	psi	Mid Pressure	10 psi
Eff. VOC Level	ppm	Eff. VOC Level	3.0 ppm
Change out Date		Change out Date	8-22-96

WATER TREATMENT

Flowmeter Reading 2137.3 Gallons

COMMENTS

213113

OPERATIONAL DATA FORM
Air Sparging/Soil Vapor Extraction System
DOLPHIN SITE
Naval Submarine Base
Groton, CT.

Date: 1/23/97
Time: 10:00 AM
Technician: J.K. M.J.B

SOIL VAPOR EXTRACTION TRENCHES
820. scfm total
SET VET-7 through VET-10 +VET-17 AT: 1787. ft/m.
VET-11 through VET-16 AT: 3575. ft/m

LOCATION	FLOW (FT/M)	VALVE SETTING	VACUUM ("H2O)	COMMENTS
VET-1	6000	50	8	1/8" Ice in Roadbox
VET-2	6000	50	6	
VET-3	6000	100	18	
VET-4	6000	50	6	1" Ice in roadbox
VET-5	6000	100	18	
VET-6	6000	100	22	
VET-7	6000	100	16	1" Ice in Roadbox
VET-8	6000	50	8	1" Ice in Roadbox
VET-9	6000	50	8	
VET-10	6000	100	8	
VET-11	6000	100	10	
VET-12	6000	100	8	1" Ice in Roadbox
VET-13	—	—	—	closed
VET-14	—	—	—	closed
VET-15	—	—	—	closed
VET-16	—	—	—	closed
VET-17	6000	100	20	

OPERATIONAL DATA FORM
Air Sparging/Soil Vapor Extraction System
DOLPHIN SITE
Naval Submarine Base
Groton, CT.

Date: 11/3/97
Time: 11:30 Am
Technician: J.K. JR. LT.B.

AIR SPARGE WELLS
75. scfm total
916. ft/m at each point

LOCATION	FLOW (FT/M)	VALVE SETTING	VACUUM ("H2O)	COMMENTS
ASP-A	6000	100	9	1" ICE in ROADBOX
ASP-B	<0	50	6	1" Ice in Road box
ASP-C	6000	50	7	1" ICE IN ROADBOX
ASP-D	6000	25	4.5	
ASP-E	6000	50	4.0	
ASP-F	6000	50	5	
ASP-G	6000	50	6.5	
ASP-H	—	—	—	closed
ASP-J	—	—	—	closed
ASP-K	—	—	—	closed
ASP-L	—	—	—	closed
ASP-M	—	—	—	closed
ASP-N	—	—	—	closed
ASP-P	—	—	—	closed
ASP-Q	—	—	—	closed

OPERATIONAL DATA FORM
Air Sparging/Soil Vapor Extraction System
Naval Exchange
Naval Submarine Base -Groton, CT
Project #83001-9999

Date: 1/13/97
Time: 14:20
Technician: J.K.JR. / J.B.

AIR COMPRESSOR SYSTEM

Flow Rate	SCFM	Total Flow	SCFM
Air Compressor C-1		**Air Compressor C-2**	
Pressure	psi	Pressure	psi
Temperature	°F	Temperature	°F
Flow Control Valve Setting		Flow Control Valve Setting	
Bleed Valve		Bleed Valve	
Radiator	ON / OFF	Radiator	ON / OFF

SOIL VAPOR EXTRACTION SYSTEM

Eastern Flow Rate 21/43925	SCFM	Total Flow 240	SCFM
Western Flow Rate 1121/875	SCFM	Total Flow 82	SCFM
Vacuum Pump V-1		**Vacuum Pump V-2**	
Vacuum 1	"Hg	Vacuum .5	"Hg
Temperature 110	°F	Temperature 110	°F
Particulate Filter OK		Particulate Filter OK	
Flow Control Valve Setting 100 %		Flow Control Valve Setting 100 %	
Bleed Air Valve Setting 50 %		Bleed Air Valve Setting 50 %	
Liquid Level		Liquid Level	
Vacuum Pump V-3		**Vacuum Pump V-4**	
Vacuum	"Hg	Vacuum	"Hg
Temperature	°F	Temperature	°F
Particulate Filter		Particulate Filter	
Flow Control Valve Setting		Flow Control Valve Setting	
Bleed Air Valve Setting		Bleed Air Valve Setting	
Liquid Level		Liquid Level	

ACTIVATED CARBON ADSORPTION SYSTEM

Carbon Adsorber A/B		**Carbon Adsorber C/D**	
Inf. VOC Level	ppm	Inf. VOC Level 8.2	ppm
Inf Pressure	psi	Inf Pressure 30	psi
Mid. VOC Level	ppm	Mid. VOC Level	ppm
Mid Pressure	psi	Mid Pressure	psi
Eff. VOC Level	ppm	Eff. VOC Level 8.2	ppm
Change out Date		Change out Date 8-22-96	

WATER TREATMENT

Flowmeter Reading 1187.8 Gallons

COMMENTS

OPERATIONAL DATA FORM
Air Sparging/Soil Vapor Extraction System
NEX Site
Naval Submarine Base
Groton, CT

Date: 1-13-97
Time: 1500
Technician: JKM

SOIL VAPOR EXTRACTION WELLS
West side: 480. scfm total East side: 360. scfm total
Target setting at each point: 1100. ft/m

LOCATION	FLOW (FT/M)	VALVE SETTING	VACUUM ("H20)	COMMENTS
VEA-1	—	—	—	closed
VEA-2	—	—	—	" "
VEA-3	—	—	—	" "
VEA-4	—	—	—	" "
VEA-5	—	—	—	" "
VEA-6	—	—	—	" "
VEA-7	—	—	—	" "
VEA-8	—	—	—	" "
VEA-9	—	—	—	" "
VEA-10	—	—	—	" "
VEA-11	—	—	—	" "
VEA-12	—	—	—	" "
VEA-13	0	100 %	32	" "
VEA-14	0	100 %	31	" "
VEA-15				water in road box
VEA-16	0	100 %	32	
VEA-17	—	—	—	—
VEA-18		100 %	32	
VEA-19				
VEA-20	0	100 %	32	
VEB-1		100	4	
VEB-2	—	100	32	
VEB-3	—	100	30	
VEB-4	—	100	33	

OPERATIONAL DATA FORM
Air Sparging/Soil Vapor Extraction System
NEX Site
Naval Submarine Base
Groton, CT.

Date: 11/3/97
Time: 13:45
Technician: F.R. / J.B.

SOIL VAPOR EXTRACTION WELLS
West side: 480. scfm total East side: 360. scfm Total
Target setting at each point: 1100. Ft/m

LOCATION	FLOW (FT/M)	VALVE SETTING	VACUUM ("H2O)	COMMENTS
VEB-5	—	100	34	
VEB-6	—	100	28	
VEB-7	—	100	4	
VEB-8	—	50 %	33	
VEB-9	—	100 %	33	
VEB-10	—	50 %	31	
VEB-11	—	50 %	30	
VEB-12	—	50 %	35	
VEB-13	—	100 %	30	
VEB-14				water in manhole
VEB-15				water in manhole

East 21149925 240 CFM
west 11211875 82 CFM

NAVAL SUBMARINE BASE GROTON, CT. (NEX SITE)

Monitoring		
Component:	**Frequency:**	**Record Data for/By:**
Carbon Adsorbors: A/B (Inf. / Eff.) C/D (Inf. / Eff.)	Monthly	Air Sample for: EPA T03 BTEX,MTBE Misc.aromatics/aliphatics
Water Sump:	Prior to discharging	Flowmeter reading Eff EPA 624+zxylenes (2-40ml. Voa/HCL) Eff TPH EPA 418.1 (1-1 lt./H2S04) Eff Total Lead EPA 239.2 (1-500ml./HN03) PH (Inf./Eff) (Field test) Eff Aquatic Toxicity (Minnows+Water Fleas)
Monitoring Wells: ERM-5 - ERM-19	Quarterly	EPA 8010 (3-40ml./HCL) EPA 8020 +MTBE (" ") TPH 418.1 (2-1lt.) TPH as gasoline,CG/FID hydrocarbon screen (" ") TPH as Diesel,GC/FID hydrocarbon screen (" ")

OPERATIONAL DATA FORM OT-8 MW-7 PRODUCT RECOVERY SYSTEM Naval Submarine Base, Groton, Ct. Project #97280014 Task 1140	Date: 1/13/97 Time: 14.50 Technician: J.R.JR. / J.B

Check compressor, pressure should be 80 psi. ✓
Check air dryer panel, pressure should be 60 psi. ✓
Drain moisture trap on panel dryer.
Gauge recovery tank: DTB:_____ Product Thickness:_____
DTW:_____ Total Fluid Gallons:_____
DTP:_____ Total Product Gallons: 4 gallons

Additional comments:
DTW = 7.86
DTP = 7.76
Could not use an L.P in the recovery tank because water in the tank was frozen
Reactivated OT8 System

NAVAL SUBMARINE BASE GROTON, CT. (DOLPHIN SITE)

Monitoring:		
Component:	**Frequency:**	**Record Data for :**
Air Compressors: C-1 C-2	Weekly	Flowrate Pressure Temperature Flow control setting Bypass control setting Radiator
Air Sparge Wells: ASP-a - ASP-Q	Monthly	Flow Valve settings % open Pressure
Carbon Adsorbers: A/B C/D	Weekly	Pressure Influent VOC Con. Middle VOC Con. Effluent VOC Con. Date carbon was changed out.
Vacuum Pumps: V-1 V-2 V-3 V-4	Weekly	Pressure temperature Check Particle Filters Flow Control Valve setting Bleed Valve Control Setting Condensate Trap Levels
Soil Vapor Extraction Wells: VET-1 - VET-17	Bi-Monthly	Flow Valve Setting Vacuum VOC Conc. By PID
Monitoring Wells: MW-1 - MW-3 WE-3, 4, 5, 6, 2S, 2D, HRP-10, DM-1, 2, 3, 4, 5	Monthly	Depth to Groundwater Depth to Liquid Phase(if present)
Vapor Monitoring Wells: VP-1 - VP-9	Monthly	Vacuum VOC Conc. By PID

NAVAL SUBMARINE BASE GROTON, CT. (DOLPHIN SITE)

Monitoring		
Component:	**Frequency:**	**Record Data for/By:**
Carbon Adsorbors: A/B (Inf. / Eff.) C/D (Inf. / Eff.)	Monthly	Air Sample for: EPA TO3 BTEX+MTBE Misc. Aliphatics+Aromatics
Water Sump:	Prior to discharging	Flowmeter reading Eff-EPA 624+MTBE+xylenes (2-40ml/HCL) Eff/Inf-TPH 418.1 (1-1lt./H2S04) Eff-Total Lead 239.2 (1-250ml/HN03) Eff/Inf EPA 335.1 Amenable Cyanide (1-500ml/NAOH) Eff/Inf-EPA 8020 (2-40ml/HCL) Eff/Inf-EPA 6010 Total Metals -arsenic (1-250ml/HCL) -barium -boron -chromium (+6) -chromium (total) -magnesium -manganese -copper -zinc -cadmium -lead -tin -silver -mercury -nickel Eff/Inf-EPA 160.2 TSS (1-500ml/none) Eff/Inf-EPA 340.2 Fluoride (1-500ml/none, usually combined with EPA160.2TSS analysis) Eff/Inf-PH (Field test)
Monitoring Wells: MW-1 - MW-3 WE- 2, 3, 4, 5, 6, 2S, 2B HRP-10, DM-1, 2, 3, 4, 5	Quarterly	EPA 8010 (3-40ml) EPA 8020 BTEX/MTBE only (3-40ml/HCL) TPH as gasoline TPH as Diesel TPH 418.1 (2-1lt/H2S04) PH (Field test)

NAVAL SUBMARINE BASE GROTON, CT. (NEX SITE)

Monitoring		
Component:	**Frequency:**	**Record Data for :**
Air Compressors: C-1 C-2	Weekly	Flowrate Pressure Temperature Flow control setting Bypass control setting Radiator
Air Sparge Wells: SPA-1 - SPA-37 SPB-1 - SPB-27	Monthly	Flow Valve settings % open Pressure
Carbon Adsorbers: A/B C/D	Weekly	Pressure Influent VOC Con. Middle VOC Con. Effluent VOC Con. Date carbon was changed out.
Vacuum Pumps: V-1 V-2 V-3 V-4	Weekly	Pressure temperature Check Particle Filters Flow Control Valve setting Bleed Valve Control Setting Condensate Trap Levels
Soil Vapor Extraction Wells: VEA-1 - VEA-20 VEB-1 - VEB-15	Bi-Monthly	Flow Valve Setting Vacuum VOC Conc. By PID
Monitoring Wells: ERM-5 - ERM-19	Monthly	Depth to Groundwater Depth to Liquid Phase(if present)
Complete MW-7 system check	Weekly	Gauge recovery drum Check compressor oil level Drain condensation from compressor dryer
Vapor Monitoring Wells: VP-1 - VP-9	Monthly	Vacuum VOC Conc. By PID

ATTACHMENT 2

MONTHLY FIELD ACTIVITY SUMMARY

Field Activity Summary
January 1997
New London Naval Submarine Base
Groton, Connecticut

Week Ending	Site	Period	Field Activities[1]	Comments
1/3/97	Dolphin Mart	Bi-monthly Monitoring	Conducted bi-monthly system monitoring.	SVE/air sparge system operating normally.
	NEX		Conducted bi-monthly system monitoring.	SVE system operating normally.
	OT-8		Conducted bi-monthly system monitoring.	Product recovery system inactive due to high water table.
1/10/9	Dolphin Mart	Bi-monthly Monitoring	No field activities.	SVE/air sparge system operating normally.
	NEX			SVE system operating normally.
	OT-8			Product recovery system inactive due to high water table.
1/17/97	Dolphin Mart	Bi-monthly Monitoring	Conducted monthly system monitoring.	SVE/air sparge system operating normally.
	NEX		Conducted monthly system monitoring.	SVE system operating normally.
	OT-8		Conducted monthly system monitoring.	Product recovery system reactivated.
1/24/97	Dolphin Mart	Bi-monthly Monitoring	No Field Activities.	SVE/air sparge system operating normally.
	NEX			SVE system operating normally.
	OT-8			OT-8 passive free product recovery system operating normally.
1/31/97	Dolphin Mart	Bi-monthly Monitoring	Conducted bi-monthly system monitoring.	SVE/air sparge system operating normally.
	NEX		Conducted bi-monthly system monitoring.	SVE system operating normally. Repaired broken water effluent discharge piping.
	OT-8		Conducted bi-monthly system monitoring.	Product recovery system deactivated due to high water table.

Note: [1] Bi-monthly operation and maintenance tasks include well gauging and system monitoring.

ATTACHMENT 3

AIR SPARGE/SVE SYSTEM DATABASES

SYSTEM MONITORING DATA
SOIL VAPOR EXTRACTION/AIR SPARGE SYSTEM

New London Naval Submarine Base
Dolphin Mart Site
Groton, CT

Date	Day of Operation	Air Sparge Flowrate (scfm)	Extraction Flowrate (scfm)	Extraction Flowrate (cfm)	Influent Concentration BTEX (ppmv)	Removal Rate BTEX (lb/hr)	Influent Concentration MTBE (ppmv)	Removal Rate MTBE (lb/hr)	Influent Concentration Aliphatics (ppmv)	Removal Rate Aliphatics (lb/hr)	Influent Concentration Aromatics (ppmv)	Removal Rate Aromatics (lb/hr)	Influent Concentration TVPH (ppmv)	Removal Rate TVPH (lb/hr)	Total Mass Removal Rate (lbs/hr)	Period Mass Removed (lbs)	Cumulative Mass Removed (lbs)	Comments
07/02/96	0	25	450	512.26	24.00	0.187	33.00	0.232	1000.00	6.876	0.00	0.000	—	0.000	7.295	0.00	0.00	
07/23/96	21	20	449	511.12	11.40	0.091	0.00	0.000	200.00	1.375	0.00	0.000	—	0.000	1.467	446.86	446.86	system operated approx. 102 hrs between 7/2 and 7/23
08/08/96	37	32	454	516.81	18.00	0.142	—	0.000	210.00	1.444	12.00	0.102	—	0.000	1.687	209.75	656.61	system operated approx. 133 hrs between 7/23 and 8/8
08/30/96	59	0	450	512.26	18.00	0.142	—	0.000	210.00	1.444	12.00	0.102	—	0.000	1.687	187.31	843.92	system operated approx. 111 hrs between 8/8 and 8/30
10/02/96	92	30	448	509.98	2.30	0.019	0.00	0.000	—	0.000	—	0.000	36.00	0.287	0.306	0.00	843.92	system not in operation from 8/30 to 10/2 due to flow meter problem
10/16/96	106	30	450	512.26	2.30	0.019	0.00	0.000	—	0.000	—	0.000	36.00	0.287	0.306	102.81	946.74	system reactivated 10/2/96
11/19/96	140	30	450	512.26	0.38	0.003	0.00	0.000	—	0.000	—	0.000	5.29	0.042	0.045	143.33	1090.06	
12/17/96	168	30	450	512.26	0.12	0.001	0.00	0.000	—	0.000	—	0.000	1.97	0.016	0.017	20.84	1110.90	
01/27/97	209	30	450	512.26	1.35	0.011	0.00	0.000	—	0.000	—	0.000	13.23	0.106	0.117	65.56	1176.46	

Notes:
1) Aliphatics are weighted using a response factor of hexane. (MW = 86.2)
2) Aromatics are weighted using a response factor of o-xylene. (MW=106.16)
3) Analytical data for 8/30/96 is assumed based on results of sampling conducted 8/8/96. System was deactivated 8/30/96 due to flow meter failure.
4) Flow rate of 10/16/96 through 1/27/97 is assumed. Air flow meter not in operation.
5) Analytical data for 10/2 is assumed based on data from 10/16/96.
6) Beginning 10/16/96 lab analysis was performed by Mitkem Laboratory. Prior to 10/16/96 air analysis performed by NEI/GTEL
7) Mitkem results report total volatile petroleum hydrocarbons, not misc. aromatics and aliphatics.
Total Volatile Petroleum Hydrocarbons are weighted to molecular weight of 100.
8) Laboratory results from 11/19/96 to present are reported in mg/m3.

SYSTEM MONITORING DATA
SOIL VAPOR EXTRACTION/AIR SPARGE SYSTEM

New London Naval Submarine Base
NEX Site
Groton, CT

Date	Day of Operation	Air Sparge Flowrate (scfm)	Extraction Flowrate (east side) (scfm)	Extraction Flowrate (west side) (scfm)	Extraction Flowrate (total) (scfm)	Extraction Flowrate (cfm)	Influent Concentration BTEX (ppmv)	Removal Rate BTEX (lb/hr)	Influent Concentration MTBE (ppmv)	Removal Rate MTBE (lb/hr)	Influent Concentration Aliphatics (ppmv)	Removal Rate Aliphatics (lb/hr)	Influent Concentration Aromatics (ppmv)	Removal Rate Aromatics (lb/hr)	Influent Concentration TVPH (ppmv)	Removal Rate TVPH (lb/hr)	Total Mass Removal Rate (lbs/hr)	Period Mass Removed (lbs)	Cumulative Mass Removed (lbs)	Comments
07/31/96	0	0	54	199	253	288.00	1.80	0.013	—	0.000	130.00	0.810	0.00	0.000	—	0.000	0.823	0.00	0.00	
08/08/96	8	0	85	185	270	307.35	1.80	0.013	—	0.000	130.00	0.810	0.00	0.000	—	0.000	0.823	78.21	78.21	system operated approx. 92 hrs between 7/31 and 8/8
08/22/96	22	0	85	185	270	307.35	1.80	0.013	—	0.000	130.00	0.810	0.00	0.000	—	0.000	0.823	88.09	166.30	24-hour per day system operation began 8/8
09/16/96	47	0	186	134	320	364.27	2.70	0.021	0.00	0.000	—	0.000	—	0.000	61.00	0.487	0.508	0.00	166.30	
10/16/96	77	0	186	134	320	364.27	2.50	0.020	0.00	0.000	—	0.000	—	0.000	42.00	0.335	0.355	310.76	477.06	
11/19/96	111	0	192	132	324	368.83	0.95	0.008	0.00	0.000	—	0.000	—	0.000	22.61	0.180	0.188	221.67	698.72	
12/17/96	139	0	223	87	310	352.89	0.18	0.001	0.07	0.000	—	0.000	—	0.000	6.98	0.056	0.058	82.54	781.27	
01/27/97	180	0	252	69	321	365.41	0.14	0.001	0.00	0.000	—	0.000	—	0.000	4.81	0.038	0.040	47.78	829.04	

Notes:
1) Aliphatics are weighted using a response factor of hexane. (MW = 86.2)
2) Aromatics are weighted using a response factor of o-xylene. (MW=106.16)
3) Analytical data for 7/31/96 is assumed based on results of sampling conducted 8/8/96.
4) Analytical data for 8/22/96 is assumed based on results of sampling conducted 8/8/96.
5) Air flow rate from 10/16/96 assumed for 9/16/96, due to a broken flow meter
6) Beginning 9/16/96 lab analysis was performed by Mitkem Laboratory. Prior to 9/16/96 air analysis performed by NEI/GTEL
7) Mitkem results report total volatile petroleum hydrocarbons, not misc. aromatics and aliphatics.
Total Volatile Petroleum Hydrocarbons are weighted to molecular weight of 100.
8) Laboratory results for 11/19/96 to present are reported in mg/m3.

MASSREM.WK4

ATTACHMENT 4

HISTORICAL CARBON USAGE SUMMARY

Carbon Breakthrough Matrix
Dolphin Mart and NEX Site

Groton Naval Submarine Base
Groton, CT

Carbon Breakthrough (#)[1]	Sample Date	Sample Time	Influent Conc. (ppmv, PID/FID)	Effluent Conc. (ppmv, PID/FID)	Influent Conc. (ppmv, PGC)	Effluent Conc. (ppmv, PGC)	SVE System Flow Rate (scfm)	Air Sparge System Flow Rate (scfm)	Estimated Breakthrough Time (hours)	Comments
2	7-2-96	17:05	66	8.1	230	50	452	25		Dolphin Mart Site
	7-3-96	8:50	375	289	380	320	448	33		
									15.75	
3	7-11-96	15:10	204.8	0	274	0.0	449	25		Dolphin Mart Site
	7-12-96	7:30	534	268	318	206	450	37		
									16.33	
4	7-12-96	9:55	588	15	NS	NS	450	30		Dolphin Mart Site. System deactivated 7/12/96 15:55 for weekend.
	7-15-96	18:10	366	0.0	NS	NS	449	16		
	7-16-96	9:30	149	77	250	88	442	24		
									21.33	
5	7-19-96	11:30	105	0	NS	NS	440	16		Approx. 1 hour test-only on 7/19/96.
	7-22-96	10:30	142	0	NS	NS	445	15		
	7-23-96	11:20	215	75	NS	NS	449	20		
									25.83	
6	7/24/96	9:45	96	0	NS	NS	450	16		Dolphin Mart Site. System down up to 8 hrs on 7/19/96 for electrical work.
	7/25/96	17:45	84.6	0	NS	NS	446	17		
	7/26/96	11:45	275	192	NS	NS	442	21		
									40	

Carbon Breakthrough Matrix
Dolphin Mart and NEX Site

Groton Naval Submarine Base
Groton, CT

Carbon Breakthrough (#)[1]	Sample Date	Sample Time	Influent Conc. (ppmv, PID/FID)	Effluent Conc. (ppmv, PID/FID)	Influent Conc. (ppmv, PGC)	Effluent Conc. (ppmv, PGC)	SVE System Flow Rate (scfm)	Air Sparge System Flow Rate (scfm)	Estimated Breakthrough Time (hours)	Comments
7	8/1/96	6:20	83.9	0	NS	NS	447.7	20		Dolphin Mart Site. Carbon loading test shut down for weekend 8/2/96.
	8/2/96	15:30	68	0	NS	NS	451	33		
	8/5/96	16:00	102	0	NS	NS	456	29		
	8/6/96	17:45	77.8	5.2	NS	NS	450	33		
	8/7/96	20:00	100.3	12.0	NS	NS	452	22		
	8/8/98	9:15	122.6	74.2	NS	NS	453.5	32		
									48	
8	8/1/96	6:50	6.6	4.5	NS	NS	116	0		NEX Site. A/B Carbon Units.
	8/2/96	15:00	33	7.2	NS	NS	68.5	0		
	8/5/96	15:45	0	0	NS	NS	166	0		
	8/6/96	17:10	3.1	4.0	NS	NS	137	0		
	8/7/96	17:00	2.0	3.3	NS	NS	158	0		
	8/8/96	9:45	2.3	3.5	NS	NS	135	0		
	8/12/96	14:00	65.4	47.6	NS	NS	262	0		
									290	

Carbon Breakthrough Matrix
Dolphin Mart and NEX Site

Groton Naval Submarine Base
Groton, CT

Carbon Breakthrough (#)[1]	Sample Date	Sample Time	Influent Conc. (ppmv, PID/FID)	Effluent Conc. (ppmv, PID/FID)	Influent Conc. (ppmv, PGC)	Effluent Conc. (ppmv, PGC)	SVE System Flow Rate (scfm)	Air Sparge System Flow Rate (scfm)	Estimated Breakthrough Time (hours)	Comments
9	8/1/96	6:50	44	8	NS	NS	116	0		NEX Site. C/D Carbon Units.
	8/2/96	15:00	46.5	9.1	NS	NS	68.5	0		
	8/5/96	15:45	100	15.8	NS	NS	166	0		
	8/6/96	17:10	60	24.0	NS	NS	137	0		
	8/7/96	17:00	50.6	34	NS	NS	158	0		
	8/8/96	9:45	54.4	44	NS	NS	135	0		
									189	
10	8/22/96	12:00	120	0.0	NS	NS	448	30		Dolphin Mart Site. C/D Carbon Units
	8/24/96	12:30	141	55	NS	NS	445	35		
									116	

Carbon Breakthrough Matrix
Dolphin Mart and NEX Site

Groton Naval Submarine Base
Groton, CT

Carbon Breakthrough (#)[1]	Sample Date	Sample Time	Influent Conc. (ppmv, PID/FID)	Effluent Conc. (ppmv, PID/FID)	Influent Conc. (ppmv, PGC)	Effluent Conc. (ppmv, PGC)	SVE System Flow Rate (scfm)	Air Sparge System Flow Rate (scfm)	Estimated Breakthrough Time (hours)	Comments
11	8/22/96	16:00	29	0.0	NS	NS	232	0		NEX Site. C/D Carbon Units. Carbon units taken off-line 9/4/96.
	8/27/96	9:20	36	12	NS	NS	228	0		
	8/30/96	14:40	26	24	NS	NS	108	0		
	9/4/96	16:00	49	NA	NS	NS	330	0		
	9/10/96	10:30	52.6	52.6	NS	NS	243	0		
	9/16/96	14:00	35	35	NS	NS	320	0		
	9/27/96	13:00	42.7	42.7	NS	NS	60	0		
	10/2/96	10:00	17	17	NS	NS	84	0		
	10/8/96	12:00	33.7	33.7	NS	NS	413	0		
	10/10/96	12:50	22.3	22.3	NS	NS	282	0		
	10/16/96	13:30	23.8	23.8	NS	NS	259	0		
	10/21/96	14:40	14.6	14.6	NS	NS	281	0		
	10/25/96	15:05	49.9	49.9	NS	NS	173	0		
	10/28/96	12:30	65.0	65.0	NS	NS	350	0		
	11/8/96	17:15	26.3	26.3	NS	NS	342	0		
	11/19/96	14:40	8.7	8.7	NS	NS	324	0		
	12/2/96	10:30	160	160	NS	NS	299	0		
	12/17/96	NA	5.0	5.0	NS	NS	310	0		
	1/13/97	14:20	8.2	8.2	NS	NS	322	0		
	1/27/97	17:10	15.0	15.0	NS	NS	322	0		
									NA	

Carbon Breakthrough Matrix
Dolphin Mart and NEX Site

Groton Naval Submarine Base
Groton, CT

Carbon Breakthrough (#)[1]	Sample Date	Sample Time	Influent Conc. (ppmv, PID/FID)	Effluent Conc. (ppmv, PID/FID)	Influent Conc. (ppmv, PGC)	Effluent Conc. (ppmv, PGC)	SVE System Flow Rate (scfm)	Air Sparge System Flow Rate (scfm)	Estimated Breakthrough Time (hours)	Comments
12	8/27/96	12:45	68	1.0	NS	NS	450	32		Dolphin Mart Site. C/D Carbon Units. Units still in service.
	10/2/96	12:50	47.5	13.7	NS	NS	458	30		
	10/8/96	13:10	27	6.5	NS	NS	467	28		
	10/16/96	13:00	18	5.4	NS	NS	NS	NS		
	10/25/96	16:00	23.1	27.5	NS	NS	NS	NS		
	10/28/96	11:30	27.3	13.3	NS	NS	NS	NS		
	11/8/96	11:10	10.3	5.6	NS	NS	NS	NS		
	11/19/96	14:10	2.5	0.0	NS	NS	NS	NS		
	12/2/96	14:15	4.0	9.0	NS	NS	NS	NS		
	12/17/96	NA	13.0	2.0	NS	NS	NS	NS		
	12/30/96	NA	12.0	12.0	NS	NS	NS	NS		
	1/13/97	13:50	5.0	5.0	NS	NS	NS	NS		
	1/27/97	15:00	12.0	8.0	NS	NS	NS	NS		
									NA	

Notes:
1 The initial carbon breakthrough (not included in this table) occurred during OHM's start-up activities.
ppmv = parts per million by volume
PID = photoionization detector
FID = flame ionization detector
PGC = portable gas chromatograph
NS = not sampled

ATTACHMENT 5

HISTORICAL WELL GAUGING DATA

Well Gauging Data
Dolphin Mart Site
New London Naval Submarine Base
Groton, Connecticut

Date	Depth to Water (ft) Well ID														
	DM-1	DM-2	DM-3	DM-4	DM-5	HRP-10	MW-1	MW-2	MW-3	WE-2S	WE-2D	WE-3	WE-4	WE-5	WE-6
07/02/96	6.37	NG	NG	NG	NG	4.65	4.65	3.55	3.12	6.78	6.56	8.67	4.24	4.80	3.40
07/03/96	NG	NG	NG	NG	NG	5.19	4.63	2.86	0.00	6.58	6.35	8.69	6.38	4.33	2.30
07/12/96	NG	NG	NG	NG	NG	5.81	5.01	3.82	1.95	6.96	6.83	8.93	6.38	4.98	3.60
07/16/96	NG	NG	NG	NG	NG	4.33	4.55	2.89	0.74	6.47	6.24	8.5	6.27	4.08	2.76
07/17/96	NG	NG	NG	NG	NG	2.73	4.94	1.63	2.79	6.3	5.88	8.62	6.47	3.62	1.72
07/19/96	NG	NG	NG	NG	NG	4.38	5.21	0.61	0.00	6.18	5.53	8.45	NG	3.19	1.08
07/22/96	NG	NG	NG	NG	NG	4.54	4.82	1.95	1.17	6.45	6.42	8.64	3.68	3.73	1.96
07/23/96	NG	NG	NG	NG	NG	4.55	4.75	3.33	0.00	6.7	6.33	8.72	8.72	4.49	2.40
07/24/96	NG	NG	NG	NG	NG	4.33	5.22	1.18	0.00	6.31	5.67	8.45	3.38	3.33	1.49
07/25/96	NG	NG	NG	NG	NG	4.46	5.31	NG	NG	NG	NG	NG	NG	NG	2.12
07/26/96	NG	NG	NG	NG	NG	4.43	4.79	NG	NG	NG	NG	NG	NG	NG	2.95
08/01/96	NG	NG	NG	NG	NG	3.93	4.96	2.2	1.28	6.39	6.09	8.55	3.22	4.06	1.15
08/02/96	NG	NG	NG	NG	NG	4.08	5.24	1.82	1.31	6.3	5.73	8.56	2.96	3.76	0.86
08/05/96	NG	NG	NG	NG	NG	4.35	5.08	NG	1.08	NG	NG	NG	NG	NG	1.28
09/04/96	NG	NG	NG	NG	NG	5.43	6.07	4.59	DRY	7.39	7.51	9.73	5.11	6.23	4.59
10/02/96	NG	NG	NG	NG	NG	3.53	5.43	NG	3.86	6.41	5.82	8.41	3.11	3.96	1.60
10/21/96	NG	NG	NG	NG	NG	3.98	NG	NG	NG	NG	NG	NG	NG	NG	2.43
11/19/96	1.90	NG	2.06	2.68	5.37	4.15	3.85	3.00	DRY	6.46	5.89	8.32	3.53	3.87	2.90
12/17/96	2.53	NG	1.60	NG	3.67	NG	2.53	2.17	NG	6.10	NG	7.92	2.17	2.96	2.10
01/27/97	1.91	NG	1.89	NG	4.26	3.29	2.98	2.13	NG	6.24	5.73	7.94	3.08	3.26	1.53

Notes:

NG = Not Gauged
(1) Depth to Product/Depth to Water

Grsubbas\123\Gr169.wk4

Well Gauging Data
NEX Site
New London Naval Submarine Base
Groton, Connecticut

Date	Depth to Water (ft) Well ID														
	ERM-5	ERM-6	ERM-7	ERM-8	ERM-9	ERM-10	ERM-11	ERM-12	ERM-13	ERM-14	ERM-15	ERM-16	ERM-17	ERM-18	ERM-19
09/16/96	3.82	5.14	5.27	NG	NG	NG	NG	8.38	7.01	6.89	4.30	8.51	5.62	3.65	5.28
10/16/96	NG	4.82	4.75	NG	NG	NG	6.4	8.13	7.15	6.92	3.94	8.49	5.56	3.96	5.17
11/18/96	3.72	4.64	4.93	NG	NG	NG	6.36	8.09	7.13	6.91/7.10 (1)	4.03	8.43	5.53	NG	5.19
12/16/96	3.10	4.08	4.21	NG	NG	NG	5.02	7.83	6.55	6.35	NG	7.8	3.73	NG	4.23

Notes:

NG = Not Gauged
(1) Depth to Product/Depth to Water

Grsubbas\123\Gr168.wk4

MW-7 Well Gauging Data
OT-8 Site
New London Naval Submarine Base
Groton, Connecticut

Date	Depth to Product (feet)	Depth to Water (feet)	LNAPL Thickness (feet)	LNAPL Recovered (gallons)	Total LNAPL Recovered (gallons)
09/26/96	4.26	6.02	1.76	0.00	0.00
10/02/96	NS	NS	0.00	4.00	4.00
10/08/96	NS	NS	0.00	0.00	4.00
10/16/96	NS	NS	0.00	0.00	4.00
10/21/96	1.65	1.66	0.01	0.00	4.00
10/25/96	3.06	3.18	0.12	0.00	4.00
10/28/96	3.46	3.55	0.09	0.00	4.00
12/17/96	NA	0.00	0.00	0.00	4.00
01/13/97	7.76	7.86	0.10	0.00	4.00
01/27/97	NA	0.00	0.00	0.00	4.00

Notes: Gauging on 10/02/96 and 10/16/96 was with a clear bailer, to visually confirm product thickness.
The well and vault were flooded on 12/17/96
OT-8 product recovery system was deactivated on January 28, 1997due to flooding of the well and vault
NA = Not Applicable
NG = Not Gauged

Grsubbas\123\Gr175.wk4

ATTACHMENT 6

HISTORICAL GROUNDWATER SAMPLING RESULTS

Historical Groundwater Sampling Results
NEX - March 1995/November 1996
Naval Submarine Base, Groton, Ct.

(analytical results in µg/l)

Well	Date	BTEX				MTBE	TPH (By EPA Method 418.1)	Total Volatiles (by EPA Method 8010/8020)	DRO	GRO
		Benzene	Toluene	Ethylbenzene	Xylenes					
NEX-1	3/95	<1.0	<1.0	<1.0	<1.0	<2.0	NS	7	35	<143
	5/96	<1.0	<1.0	<1.0	<1.0	<2.0	NS	8	<122	<143
	11/96	NS	NS	NS	NS	NS	NS	NS	NS	NS
ERM-5	3/95	967	431	390	1,340	<100	NS	3,295.1	430	8,250
	5/96	112	6	34	28	<10	NS	196	159	554
	11/96	370D	14	33	61D	<1.0	3,000	480	1,100	1,600
ERM-6	5/96	15	<1.0	<1.0	<1.0	<2.0	NS	35	63	<473
	11/96	610	230	770	2,400E	<40	5,000	4,054	500	7,800
ERM-7	5/96	5	<1.0	<1.0	<1.0	<2.0	NS	8	38	<473
	11/96	<1.0	<1.0	<1.0	<1.0	<1.0	<1,000	4	<500	<500

Notes: NS = Not sampled (NS results have been placed in grey)
D = Analyte concentration was obtained from a diluted analysis
E = Analyte concentration exceeded the calibration range
The trip blank contained a total 8010/8020 concentration of 10 µg/l
The method blanks contained total 8010/8020 concentrations of 8 µg/l and 1 µg/l
DRO=Diesel Range Organics
GRO=Gasoline Range Organics

GRUBBS/WP/GR1.75

Historical Groundwater Sampling Results
NEX - March 1995/November 1996
Naval Submarine Base, Groton, Ct.

(analytical results in µg/l)
page 2 of 3

Well	Date	BTEX				MTBE	TPH (By EPA Method 418.1)	Total Volatiles (by EPA Method 8010/8020)	DRO	GRO
		Benzene	Toluene	Ethylbenzene	Xylenes					
ERM-8	3/95	109	11.5	272	157	<50	NS	665.4	464	2,350
	5/96	NS	NS	NS	NS	NS	NS	NS	NS	NS
	11/96	NS	NS	NS	NS	NS	NS	NS	NS	NS
ERM-9	5/96	<1.0	<1.0	<1.0	<1.0	2	NS	4	3,310	<473
	11/96	NS	NS	NS	NS	NS	NS	NS	NS	NS
ERM-11	11/96	<1.0	<1.0	<1.0	<1.0	<1.0	<1,000	3	<500	<500
ERM-12	3/95	<1.0	<1.0	<1.0	<1.0	<2.0	NS	1	27	<473
	5/96	1	2	7	14	<2.0	NS	61	4,300	1,390
	11/96	<1.0	2	<1.0	9	<1.0	3,000	16	7,300	6,700
ERM-13	3/95	<1.0	<1.0	<1.0	<1.0	<2.0	NS	534	50	<473
	5/96	<1.0	<1.0	<1.0	<1.0	<2.0	NS	9	<100	<473
	11/96	<1.0	<1.0	<1.0	<1.0	<1.0	<1,000	2	<500	<500

Notes: NS = Not sampled (NS results have been placed in grey)
D = Analyte concentration was obtained from a diluted analysis
E = Analyte concentration exceeded the calibration range
The trip blank contained a total 8010/8020 concentration of 10 µg/l
The method blanks contained total 8010/8020 concentrations of 8 µg/l and 1 µg/l
DRO=Diesel Range Organics
GRO=Gasoline Range Organics

GRUBBS/WP/GR1.75

Historical Groundwater Sampling Results
NEX - March 1995/November 1996
Naval Submarine Base, Groton, Ct.

(analytical results in µg/l)
page 3 of 3

Well	Date	BTEX				MTBE	TPH (By EPA Method 418.1)	Total Volatiles (by EPA Method 8010/8020)	DRO	GRO
		Benzene	Toluene	Ethylbenzene	Xylenes					
ERM-14	3/95	292	4,880	8,190	6,020	<2.0	NS	19,995	4,840	3,670
	5/96	305	5,670	1,250	8,350	<2.0	NS	22,543	7,290	3,890
	11/96	270	8,300D	1,700D	11,000D	<25	7,000	21,270	12,000	30,000
ERM-15	11/96	280	760	330	1,100	<40	1,000	2,517	2,300	4,500
ERM-16	11/96	37	<2.0	13	16	30	<1,000	68	4,400	2,000
ERM-17	11/96	10	<1.0	<1.0	<1.0	9	<1,000	11	600	600
ERM-19	11/96	<1.0	<1.0	<1.0	<1.0	<1.0	<1,000	1	<500	<500

Notes: NS = Not sampled (NS results have been placed in grey)
D = Analyte concentration was obtained from a diluted analysis
E = Analyte concentration exceeded the calibration range
The trip blank contained a total 8010/8020 concentration of 10 µg/l
The method blanks contained total 8010/8020 concentrations of 8 µg/l and 1 µg/l
DRO=Diesel Range Organics
GRO=Gasoline Range Organics

GRUBBS/WP/GR1.75