

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN II)
Northern and Central California, Nevada, and Utah
Contract No. N62474-94-D-7609
Contract Task Order No. 284

Prepared For

DEPARTMENT OF THE NAVY
Ms. Ellen Casados
Remedial Project Manager
Southwest Division
Naval Facilities Engineering Command
San Diego, California

FINAL
TOTAL DISSOLVED AND SUSPENDED SOLIDS ADDENDUM
TO THE FIELD SAMPLING PLAN AND QUALITY ASSURANCE PROJECT PLAN
FOR FACILITYWIDE GROUNDWATER MONITORING

NAVAL STATION TREASURE ISLAND
SAN FRANCISCO, CALIFORNIA

DS.0284.17415

October 16, 2001

Prepared by

TETRA TECH EM INC.
135 Main Street, Suite 1800
San Francisco, California 94105
(415) 543-4880



Craig C. Freeman, Project Manager

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REVIEW AND APPROVALS

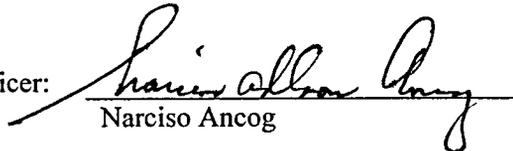
TtEMI Program
Quality Assurance Manager:



Greg Swanson

Date: 10/12/01

Navy Quality Assurance Officer:



Narciso Ancog

Date: 10/15/01



Tetra Tech EM Inc.

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October 16, 2001

Ms. Ellen Casados (06CAEC)
Remedial Project Manager
Southwest Division Naval Facilities Engineering Command
BRAC Operations Office
1230 Columbia Street, Suite 1100
San Diego, CA 92101-8517

**Subject: Addendum to Field Sampling Plan and Quality Assurance Project Plan
Facilitywide Groundwater Monitoring Program
Naval Station Treasure Island, San Francisco, California
CLEAN II Contract No. N62474-94-D-7609, Contract Task Order 0284**

Dear Ms. Casados:

Further to our conversation on October 2, 2001, Tetra Tech EM Inc. (TtEMI) recommends the addition of two laboratory analyses--total suspended solids (TSS) and total dissolved solids (TDS)--to the facilitywide groundwater monitoring program at Naval Station Treasure Island (NAVSTA TI), San Francisco, California. Both analyses will support the contaminant of concern monitoring at NAVSTA TI and will incur minor additional expense to the sampling program. Both analyses were also conducted on a selective basis in year 2000 under the facilitywide groundwater monitoring program at NAVSTA TI.

Please contact me or project chemist, Kevin Hoch (415-222-8304), if you have any questions.

Sincerely,

 Craig C. Freeman
Project Manager

Enclosure: TDS-TSS Addendum

cc: Nars Ancog, SWDIV
Navy Contract File (transmittal form only)
Navy Administrative Record
Greg Swanson, TtEMI
Ron Ohta, TtEMI
File

DS.0284.17415



TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N62474-94-D-7609

Document Control No. DS.0284.17415

TO: Mr. Ron Fuller, Code 02R1.RF
Contracting Officer
Naval Facilities Engineering Command
Southwest Division
1230 Columbia Street, Suite 1100
San Diego, CA 92101-8517

DATE: 10/12/01
CTO: 0284
LOCATION: NAVSTA Treasure Island, San Francisco

FROM: Daniel Chow, Program Manager

DOCUMENT TITLE AND DATE:

Final Total Dissolved and Suspended Solids Addendum to the Field Sampling Plan and Quality Assurance Project Plan, October 16, 2001

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Date/Time Received

N60028_000647
TREASURE ISLAND
SSIC NO. 5090.3

DRAFT
QUALITY ASSURANCE PROJECT PLAN FOR
FACILITYWIDE GROUNDWATER MONITORING

DATED 10 FEBRUARY 2000

IS RECORD NO. N60028_001114

FINAL
QUALITY ASSURANCE PROJECT PLAN ADDENDUM FOR
FACILITYWIDE GROUNDWATER MONITORING

DATED 29 MAY 2001

IS RECORD NO. N60028_000168

N60028_000647
TREASURE ISLAND
SSIC NO. 5090.3

FINAL
FIELD SAMPLING PLAN FOR
FACILITYWIDE GROUNDWATER MONITORING

DATED 29 MAY 2001

IS RECORD NO. N60028_000167

1.0 INTRODUCTION

Tetra Tech EM Inc. (TtEMI) is directed to complete facilitywide groundwater monitoring at environmental restoration sites at former Naval Station Treasure Island (NAVSTA TI) in San Francisco, California, as detailed in Contract Task Order No. 0284 issued under the Comprehensive Long-Term Environmental Action Navy Contract No. N62474-94-D-7609 from the Department of the Navy, Naval Facilities Engineering Command, Southwest Division. This addendum to the 2001 field sampling plan (FSP) (TtEMI 2001b) and quality assurance project plan (QAPP) (TtEMI 2000a, 2001c) details the requirements for the addition of total suspended solids (TSS) and total dissolved solids (TDS) to the sampling and analysis activities completed under the NAVSTA TI facilitywide groundwater monitoring program. All other elements of the previously approved project plans (TtEMI 2000, 2001b, 2001c) remain unchanged.

Analysis of TSS will be completed during the October and December 2001 sampling events at those monitoring wells where metals sampling and analysis is scheduled in the 2001 FSP (TtEMI 2001b). As conducted previously under the NAVSTA TI ambient metals study (TtEMI 2001a), where elevated concentrations of metals are reported, the corresponding TSS data will be used to determine if results were affected by the inclusion of elevated levels of suspended solids. The laboratory reporting limit will be 2.0 milligrams per liter (mg/L); levels of TSS will be identified as elevated where detected concentrations are greater than 10.0 mg/L. The updated project data collection requirements and groundwater analytical protocol, including TSS and TDS, are detailed in Appendices A and B, respectively.

As conducted in year 2000 under the NAVSTA TI facilitywide groundwater monitoring program, limited TDS sampling and analysis will be completed during the October 2001 sampling event. As used previously in the NAVSTA TI tidal mixing zone study (TtEMI 2001d), TDS data will be used to delineate the extent of saltwater infiltration at NAVSTA TI. Also in the manner of previous applications of TDS data at NAVSTA TI, the 2001 data will be used, as necessary, to evaluate the applicability of Regional Water Quality Control Board-proposed beneficial uses of NAVSTA TI groundwater. The laboratory reporting limit will be 5.0 mg/L; the minimum detected TDS concentration in year 2000 sampling was 225 mg/L.

In conjunction with previously approved project plans, this addendum will be immediately available to all staff supporting work under this CTO, including during the completion of all relevant field activities.

REFERENCES

- Tetra Tech EM Inc. (TtEMI). 2000. "Draft Quality Assurance Project Plan for Facilitywide Groundwater Monitoring, Naval Station Treasure Island, San Francisco, California." Department of the Navy, Southwest Division, Naval Facilities Engineering Command. February 10.
- TtEMI. 2001a. "Final Technical Memorandum, Estimation of Ambient Concentrations of Metal in Groundwater, Naval Station Treasure Island, San Francisco, California." Department of the Navy, Southwest Division, Naval Facilities Engineering Command. DS.0284.16539. March 30.
- TtEMI. 2001b. "Final Field Sampling Plan for Facilitywide Groundwater Monitoring, Naval Station Treasure Island, San Francisco, California." Department of the Navy, Southwest Division, Naval Facilities Engineering Command. DS.0284.17059-1. May 29.
- TtEMI. 2001c. "Final Quality Assurance Project Plan Addendum for Facilitywide Groundwater Monitoring, Naval Station Treasure Island, San Francisco, California." Department of the Navy, Southwest Division, Naval Facilities Engineering Command. DS.0284.17062-1. May 29.
- TtEMI. 2001d. "Internal Draft Tidal Mixing Zone Study Technical Memorandum, Naval Station Treasure Island, San Francisco, California." Department of the Navy, Southwest Division, Naval Facilities Engineering Command. DS.0370.16944. October 3.

APPENDIX A

**UPDATED FIELD SAMPLING PLAN TABLE 4-1
2001 DATA COLLECTION REQUIREMENTS**

UPDATED TABLE 4-1
2001 DATA COLLECTION REQUIREMENTS
FACILITYWIDE GROUNDWATER MONITORING PROGRAM
NAVAL STATION TREASURE ISLAND

Well No.	Monitoring Program	Well Type	Analytes of Concern (AOC) Data							Fate and Transport Data											Sampling Frequency				Comments	
			Laboratory Analyses							Monitored Natural Attenuation (MNA)											Quarterly Sampling	Semi-Annual Sampling	Annual Sampling	Water Levels Only		
										Laboratory Analyses				Field Test Kit Analyses			Field Measurement									Laboratory Analyses (see notes)
Metals	PCBs	SVOCs	TPH-e	TPH-P	VOCs	Major Anions (Chloride & Sulfate)	Methane, Ethane, & Ethene	Nitrate	Sulfide	VOCs	Alkalinity	Iron (Fe ²⁺)	Manganese (Mn ²⁺)	Oxidation-Reduction Potential	Oxygen, dissolved	pH	Total Dissolved Solids	Total Suspended Solids	Water Level	Oil/Water Interface	Sample at Low Tide	Measure Water Levels at Low Tide				
Site 11 - Yerba Buena Island Landfill																										
11-MW02	R	D	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	2	4			X		X	X	
11-MW03	R	U	1	1	1	1	1										1	1	4			X		X	X	
11-MW04	R	S	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	2	4			X		X	X	
11-MW05	R	D	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	2	4			X		X	X	
11-MW06	R	C	1	1	1	1	1										1	1	4			X		X	X	
11-MW07	R	D	2	2	2	2	2										1	2	4			X		X	X	
Total:			10		10	10	10	10	10	10	3	3	3	3	3	3	3	6	10	24			4	2	5	6
Site 12 - Old Bunker Area																										
12-MW01	R	S	2	2	2	2	2										1	2	4			X		X	X	
12-MW03	R	S	2	2	2	2	2										1	2	4			X				
12-MW04	R	S	2	2	2	2	2										1	2	4			X				
12-MW05	R(p)	D	2	2	2	2	2	2	2	2	2	*	2	2	2	2	2	2	4			X		X	X	
12-MW06	R(p)	C	1	1	1	1	1	1	1	1	1	*	1	1	1	1	1	1	4				X		X	
12-MW07	R(p)	U	1	1	1	1	1	1	1	1	1	*	1	1	1	1	1	1	4				X			
12-MW08	R	S	2	2	2	2	2										1	2	4			X			X	
12-MW09	R	S	2	2	2	2	2										1	2	4			X				
12-MW11	R	S	2	2	2	2	2										1	2	4			X		X	X	
12-MW13	R	S	2	2	2	2	2										1	2	4			X			X	
12-MW14	R	S	2	2	2	2	2	2	2	2	2	*	2	2	2	2	2	2	4			X				
12-MW15	R	S	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	1	4			X				
12-MW16	R	S	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	1	4			X				
12-MW17	R	S	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	2	4			X		X	X	
12-MW18	R	S	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	2	4			X		X	X	
12-MW19	R	S	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	2	4			X		X	X	
12-MW20	R(p)	S	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	2	4			X		X	X	
12-MW21	R(p)	S	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	2	4			X		X	X	
12-MW22	R(p)	D	2	2	2	2	2	1	1	1	1	*	1	1	1	1	1	2	4			X		X	X	
12-MW23	R(p)	D	2	2	2	2	2	2	2	2	2	*	2	2	2	2	2	2	4			X		X	X	
12-MW24	R(p)	S	2	2	2	2	2	2	2	2	2	*	2	2	2	2	2	2	4			X		X	X	
12-MW25A1	NA	NA																							Piezometer installed for tidal study--no sampling required.	
12-MW25A2	NA	NA																							Piezometer installed for tidal study--no sampling required.	
12-MW25A3	NA	NA																							Piezometer installed for tidal study--no sampling required.	

**UPDATED TABLE 4-1
2001 DATA COLLECTION REQUIREMENTS
FACILITYWIDE GROUNDWATER MONITORING PROGRAM
NAVAL STATION TREASURE ISLAND**

Well No.	Monitoring Program	Well Type	Analytes of Concern (AOC) Data										Fate and Transport Data										Sampling Frequency					Measure Water Levels at Low Tide	Comments
			Laboratory Analyses										Monitored Natural Attenuation (MNA)										Quarterly Sampling	Semi-Annual Sampling	Annual Sampling	Water Levels Only			
			Metals	PCBs	SVOCs	TPH-e	TPH-p	VOCs	Major Anions (Chloride & Sulfate)	Methane, Ethane, & Ethene	Nitrate	Sulfide	VOCs	Alkalinity	Iron (Fe ²⁺)	Manganese (Mn ²⁺)	Oxidation-Reduction Potential	Oxygen, dissolved	pH	Laboratory Analyses (see notes)	Field Measurement								
Site 20 - Auto Hobby Shop / Transportation Center																							No analytes of concern in 2000 sampling.						
20-MW01	P	U				1	1	1													4				X				Sampling reinitiated Oct 2001 subsequent to IT Corp. removal action
20-MW04	P	D																			4						X		
20-MW05	P	S				2	2	2													4				X				Sampling reinitiated Oct 2001 subsequent to IT Corp. removal action
Total:						3	3	3													12				1	1	1		
Site 201 - UST 201																							Diesel						
201-MW1	P	N,S				3	3	3				2	2	2	2	*		2	2	2				4	X				Site scheduled for Fall 2001 closure; sampling complete in third quarter. Well to be sampled with peristaltic pump.
201-MW2	P	N,S				3	3	3				2	2	2	2	*		2	2	2				4	X				Site scheduled for Fall 2001 closure; sampling complete in third quarter. Well to be sampled with peristaltic pump.
201-MW3	P	N,C				3	3	3															4	X					Site scheduled for Fall 2001 closure; sampling complete in third quarter. Well to be sampled with peristaltic pump.
201-MW4	P	N,D				3	3	3				1	1	1	1	*		1	1	1			1	1	1	1			Site scheduled for Fall 2001 closure; sampling complete in third quarter. Well to be sampled with peristaltic pump.
201-MW5	P	N,C				3	3	3				1	1	1	1	*		1	1	1			1	1	1	1			Site scheduled for Fall 2001 closure; sampling complete in third quarter. Well to be sampled with peristaltic pump.
Total:						15	15	15				6	6	6	6			6	6	6			6	6	6	6			
Site 21 - Vessel Waste Oil Recovery Area																							A solvent investigation area. 2nd, 3rd, & 4th qtr. sampling completed by CTO 302.						
21-MW01	R	U				1	1	1	1	1	*						1	1	1			1	1	1			X		
21-MW01B	R	N,U				3	2	2	2	2	*						2	2	2			2	2	2			X		1-inch diam. well to be sampled with peristaltic pump.
21-MW02A	R	D				2	1	1	1	1	*						1	1	1			1	1	1			X		
21-MW02B	R	D				2	1	1	1	1	*						1	1	1			1	1	1			X		
21-MW03A	R	D				2	1	1	1	1	*						1	1	1			1	1	1			X	X	
21-MW03B	R	D				2	1	1	1	1	*						1	1	1			1	1	1			X	X	
21-MW04A	R	D				2	1	1	1	1	*						1	1	1			1	1	1			X	X	
21-MW04B	R	D				2	1	1	1	1	*						1	1	1			1	1	1			X	X	
21-MW05	R	D				2	1	1	1	1	*						1	1	1			1	1	1			X	X	
21-MW06	R	D				2	1	1	1	1	*						1	1	1			1	1	1			X	X	
21-MW07A1	R	N,D				2																	4			X	X	Installed for tidal study--review initial data and revise sampling freq., if nec..	
21-MW07A2	R	N,D				2																				X		Installed for tidal study--review initial data and revise sampling freq., if nec..	
21-MW07A3	R	N,D				2																				X		Installed for tidal study--review initial data and revise sampling freq., if nec..	

**UPDATED TABLE 4-1
2001 DATA COLLECTION REQUIREMENTS
FACILITYWIDE GROUNDWATER MONITORING PROGRAM
NAVAL STATION TREASURE ISLAND**

Well No.	Monitoring Program	Well Type	Analytes of Concern (AOC) Data										Fate and Transport Data										Sampling Frequency				Comments	
			Laboratory Analyses										Monitored Natural Attenuation (MNA)										Quarterly Sampling	Semi-Annual Sampling	Annual Sampling	Water Levels Only		
			Laboratory Analyses					Laboratory Analyses					Field Test Kit Analyses			Field Measurement			Laboratory Analyses (see notes)		Field Measurement							
			Metals	PCBs	SVOCs	TPH-e	TPH-p	VOCs	Major Anions (Chloride & Sulfate)	Methane, Ethane, & Ethene	Nitrate	Sulfide	VOCs	Alkalinity	Iron (Fe ²⁺)	Manganese (Mn ²⁺)	Oxidation-Reduction Potential	Oxygen, dissolved	pH	Total Dissolved Solids	Total Suspended Solids	Water Level						Oil/Water Interface
21-MW08A	R	N,S						3	2	2	2	2	*	2	2	2	2	2	2	2	2	2	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW08B	R	N,S						3	2	2	2	2	*	2	2	2	2	2	2	2	2	2	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW9A	R	N,D						3	2	2	2	2	*	2	2	2	2	2	2	2	2	2	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW9B	R	N,D						3	2	2	2	2	*	2	2	2	2	2	2	2	2	2	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW10A	R	N,C						3	2	2	2	2	*	2	2	2	2	2	2	2	2	2	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW10B	R	N,C						3	2	2	2	2	*	2	2	2	2	2	2	2	2	2	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW11A	R	N,C						3	1	1	1	1	*	1	1	1	1	1	1	1	1	1	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW11B	R	N,C						3	1	1	1	1	*	1	1	1	1	1	1	1	1	1	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW12A	R	N,U						3	1	1	1	1	*	1	1	1	1	1	1	1	1	1	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW13A	R	N,D						3	1	1	1	1	*	1	1	1	1	1	1	1	1	1	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW14A	R	N,C						3	2	2	2	2	*	2	2	2	2	2	2	2	2	2	3				X	1-inch diam. well to be sampled with peristaltic pump.
21-MW15A	R	N,D						3	1	1	1	1	*	1	1	1	1	1	1	1	1	1	3				X	1-inch diam. well to be sampled with peristaltic pump.
Total:																							79				23	16
Site 227 - UST 227																								Diesel				
227-MW1	P	C																					4				X	
227-MW2	P	D							1	1	1	1	*	1	1	1	1	1	1	1	1	1	4			X		
227-MW3	P	C							1	1	1												4				X	
227-MW4	P	N,S							2	2	2	2	*	2	2	2	2	2	2	2	2	2	4		X			
227-MW5	P	N,D							2	2	2	2	*	2	2	2	2	2	2	2	2	2	4		X			
Total:									12	12	12	5	5	5	5	5	5	5	5	5	5	5	5	20	2	1	2	

**UPDATED TABLE 4-1
2001 DATA COLLECTION REQUIREMENTS
FACILITYWIDE GROUNDWATER MONITORING PROGRAM
NAVAL STATION TREASURE ISLAND**

Well No.	Monitoring Program	Well Type	Analytes of Concern (AOC) Data													Fate and Transport Data										Sampling Frequency				Comments
			Laboratory Analyses						Monitored Natural Attenuation (MNA)							Laboratory Analyses (see notes)		Field Measurement		Quarterly Sampling	Semi-Annual Sampling	Annual Sampling	Water Levels Only							
			Metals	PCBs	SVOCs	TPH-e	TPH-p	VOCs	Major Anions (Chloride & Sulfate)	Methane, Ethane, & Ethene	Nitrate	Sulfide	VOCs	Alkalinity	Iron (Fe ²⁺)	Manganese (Mn ²⁺)	Oxidation-Reduction Potential	Oxygen, dissolved	pH					Total Dissolved Solids	Total Suspended Solids	Water Level	Oil/Water Interface			
2001 Facilitywide Total:			137	48	148	230	230	256	89	89	89	89	89	89	89	89	89	89	89	73	137	682	26	23	78	25	57	40	95	

REMARKS:

- To minimize tidal influence, wells within 200 feet of the shore must have water level data collected within 3 hours of the onset of lower low tide; wells within 100 feet of the shore must also be sampled within 3 hours of the onset of lower low tide.
- All wells will be sampled with bladder pumps unless noted otherwise in the comments column.
- Laboratory analytical methods defined in 2001 QAPP addendum Table 2-1.
- In accordance with groundwater sampling procedures, groundwater temperature, pH, and conductivity measurements will be made with field equipment to ensure that samples are collected from representative formation water. Turbidity will also be measured with field equipment to monitor for particulate interference.

NOTES:

Monitoring Program	Sampling Information	Comments Column
P Petroleum program site	1 To be sampled/measured annually--October 2001.	MNA Monitored natural attenuation
R CERCLA program site	2 To be sampled/measured semi-annually--May/June and October 2001.	AOC Analyte of concern
R(p) CERCLA program site, petroleum subarea	4 To be sampled/measured quarterly--May/June, August, October, and December 2001.	
NA Not applicable	* Monitored natural attenuation VOC data to be collected from sampling for analytes of concern.	
	☐ Inactive well--no sampling or water level data required.	
Well Type	Analyte Information	
A Alternate well of same well-type available for sampling	Metals Metals, total	
C Cross-gradient well	PCBs Polychlorinated biphenyls	
D Down-gradient well	SVOCs Semivolatile organic compounds	
N New well (previously sampled less than four quarters)	TPH-e Total petroleum hydrocarbons - extractable (diesel range/motor oil range)	
RW Remediation well	TPH-p Total petroleum hydrocarbons - purgeable (gasoline range)	
S Source area well	TDS Total dissolved solids; collected with TSS only. Only sampled for in October 2001.	
U Up-gradient well	TSS Total suspended solids; always and only collected with metals samples, starting October 2001.	
NA, Not applicable	VOCs Volatile organic compounds	

QA/QC SAMPLES:

- Equipment Rinse: If non-dedicated, disposable tubing is used, one rinse per box of tubing used.
 Field Duplicate: One for every 10 wells sampled or portion thereof.
 Matrix Spike/Matrix Spike Duplicate: One for every 20 wells sampled or portion thereof.
 Source Water Blank: One per source per event, as necessary.
 Trip Blank: One per transport container containing samples for TPH-p or VOC analysis.

APPENDIX B

**UPDATED QUALITY ASSURANCE PROJECT PLAN TABLE 2-1
GROUNDWATER ANALYTICAL PROTOCOL**

**UPDATED TABLE 2-1
GROUNDWATER ANALYTICAL PROTOCOL
FACILITYWIDE GROUNDWATER MONITORING PROGRAM
NAVAL STATION TREASURE ISLAND**

Analysis	Method/ Reference	Sample Volume, Container	Extra MS/MSD Volume	Preservation	Analytical Holding Time
Off-Site Laboratory Analyses – Analytes of Concern Data					
Metals	CLP Metals – low level	One 500-mL polyethylene container	One 500-mL polyethylene container	Preserve with HNO ₃ to pH less than 2 and cool to 4 °C.	Hg: 28 days; Others: 6 months
PCBs	EPA 8082 – low level	Two 1-L amber glass containers	Four 1-L amber glass containers	Unpreserved. Cool to 4 °C.	7 days ¹
Semivolatile Organic Compounds	CLP SVOC – low level	Two 1-L amber glass containers	Four 1-L amber glass containers	Unpreserved. Cool to 4 °C.	7 days ¹
TPH-extractable (diesel and motor oil range)	EPA 8015B with silica gel cleanup	Two 1-L amber glass containers	Four 1-L amber glass containers	Unpreserved. Cool to 4 °C.	7 days ¹
TPH-purgeable (gasoline range)	EPA 8015B	Three 40-mL VOC vials	Three 40-mL VOC vials	Sample must be collected without headspace ² . Preserve with HCl to pH less than 2 and cool to 4 °C.	14 days (7 days if unpreserved)
Volatile Organic Compounds ³	EPA 8260B – low level	Three 40-mL VOC vials	Three 40-mL VOC vials	Sample must be collected without headspace ² . Preserve with HCl to pH less than 2 and cool to 4 °C.	14 days (7 days if unpreserved)

UPDATED TABLE 2-1 (Continued)
GROUNDWATER ANALYTICAL PROTOCOL
FACILITYWIDE GROUNDWATER MONITORING PROGRAM
NAVAL STATION TREASURE ISLAND

Analysis	Method/ Reference	Sample Volume, Container	Extra MS/MSD Volume	Preservation	Analytical Holding Time
Off-Site Laboratory Analyses – Monitored Natural Attenuation Data					
Major Anions (chloride and sulfate)	EPA 300.0	One 500-mL polyethylene container	One 500-mL polyethylene container	Unpreserved. Cool to 4 °C.	28 days
Methane, Ethane, and Ethene	RSK-175	Three 40-mL VOC vials	Three 40-mL VOC vials	Sample must be collected without headspace ² . Preserve with HCl to pH less than 2 and cool to 4 °C.	14 days
Nitrate	MCAWW Method 353.2/353.3	Two 40-mL VOC vials	Four 40-mL VOC vials	Preserve with H ₂ SO ₄ to pH less than 2 and cool to 4 °C.	28 days
Sulfide	EPA 376.1/376.2	One 500-mL polyethylene container	One 500-mL polyethylene container	Preserve with zinc acetate and sodium hydroxide (NaOH) to pH greater than 9 and cool to 4 °C.	28 days
Off-Site Laboratory Analyses – Total Solids Data					
Total Dissolved Solids	EPA 160.1 MCAWW	One 1-L polyethylene container	One 1-L polyethylene container	Unpreserved. Cool to 4 °C.	7 days
Total Suspended Solids ⁶	EPA 160.2 MCAWW	Volume can be provided from total dissolved solids sample container	Volume can be provided from total dissolved solids sample container	Unpreserved. Cool to 4 °C.	7 days

UPDATED TABLE 2-1 (Continued)
GROUNDWATER ANALYTICAL PROTOCOL
FACILITYWIDE GROUNDWATER MONITORING PROGRAM
NAVAL STATION TREASURE ISLAND

Analysis	Method/ Reference	Sample Volume, Container	Extra MS/MSD Volume	Preservation	Analytical Holding Time
Field Test Kit Analyses – Monitored Natural Attenuation Data					
Alkalinity	Hach Method #8203	One 1-L amber glass container (combined with manganese II and iron II)	Not applicable.	Unpreserved. Minimize contact with atmospheric oxygen: gently fill container and leave no headspace. Keep out of sunlight and analyze within 1 hour of collection.	Analyze as soon as possible.
Iron (II) (Fe ²⁺)	Hach Method #8146, Pocket Colorimeter	One 1-L amber glass container (combined with manganese II and alkalinity)	Not applicable.	Unpreserved. Minimize contact with atmospheric oxygen: gently fill container and leave no headspace. Filter if turbid ⁴ . Keep out of sunlight and analyze within 1 hour of collection.	Analyze as soon as possible.
Manganese (II) (Mn ²⁺)	Hach Method #8149	One 1-L amber glass container (combined with iron II and alkalinity)	Not applicable.	Unpreserved. Minimize contact with atmospheric oxygen: gently fill container and leave no headspace. Filter if turbid ⁴ . Keep out of sunlight and analyze within 1 hour of collection.	Analyze as soon as possible.

UPDATED TABLE 2-1 (Continued)
GROUNDWATER ANALYTICAL PROTOCOL
FACILITYWIDE GROUNDWATER MONITORING PROGRAM
NAVAL STATION TREASURE ISLAND

Analysis	Method/ Reference	Sample Volume, Container	Extra MS/MSD Volume	Preservation	Analytical Holding Time
Field Measurement⁵ – Monitored Natural Attenuation Data					
Dissolved Oxygen	Water quality meter.	Not applicable.	Not applicable.	Limit introduction of atmospheric oxygen during measurement.	Analyze immediately.
Oxidation-Reduction Potential	Water quality meter.	Not applicable.	Not applicable.	Time sensitive.	Analyze immediately.
pH	Water quality meter.	Not applicable.	Not applicable.	Time sensitive.	Analyze immediately.
Specific Conductance	Water quality meter.	Not applicable.	Not applicable.	Time sensitive.	Analyze immediately.
Temperature	Water quality meter.	Not applicable.	Not applicable.	Time sensitive.	Analyze immediately.
Turbidity	Water quality meter.	Not applicable.	Not applicable.	Time sensitive.	Analyze immediately.

Notes:

- 1 Seven days to extraction, 40 days from extraction to analysis.
- 2 In rare cases, groundwater may react with the hydrochloric acid (HCl) preservative in the sample container, preventing collection of preserved sample without bubbles. In these cases, VOC, MEE, and TPH-p samples will be collected in unpreserved sample vials, and field staff will record on the well sampling sheet and chain-of-custody that groundwater from the well had reacted with the HCl preservative and that an unpreserved sample was collected and submitted for prompt laboratory analysis.
- 3 Includes analysis for Isopropylbenzene (Cumene).
- 4 Where formation water exhibits turbidity greater than 100 nephelometric turbidity units, Iron (II) and Manganese (II) samples will be filtered with a 0.45-micron filter prior to analysis.
- 5 Field data to be measured with YSI Inc. multi-parameter water quality analyzer and flowcell, model 6820 or equivalent.
- 6 ~~Sample bottle should be filled immediately after filling of metals sample bottle.~~

CLP Contract Laboratory Program
EPA U.S. Environmental Protection Agency
Hach The Hach Company (Hach 1997)
H₂SO₄ Sulfuric acid
HCl Hydrochloric acid
HNO₃ Nitric acid
L Liter

mL Milliliter
MCAWW Methods for chemical analysis of water and waste
MS/MSD Matrix spike/matrix spike duplicate. Identified volumes to be collected in addition to those for the original sample.
TPH Total petroleum hydrocarbons
SVOC Semivolatile organic compound
VOC Volatile organic compound