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LETTER REPORT REGARDING ANNUAL MONITORING REPORT FOR SOLID WASTE
MANAGEMENT UNITS 6 AND 7 NS MAYPORT FL
5/3/2001
TETRA TECH NUS



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Document Tracking No. 01JAX0072

May 3, 2001

Project Number N0482

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Ms. Adrienne Wilson, Code 1852
Remedial Project Manager
2155 Eagle Drive
North Charleston, South Carolina 29406

Reference: Clean Contract Number N62467-94-D-0888
Contract Task Order Number 0120

Subject: Annual Monitoring Report for
Solid Waste Management Units 6 and 7
Naval Station Mayport, Mayport, Florida

Dear Ms. Wilson:

This annual Interim Measure (IM) Monitoring Report presents quarterly field and laboratory analytical data acquired during 1999 and 2000 at Solid Waste Management Units (SWMUs) 6 and 7, which are located along the St. Johns River at Naval Station (NAVSTA) Mayport, Florida (Figure 1). The quarterly monitoring data will be part of the information used to assess whether or not the IM at SWMUs 6 and 7 was successful in meeting its objectives.

The objectives for this IM as presented in the HLA's 1999 Annual Report (HLA, 2000) are as follows:

- 1) The IM must remove light non-aqueous phase liquid (LNAPL) to a thickness of less than 0.01 foot (ft).
- 2) The IM must minimize the lateral migration of the LNAPL, thereby preventing the discharge of LNAPL into the St. Johns River.
- 3) The IM must reduce the concentration of petroleum hydrocarbons and related organic chemicals in the vadose zone such that they do not exceed human health and leachability criteria, if applicable, as specified in Chapter 62-770, Florida Administrative Code (FAC), Petroleum Contaminated Site Cleanup Criteria (effective September 23, 1997).
- 4) The IM must remove LNAPL so that it is not a source of dissolved petroleum-related constituents in groundwater that exceed Florida Department of Environmental Protection's (FDEP) groundwater (Chapter 62-777, FAC) and surface water (Chapter 62-302, FAC) quality criteria and does not present a threat to human and ecological receptors [ABB Environmental Services (ABB-ES), 1996; and Harding Lawson Associates, Inc. (HLA), 1998].

LNAPL thickness, groundwater-level measurements, and chemical analysis of groundwater samples have been evaluated to assess the effectiveness of the IM with respect to the four objectives.

Chemical analysis of the soil samples will be used to assess whether or not the bioventing has resulted in bioremediation of total recoverable petroleum hydrocarbons (TRPH), petroleum-related volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) (Objective 3). The chemical analysis of soil samples was not included in the annual groundwater-monitoring program conducted in 2000. In addition, LNAPL thickness and groundwater level measurements were made monthly by Bechtel Environmental, Inc. (BEI) and Battelle in 2000 (Objectives 1 and 2). BEI and Battelle reported the LNAPL and water level data to the NAVSTA Mayport Partnering Team during 2000.

This report provides field and laboratory analytical results for quarterly groundwater samples that were collected in 2000. These results are also compared with the field and laboratory analytical results that were collected in 1999. The analytical results are part of the SWMUs 6 and 7 monitoring program data that will be used to assess whether or not biodegradation is occurring, whether or not dissolved petroleum-related constituents are present in groundwater, and whether or not there is a need to conduct a human health and/or ecological risk assessment (Objectives 1 and 4).

Groundwater Sample Collection and Analysis. Groundwater samples were collected using low-flow purging (typically a rate less than 1 liter-per-minute) and sampling with a peristaltic pump and disposable Teflon™ tubing dedicated to each well. Groundwater samples were not collected from wells that contained LNAPL.

Prior to groundwater sample collection, the monitoring wells were purged to remove stagnant water in the well casing without causing the suspension of silts and clays. The purging and sampling was conducted at flow rates that attempted to obtain a turbidity of five nephelometric turbidity units (NTU) or less.

The purging was considered complete when a minimum of three well volumes of water was removed, and the groundwater parameters (temperature, pH, specific conductance, salinity, dissolved oxygen, oxidation potential, and turbidity) had stabilized (within 10 percent of three previous measurements). The purpose of the purging process was to ensure good conductance between the well and the surrounding aquifer matrix, and that the groundwater sample was representative of the well screen zone.

Groundwater samples were collected before contacting the peristaltic pump and were placed in pre-cleaned containers supplied by the analytical laboratory. Sample aliquots were filled in the order of TRPH first, polynuclear aromatic hydrocarbons (PAHs) second, and the VOCs last. VOCs were collected last by the "straw" method whereby the tubing is slowly pulled from the well to minimize agitation of the formation and then carefully transferring the contents of the tube to a VOC vial with a Teflon™ septa cap. The groundwater samples were immediately placed in a cooler with ice and subsequently sent via overnight delivery under chain-of-custody protocol to an off-site laboratory for analysis.

During each quarter the groundwater samples were analyzed by an off-site laboratory for methane. Field measurements were made for carbon dioxide, nitrate, nitrite (if necessary), sulfide, sulfate, hydrogen sulfide, ferrous iron, pH, dissolved oxygen, and oxidation-reduction potential.

During two of the sampling events, the groundwater samples were analyzed for VOCs using the U.S. Environmental Protection Agency (USEPA) Method 8021B, PAHs using USEPA Method 8100, and TRPH using the FL-PRO Method.

Groundwater Sampling Results. The analytical results for 2000 are provided in Table 1 including a summary of the laboratory analytical results for the semiannual quarterly sampling events for 1999 and 2000. The field measurements made during each of the four quarterly sampling events are provided in Table 2. Monitoring well locations are shown in Figure 2.

Groundwater samples were not collected from wells that contained LNAPL. Figure 3 presents the free product levels in the monitoring wells during the IM.

Due to construction activities in proximity to SWMUs 6 and 7, a number of wells were destroyed during the course of the year. The following wells have been destroyed during the past year: MPT-8-MW14S, MPT-8-MW15S, MPT-8-MW15I, and MPT-8-MW16S. Table 3 presents the current status of the wells intended for quarterly monitoring provided in the HLA Work Plan.

The following is a summary of the analytical results obtained during the fourth quarter sampling event:

- Seven VOCs were detected in the groundwater samples collected from SWMUs 6 and 7. There were no VOCs detected above FDEP Groundwater Cleanup Target Levels (GCTLs).
- Five PAHs were detected in the groundwater samples collected from SWMUs 6 and 7. Two PAHs were detected in the groundwater samples at concentrations that exceed FDEP GCTLs. 1-Methylnaphthalene and 2-methylnaphthalene were detected at 89 and 88 micrograms per liter ($\mu\text{g/L}$), respectively, exceeding their FDEP GCTLs of 20 $\mu\text{g/L}$.
- TRPH concentrations exceeded the FDEP GCTLs of 5,000 $\mu\text{g/L}$ in the groundwater samples collected from monitoring wells MPT-8-MW04 (14,000 $\mu\text{g/L}$) and MPT-8-MW09 (9,300 $\mu\text{g/L}$).

Historical Comparison Summary

LNAPL detections have occurred in monitoring wells MPT-8-MW01S, MPT-8-MW02S, MPT-8-MW03S, MPT-8-MW04S, and MPT-8-15S during the IM at SWMUs 6 and 7. LNAPL was detected in the latest quarterly event in monitoring wells MPT-8-MW01S, MPT-8-MW02S, and MPT-8-MW03S. LNAPL has not been detected in monitoring wells MPT-8-MW04S and MPT-8-MW15S for at least four consecutive quarterly sampling events. Overall, the LNAPL levels in the monitoring wells appear to be declining.

VOCs detected in the groundwater samples have not exceeded regulatory criteria in any of the samples collected during the two year monitoring at SWMUs 6 and 7. Although detections of various VOCs appear to be more prevalent during the second year, the concentrations are very slight and a trend is not apparent.

Two PAHs (1-methylnaphthalene and 2-methylnaphthalene) were detected in the groundwater samples above regulatory criteria in two monitoring wells (MPT-8-MW04S and MPT-8-MW15S) during the IM at SWMUs 6 and 7. The concentration of the two analytes in monitoring well MPT-8-MW04S has fluctuated, but has been above regulatory criteria for three of the last four sampling events. A trend for the analytes is not apparent. The concentration in monitoring well MPT-8-MW15S has not been detected since the 1999 first quarter sampling event. This monitoring well was not sampled during the fourth quarter of 2000 because it had been destroyed.

TRPH was detected above regulatory criteria in the groundwater samples in monitoring wells MPT-8-MW04S and MPT-8-MW09S during the IM at SWMUs 6 and 7. TRPH concentration in monitoring well MPT-8-MW04S has increased substantially over the previous sampling events. The results for the latest sampling event were the only time TRPH concentrations have exceeded regulatory criteria; however, LNAPL was previously detected in monitoring well MPT-8-MW04S during second quarter of 1999. The fourth quarter sampling event was the first time TRPH has been detected in monitoring well MPT-8-MW09S.

A historical comparison of the analytical data is provided in Table 1.

Interim Measure Objectives Summary

Objective 1

LNAPL was detected in monitoring wells MPT-8-MW01S (0.01 ft), MPT-8-MW02S (0.05 ft), and MPT-8-MW03S (0.05 ft) during the fourth quarter sampling event. These levels are at or above the established 0.01-ft criteria. Due to the continued presence of LNAPL at or above criteria, this objective has not been satisfied.

Objective 2

There have been no LNAPL detections in the monitoring wells adjacent to the St. Johns River. Furthermore, historical LNAPL levels in monitoring wells in close proximity (i.e. MPT-8-MW15S) to the St. Johns River have decreased to non-detectable levels. Although, the possibility exists for LNAPL migration toward these monitoring wells, it appears that this objective has been satisfied.

Objective 3

The concentrations of petroleum hydrocarbons and related chemicals have been detected above regulatory criteria in some of the monitoring wells at SWMUs 6 and 7. The highest concentrations were detected in monitoring well MPT-8-MW04S. The *Annual Report for Solid Waste Management Units 6 and 7* reported the presence of free product in monitoring well MPT-8-MW04S during at least one quarterly sampling event in 1999 (HLA, 2000). The continued presence of analyte concentrations above regulatory criteria indicates that this objective has not been satisfied.

Objective 4

LNAPL has been detected in four consecutive sampling events in monitoring wells MPT-8-MW02S and MPT-8-MW03S, and two consecutive sampling events in monitoring well MPT-8-MW01S. This objective has not been satisfied.

Conclusions

It appears that bioremediation of the dissolved hydrocarbon related compounds is occurring as evidenced by the anaerobic conditions such as negative redox potential, low dissolved oxygen concentrations, and the presence of nitrite, ferrous iron, sulfide and/or methane at monitoring well locations. Additional evidence supporting biodegradation of the dissolved hydrocarbons is the presence of carbon dioxide from respiration (Table 1).

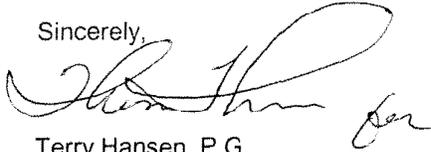
Although bioremediation appears to be occurring at SWMUs 6 and 7, three of the four objectives have not been satisfied at the conclusion of the 2000 quarterly monitoring events. It is recommended that quarterly monitoring continue or that a more aggressive approach be taken to mitigate the contamination at SWMUs 6 and 7.

During the April 2001 Partnering Team meeting, it was determined that the data collected thus far at SWMUs 6 and 7 will undergo further review and that a memo be drafted summarizing this data. The memo will include data from work performed by ABB-ES, HLA, Battelle, and TtNUS and will be used to determine potential options for further work.

Ms. Adrienne Wilson
SOUTHNAVFACENGCOM
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If you have any comments or questions concerning this report, or should any additional information become available for this site that would affect the conclusions or recommendations, please contact me at (850) 385-9899.

Sincerely,



Terry Hansen, P.G.

TH/tnt

Enclosures

cc: ✓ Ms. Cheryl Mitchell, NAVSTA Mayport
Mr. Craig Benedikt, USEPA
Mr. Jim Cason, FDEP
Mr. Mark Perry, TtNUS (unbound)
Ms. Debbie Wroblewski (cover letter only)
MR Bill Raspert (" " ")

TABLES

Table 1
Summary of Chemicals and Analytes in Groundwater
 Annual Monitoring Report for SWMUs 6 and 7
 Naval Station Mayport
 Mayport, Florida

Sample No. Quarter Collection Date	Groundwater Cleanup Criteria ¹ (ug/L)	MPT-S-MW01S				MPT-S-MW02S			
		Q2 Mar-99	Q4 Sep-99	Q2 Jun-00	Q4 Dec-00	Q2 Mar-99	Q4 Sep-99	Q2 Jun-00	Q4 Dec-00
Volatile² (ug/L)									
1,1-Dichloroethane	70								
1,1-Dichloroethene	7								
1,2-Dichloroethene, total	63								
2-Butanone	4,200								
Acetone	700			2.9J				2.1J	
Benzene	1								
cis-1,2-Dichloroethene	70								
Chloroform	5.7								
Chloromethane	2.7			0.12J				0.35J	
Ethylbenzene	700								
Isobutyl Alcohol	2,100								
Methyl tert-Butyl Ether	50								
Methylene Chloride	5							0.15J	
Toluene	40								
Polycyclic Aromatic Hydrocarbons³ (ug/L)									
1-Methylnaphthalene	20								3.8
2-Methylnaphthalene	20								
Acenaphthene	20								
Anthracene	2,100								
Fluorene	280								
Naphthalene	20								
Phenathrene	210								
Total Petroleum Hydrocarbons⁴ (ug/L)									
See notes at end of table									

Table 1
Summary of Chemicals and Analytes in Groundwater
 Annual Monitoring Report for SWMUs 6 and 7
 Naval Station Mayport
 Mayport, Florida

Sample No. Quarter Collection Date	Groundwater Cleanup Criteria ¹ (ug/L)	MPT-8-MW04S				MPT-8-MW09S			
		Q2 Mar-99	Q4 Sep-99	Q2 Jun-00	Q4 Dec-00	Q2 Mar-99	Q4 Sep-99	Q2 Jun-00	Q4 Dec-00
Volatile² (ug/L)									
1,1-Dichloroethane	70								
1,1-Dichloroethene	7								
1,2-Dichloroethene, total	63								
2-Butanone	4,200								
Acetone	700			4.8J				1.1J	
Benzene	1			0.21J	0.37J				
cis-1,2-Dichloroethene	70				0.11J				
Chloroform	5.7								
Chloromethane	2.7			0.16J					
Ethylbenzene	700			0.075J					
Isobutyl Alcohol	2,100							4.5	
Methyl tert-Butyl Ether	50								
Methylene Chloride	5				0.74J				0.34J
Toluene	40			0.15J	0.34J				
Polycyclic Aromatic Hydrocarbons³ (ug/L)									
1-Methylnaphthalene	20	140	61		89	0.85			
2-Methylnaphthalene	20	120	43		88	0.81			
Acenaphthene	20		6	2.4J	1.8J				
Anthracene	2,100		0.6						
Fluorene	280	17	6.4					17	
Naphthalene	20								
Phenathrene	210							22	
Total Petroleum Hydrocarbons⁴ (ug/L)									

See notes at end of table

Table 1
Summary of Chemicals and Analytes in Groundwater

Annual Monitoring Report for SWMUs 6 and 7
Naval Station Mayport
Mayport, Florida

Sample No. Quarter Collection Date	Groundwater Cleanup Criteria ¹ (ug/L)	MPT-S-MW03S				MPT-8-MW01S			
		Q2	Q4	Q2	Q4	Q2	Q4	Q2	Q4
		Mar-99	Sep-99	Jun-00	Dec-00	Mar-99	Sep-99	Jun-00	Dec-00
Volatile² (ug/L)									NA
1,1-Dichloroethane	70								
1,1-Dichloroethene	7								
1,2-Dichloroethene, total	63								
2-Butanone	4,200								
Acetone	700			1.5J			1.6J		
Benzene	1								
cis-1,2-Dichloroethene	70								
Chloroform	5.7								
Chloromethane	2.7								
Ethylbenzene	700								
Isobutyl Alcohol	2,100								
Methyl tert-Butyl Ether	50								
Methylene Chloride	5			0.14J	0.29 ^l		0.16J		
Toluene	40								
Polycyclic Aromatic Hydrocarbons³ (ug/L)									
1-Methylnaphthalene	20								
2-Methylnaphthalene	20								
Acenaphthene	20								
Anthracene	2,100								
Fluorene	280								
Naphthalene	20								
Phenathrene	210					0.05J			
Total Petroleum Hydrocarbons⁴ (ug/L)									

See notes at end of table

Table 1
Summary of Chemicals and Analytes in Groundwater

Annual Monitoring Report for SWMUs 6 and 7
 Naval Station Mayport
 Mayport, Florida

Sample No. Quarter Collection Date	Groundwater Cleanup Criteria ¹ (ug/L)	MPT-8-MW10S				MPT-8-MW13S			
		Q2	Q4	Q2	Q4	Q2	Q4	Q2	Q4
		Mar-99	Sep-99	Jun-00	Dec-00	Mar-99	Sep-99	Jun-00	Dec-00
Volatile² (ug/L)									
1,1-Dichloroethane	70								
1,1-Dichloroethene	7			0.15J					
1,2-Dichloroethene, total	63								
2-Butanone	4,200								
Acetone	700			3J			1.8J		
Benzene	1								
cis-1,2-Dichloroethene	70						0.19J		
Chloroform	5.7			0.15J			0.36J		
Chloromethane	2.7								
Ethylbenzene	700						23J		
Isobutyl Alcohol	2,100			0.16J					
Methyl tert-Butyl Ether	50								
Methylene Chloride	5								0.39J
Toluene	40								
Polycyclic Aromatic Hydrocarbons³ (ug/L)									
1-Methylnaphthalene	20								
2-Methylnaphthalene	20								
Acenaphthene	20								
Anthracene	2,100								
Fluorene	280								
Naphthalene	20								
Phenathrene	210								
Total Petroleum Hydrocarbons⁴ (ug/L)									
See notes at end of table									

Table 1
Summary of Chemicals and Analytes in Groundwater

Annual Monitoring Report for SWMUs 6 and 7
 Naval Station Mayport
 Mayport, Florida

Sample No. Quarter Collection Date	Groundwater Cleanup Criteria ¹ (ug/L)	MPT-8-MW13I				MPT-8-MW15S			
		Q2 Mar-99	Q4 Sep-99	Q2 Jun-00	Q4 Dec-00	Q2 Mar-99	Q4 Sep-99	Q2 Jun-00	Q4 Dec-00
Volatile² (ug/L)									
1,1-Dichloroethane	70			0.14J	0.13J				
1,1-Dichloroethene	7			0.15J	0.14J			0.12J	
1,2-Dichloroethene, total	63								
2-Butanone	4,200							0.8J	
Acetone	700			2.4J				6.1J	
Benzene	1								
cis-1,2-Dichloroethene	70				0.14J				
Chloroform	5.7								
Chloromethane	2.7			0.28J				0.29J	
Ethylbenzene	700								
Isobutyl Alcohol	2,100								
Methyl tert-Butyl Ether	50				0.14J				
Methylene Chloride	5			0.13J					
Toluene	40								
Polycyclic Aromatic Hydrocarbons³ (ug/L)									
1-Methylnaphthalene	20					26			
2-Methylnaphthalene	20					20			
Acenaphthene	20								
Anthracene	2,100								
Fluorene	280					3.6			
Naphthalene	20					14			
Phenathrene	210					1.5			
Total Petroleum Hydrocarbons⁴ (ug/L)									

See notes at end of table

Table 1
Summary of Chemicals and Analytes in Groundwater
 Annual Monitoring Report for SWMUs 6 and 7
 Naval Station Mayport
 Mayport, Florida

Sample No. Quarter Collection Date	Groundwater Cleanup Criteria ¹ (ug/L)	MPT-8-MW15I				MPT-8-MW17S			
		Q2 Mar-99	Q4 Sep-99	Q2 Jun-00	Q4 Dec-00	Q2 Mar-99	Q4 Sep-99	Q2 Jun-00	Q4 Dec-00
Volatile² (ug/L)									
1,1-Dichloroethane	70			0.12J					
1,1-Dichloroethene	7			0.31J					
1,2-Dichloroethene, total	63			0.13J					
2-Butanone	4,200								
Acetone	700			3.8J					
Benzene	1								
cis-1,2-Dichloroethene	70								
Chloroform	5.7								
Chloromethane	2.7								
Ethylbenzene	700								
Isobutyl Alcohol	2,100								
Methyl tert-Butyl Ether	50								
Methylene Chloride	5			0.06J					
Toluene	40								
Polycyclic Aromatic Hydrocarbons³ (ug/L)									
1-Methylnaphthalene	20	2.5							
2-Methylnaphthalene	20	1.3							
Acenaphthene	20								
Anthracene	2,100								
Fluorene	280								
Naphthalene	20								
Phenathrene	210								
Total Petroleum Hydrocarbons⁴ (ug/L)									

Notes:

Monitoring wells MPT-S-MW01S, MPT-S-MW02S, MPT-8-MW13I, and MPT-8-MW15S were also sampled during this time; however, there were no reported detections.

¹ Groundwater Clean-up Criteria as provided in Chapter 62-777, F.A.C.

² SW-846 8260B, ³ SW-846 8310, ⁴ FDEP FL-PRO

^J indicates the presence of a chemical at an estimated concentration.

* = monitoring well was destroyed

NA = not analyzed

Analytical results that were below laboratory detection limits are left blank

Bold indicates an exceedance of FDEP GCTLs

Table 2
Annual Summary of Natural Attenuation Results

Annual Monitoring Report for SWMUs 6 and 7
 Naval Station Mayport
 Mayport, Florida

Sample ID Quarter Collect Date	MPT-S-GW-01S-01				MPT-S-GW-02S-01				MPT-S-GW-03S-01			
	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00
Total Depth (Ft. Top of Casing)	12.10	12.10	12.01	12.10	15.09	15.09	15.09	15.09	15.08	15.08	15.08	15.08
Water Level (Ft. Top of Casing)	4.48	5.18	2.25	4.39	8.83	8.92	7.14	8.20	10.96	10.3	9.31	10.4
Temperature (°C)	21.09	23.80	26.00	22.56	21.50	23.70	25.90	20.99	21.82	24.00	25.70	20.45
pH (Standard Units)	7.13	7.65	6.88	6.9	6.94	7.08	8.22	6.53	6.72	6.58	6.86	6.03
Conductivity (mS/cm)	0.875	0.926	0.577	0.623	5.83	0.3	1.08	12.20	0.903	0.896	0.825	1.07
Turbidity (NTU)	4	5	0	14	-3.0	0.0	0	5	-3	0	1.3	0
Redox Potential (Millivolts)	-16	20	-72	-8	-40	77	76	-29	18	139	44	79
Dissolved Oxygen (mg/L)	0.7	0.5	0.8	0.5	2.0	1.7	5.0	1.0	0.5	0.6	2.0	1.0
Carbon Dioxide (mg/L)	149	20	20	13	71.4	30	<10	32	213	55	45	40
Sulfide (mg/L)	0.03	0.04	0.01	0.02	0.02	0	0.02	0.02	0.3	0.5	0.01	0
Sulfate (mg/L)	>80	>80	>80	>80	>80	>80	32	>80	>80	9	14	37
Nitrate (mg/L)	0.14	0.08	0.02	0.01	0.07	0.16	0.05	0.03	0.06	0.16	0.15	0.08
Nitrite (mg/L)	0.064	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.018	NA
Ferrous Iron (mg/L)	0	0.13	0.01	0.04	0.07	0.02	0.24	0.02	0.29	0.07	0	0.09
Hydrogen Sulfide (mg/L)	0	0	0	0	0	0	0	0	0	0.1	0	0
Methane ¹	NA	19	ND	2.2	NA	580	ND	2,000	NA	7.40	ND	4.40

See notes at end of table

Table 2 (continued)
Annual Summary of Natural Attenuation Results

Annual Monitoring Report for SWMUs 6 and 7
 Naval Station Mayport
 Mayport, Florida

Sample ID Quarter Collect Date	MPT-8-MW01S				MPT-8-MW04S				MPT-8-MW08S			
	Q1 Mar-00	Q2 Jun-00	Q3* Sep-00	Q4* Dec-00	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00
Total Depth (Ft. Top of Casing)	16.32	16.32	--	--	15.27	15.27	15.27	15.27	13.86	13.86	13.86	13.86
Water Level (Ft. Top of Casing)	10.73	10.59	--	--	10.2	9.89	9.74	10.46	10.68	10.56	9.39	10.48
Temperature (°C)	21.50	25.50	--	--	23.05	25.10	27.10	25.06	21.83	26.10	26.90	20.79
pH (Standard Units)	7.06	7.02	--	--	6.47	6.37	6.56	6.46	7.58	7.49	7.36	7.11
Conductivity (mS/cm)	0.497	0.522	--	--	0.936	0.099	0.95	1.12	0.656	0.668	0.797	0.747
Turbidity (NTU)	5.9	0	--	--	20	0	0	17	1	0	1	2
Redox Potential (Millivolts)	-85	-162	--	--	-114	-132	-144	-122	-90	-29	-89	-66
Dissolved Oxygen (mg/L)	0.5	0.5	--	--	0.2	0.3	0.5	0.3	3.0	2.5	3.5	2.0
Carbon Dioxide (mg/L)	38.2	12	--	--	232	70	100	50	29.8	50	10	10
Sulfide (mg/L)	0.05	0	--	--	0.3	0.02	0.1	0.1	0.03	0.05	0.03	0.01
Sulfate (mg/L)	43	61	--	--	>80	0	15	18	>80	>80	>80	>80
Nitrate (mg/L)	0.06	0.09	--	--	0.02	0	0.02	0.01	0.03	0.1	0.25	0.04
Nitrite (mg/L)	NA	NA	--	--	NA	NA	NA	NA	NA	NA	0.021	NA
Ferrous Iron (mg/L)	0.58	1.13	--	--	>3.3	>3.3	2.35	>3.3	0.01	0.02	0.08	0.03
Hydrogen Sulfide (mg/L)	0	0	--	--	0.1	0	0.7	1.0	0	0	0.1	0.3
Methane ¹	NA	17	--	--	NA	2400	4900	7,700	NA	NA	7.3	17

See notes at end of table

Table 2 (continued)
Annual Summary of Natural Attenuation Results
Annual Monitoring Report for SWMUs 6 and 7
Naval Station Mayport
Mayport, Florida

Sample ID Quarter Collect Date	MPT-8-GW-09S-01				MPT-8-GW-10S-01				MPT-8-GW-12S-01			
	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00
Total Depth (Ft. Top of Casing)	12.70	12.70	12.70	12.70	14.30	14.30	14.30	14.30	17.92	17.92	17.92	17.92
Water Level (Ft. Top of Casing)	10.31	8.31	8.49	10.19	7.94	10.3	6.71	7.4	11.05	10.51	10.28	11.7
Temperature (°C)	21.30	25.4	26.45	21.10	21.11	24.2	25.8	21.37	21.70	24.10	25.20	21.43
pH (Standard Units)	6.74	6.89	6.78	5.94	7.54	7.47	7.33	7.31	6.79	6.83	6.84	6.99
Conductivity (mS/cm)	0.656	0.7	0.752	1.25	0.843	0.09	0.917	0.005	0.674	0.738	0.806	0.004
Turbidity (NTU)	6	13	0	6	7	1	0	53	8	3	0	37
Redox Potential (Millivolts)	-27	-70	-62	-49	-139	-106	-126	-139	-62	-153	-138	-126
Dissolved Oxygen (mg/L)	1.5	2.0	3.5	0.6	0.5	0.4	1.0	0.3	0.8	1.0	0.8	1.0
Carbon Dioxide (mg/L)	54.9	25	0	100	44.6	16	13	15	82.2	40	32	27
Sulfide (mg/L)	0	0	0.04	0	0.10	0	0.08	0.07	0.04	--	0.06	0.05
Sulfate (mg/L)	>80	>80	14	>80	>81	60	>80	>80	57	24	63	26
Nitrate (mg/L)	0.05	0.06	0.35	0.01	0.04	0.09	0.01	0.03	0.01	0	0.01	0
Nitrite (mg/L)	NA	NA	0.023	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron (mg/L)	0.21	0.3	0.02	3.02	0.36	0.07	0.11	1.03	1.02	0.72	0.93	0.54
Hydrogen Sulfide (mg/L)	0	0	0	0.3	0.1	0	0.7	0.3	0.5	2	1.0	2
Methane ¹	NA	16	ND	140	NA	120	87	300	NA	NA	110	400

See notes at end of table

Table 2 (continued)
Annual Summary of Natural Attenuation Results

Annual Monitoring Report for SWMUs 6 and 7
 Naval Station Mayport
 Mayport, Florida

Sample ID Quarter Collect Date	MPT-8-GW-13S-01				MPT-8-GW-13I-01				MPT-8-GW-15S-01			
	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00	Q1 Mar-00	Q2 Jun-00	Q3** Sep-00	Q4** Dec-00
Total Depth (Ft. Top of Casing)	15.25	15.25	15.25	15.25	39.45	39.45	39.45	39.45	14.72	14.72	--	--
Water Level (Ft. Top of Casing)	9.78	8.52	8.85	9.45	10.1	9.9	8.9	9.4	7.94	8.15	--	--
Temperature (°C)	22.30	25.40	27.20	22.59	23.61	24.10	24.20	22.97	23.3	25.3	--	--
pH (Standard Units)	6.57	6.59	6.88	6.52	7.59	7.99	7.53	6.98	6.7	6.42	--	--
Conductivity (mS/cm)	0.781	0.752	0.79	0.723	1.21	0.106	1.06	1.05	0.979	0.946	--	--
Turbidity (NTU)	2	0	0	4	0	0	0	4	0	2	--	--
Redox Potential (Millivolts)	88	-31	59	-130	-274	-319	-284	-234	-52	-184	--	--
Dissolved Oxygen (mg/L)	2.0	1.5	2.0	1	1.5	1.5	0.2	1	0.35	0.4	--	--
Carbon Dioxide (mg/L)	59.8	40	25	25	42.8	13	10	10	328	80	--	--
Sulfide (mg/L)	0.07	0	0	0	>0.8	>0.8	>0.8	>0.8	0.15	0.1	--	--
Sulfate (mg/L)	60	71	>80	67	60	52	0.51	38	>80	>80	--	--
Nitrate (mg/L)	0.08	0.17	0.09	0.47	0.1	0.15	0.06	0.04	1.01	0.06	--	--
Nitrite (mg/L)	NA	NA	NA	0.003	NA	NA	NA	NA	NA	NA	--	--
Ferrous Iron (mg/L)	0.03	0.03	0.2	0.01	0	0	0.1	0.1	2.08	0	--	--
Hydrogen Sulfide (mg/L)	0.5	0	0	0.1	3.5	3	5	2.0	0.5	0.1	--	--
Methane ¹	NA	2.7	1.5	73	NA	160	79	1.2	NA	1900	--	--

See notes at end of table

Table 2 (continued)
Annual Summary of Natural Attenuation Results

Annual Monitoring Report for SWMUs 6 and 7
 Naval Station Mayport
 Mayport, Florida

Sample No. Quarter Collection Date	MPT-8-GW-15I-01				MPT-8-GW-17S-01				MPT-S-GW-18S-01			
	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4** Dec-00	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00	Q1 Mar-00	Q2 Jun-00	Q3 Sep-00	Q4 Dec-00
Total Depth (Ft. Top of Casing)	37.68	37.68	37.68	--	14.89	14.89	14.89	14.89	15.02	15.02	15.02	15.02
Water Level (Ft. Top of Casing)	7.56	8.23	7.18	--	9.30	--	8.92	--	7.12	5.50	5.61	6.34
Temperature (°C)	23.65	24.8	24.7	--	21.74	--	27.3	--	22.18	25.10	26.30	23.13
pH (Standard Units)	7.22	7.48	7.41	--	6.92	--	6.92	--	7.29	6.83	7.06	6.9
Conductivity (mS/cm)	3.42	0.293	3.01	--	0.755	--	0.668	--	0.423	0.557	0.594	0.642
Turbidity (NTU)	7	1.6	0	--	0	--	0	--	0	0	1	7
Redox Potential (Millivolts)	-327	-325	-381	--	-77	--	-153	--	-36	-135	-138	-106
Dissolved Oxygen (mg/L)	0.4	0.5	0.25	--	0.4	--	0.6	--	0.5	0.6	1.0	0.4
Carbon Dioxide (mg/L)	233	220	35	--	251	--	45	--	65.4	23	19	19
Sulfide (mg/L)	>80	>80	0.14	--	0.07	--	0.02	--	0.01	0	0.02	0.01
Sulfate (mg/L)	69	53	>80	--	0	--	56	--	26	33	39	42
Nitrate (mg/L)	0.09	0.53	0.09	--	0.05	--	0.03	--	NA	0	0	0.03
Nitrite (mg/L)	NA	NA	NA	--	NA	--	NA	--	NA	NA	NA	NA
Ferrous Iron (mg/L)	0	0	0.02	--	3.3	--	2.19	--	NA	1.65	0.63	0.73
Hydrogen Sulfide (mg/L)	>5.0	3	5	--	NA	--	0.3	--	NA	0	0	0.1
Methane ¹	NA	1200	3700	--	NA	--	1200	--	NA	NA	3.2	57

Notes:

¹RSK-175

°C = degrees Celcius

mS/cm = microsiemens per centimeter

mg/L = milligrams per liter

NTU = nephelometric turbidity units

NA = not analyzed

-- = data not collected

* = not sampled due to the presence of free product

** = monitoring well was destroyed

**Table 3
Monitoring Well Status Summary**

Annual Monitoring Report for SWMUs 6 and 7
Naval Station Mayport
Mayport, Florida

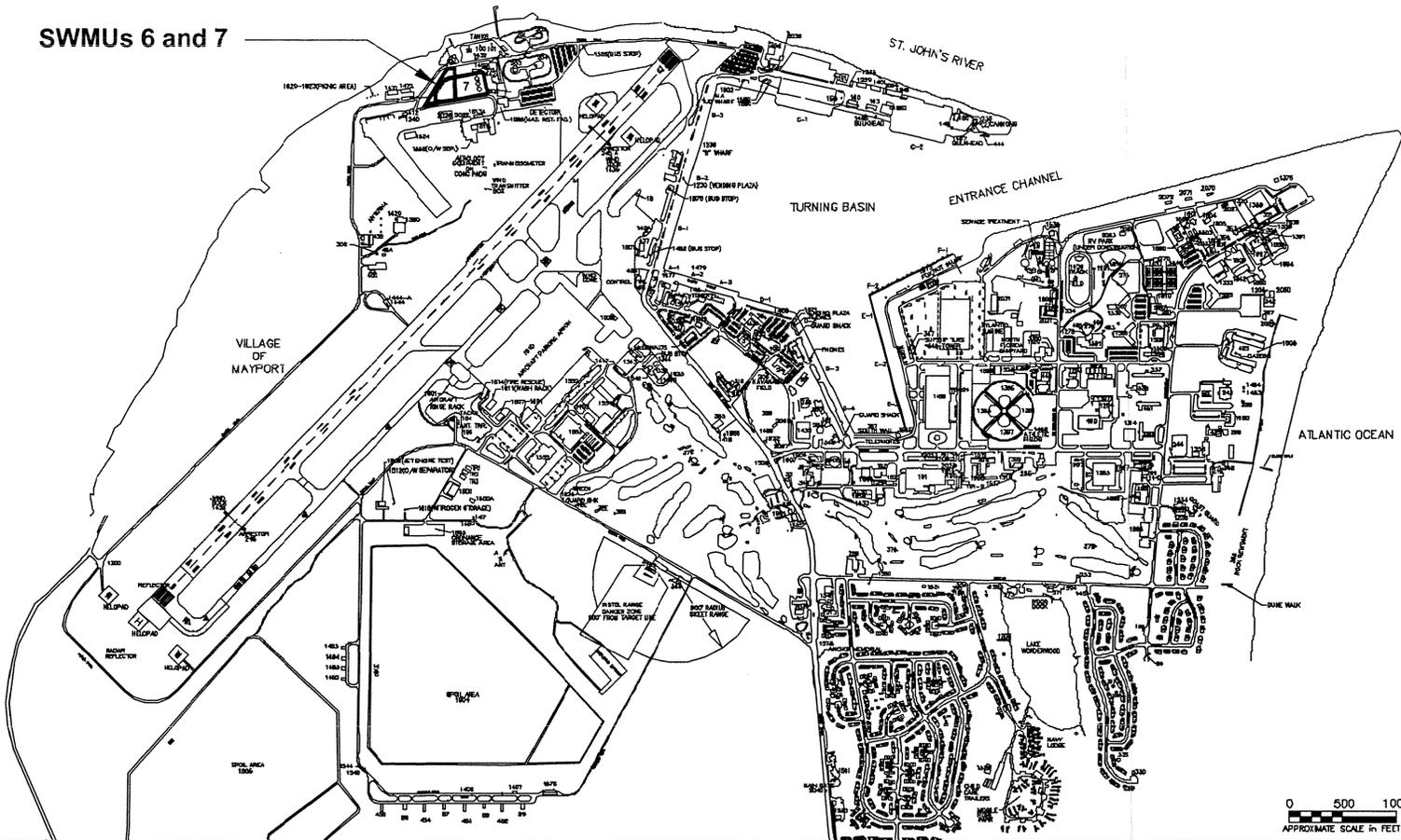
Well Identification	Current Status	Last Sampling Event
MPT-8-MW01S	Active	Quarter 4, 2000
MPT-8-MW02S	Active	Quarter 4, 2000
MPT-8-MW03S	Active	Quarter 4, 2000
MPT-8-MW04S	Active	Quarter 4, 2000
MPT-8-MW07S	Converted*	Not Sampled
MPT-8-MW08S	Active	Quarter 4, 2000
MPT-8-MW09S	Active	Quarter 4, 2000
MPT-8-MW10S	Active	Quarter 4, 2000
MPT-8-MW11S	Converted*	Not Sampled
MPT-8-MW12S	Active	Quarter 4, 2000
MPT-8-MW13S	Active	Quarter 4, 2000
MPT-8-MW13I	Active	Quarter 4, 2000
MPT-8-MW14S	Destroyed	Quarter 4, 1999
MPT-8-MW15S	Destroyed	Quarter 2, 2000
MPT-8-MW15I	Destroyed	Quarter 3, 2000
MPT-8-MW16S	Destroyed	Quarter 1, 1999
MPT-8-MW17S	Active	Quarter 4, 2000
MPT-8-MW18S	Active	Quarter 4, 2000
MPT-S-MW01S	Active	Quarter 4, 2000
MPT-S-MW02S	Active	Quarter 4, 2001
MPT-S-MW03S	Active	Quarter 4, 2002

Notes

* - monitoring well converted to extraction well.

FIGURES

SWMUs 6 and 7



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY
L.K. 5/02/01

CHECKED BY
DATE

COST/SCHED-AREA

SCALE
AS NOTED



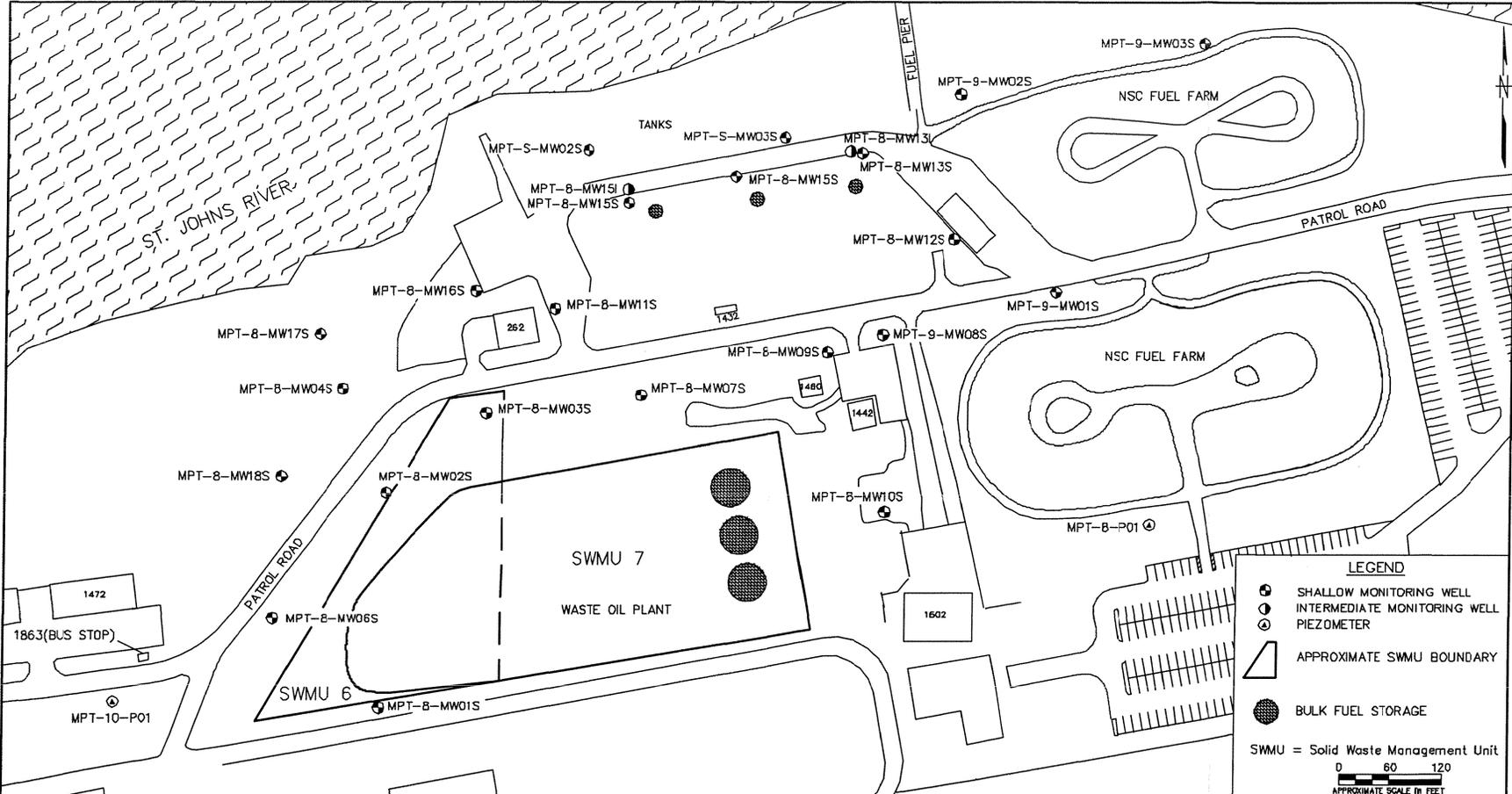
SITE LOCATION MAP
SWMUs 6 and 7
NAVAL STATION MAYPORT
MAYPORT, FLORIDA

CONTRACT NO. 0482

APPROVED BY _____ DATE _____

APPROVED BY _____ DATE _____

DRAWING NO. FIGURE 1 REV. 0



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY
LLK 4/28/00
DATE

CHECKED BY
DATE

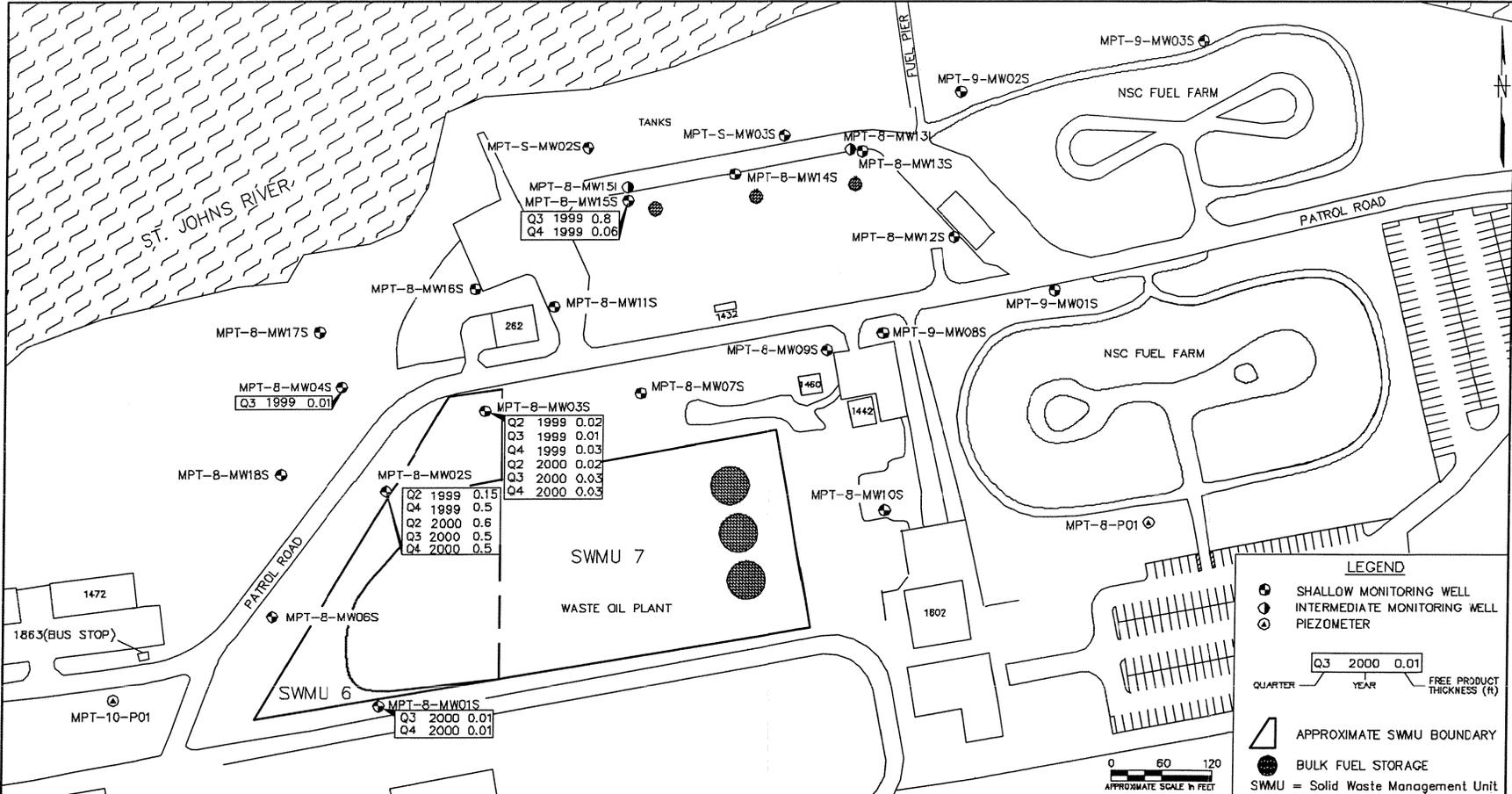
COST/SCHED-AREA

SCALE
AS NOTED



MONITORING WELL LOCATIONS
SWMUs 6 AND 7
U.S. NAVAL STATION
MAYPORT, FLORIDA

CONTRACT NO.	0482
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO.	FIGURE 2
REV.	0



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY
LLK 5/02/01

CHECKED BY

COST/SCHED-AREA

SCALE
AS NOTED



FREE PRODUCT THICKNESSES MEASURED
IN MONITORING WELLS
SWMUs 6 AND 7
U.S. NAVAL STATION
MAYPORT, FLORIDA

CONTRACT NO.	0482
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO.	FIGURE 3
REV.	0