

**COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY**  
**Northern and Central California, Nevada, and Utah**  
**Contract Number N62474-94-D-7609**  
**Contract Task Order 242**

**Prepared For**

**DEPARTMENT OF THE NAVY**  
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**Naval Facilities Engineering Command**  
**San Bruno, California**

**ADDITIONAL DIOXIN CHARACTERIZATION**  
**SITE 12 - OLD BUNKER AREA**

**TECHNICAL MEMORANDUM**

**NAVAL STATION TREASURE ISLAND**  
**SAN FRANCISCO, CALIFORNIA**

**FINAL**

**April 19, 1999**

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**RESPONSES TO REGULATORY COMMENTS**

**RESPONSE TO AGENCY COMMENTS ON  
DRAFT ADDITIONAL DIOXIN CHARACTERIZATION  
SITE 12 - OLD BUNKER AREA TECHNICAL MEMORANDUM**

This document presents the Navy's responses to comments from the Department of Toxic Substances Control (DTSC) on the Draft Additional Dioxin Characterization Site 12 - Old Bunker Area Technical Memorandum, dated January 7, 1999. The comments addressed below were received from DTSC on March 29, 1999.

**RESPONSES TO DTSC COMMENTS**

**Specific Comments**

1. **Comment:** Page 2, Section 3.0, Objectives. This section indicates that the additional dioxin sampling at Site 12 was to characterize the vertical distribution of dioxins in soil. After reviewing the results presented in Section 5.0 and the Borelogs presented in the Appendix, DTSC has concluded that the sampling did not accomplish this objective. For example, boring log 12-HP184 indicates the presence of glass pieces, wood, and bits of metal at approximately 5 feet and also indicates that the boring met with resistance at approximately 6 feet and was then terminated. The presence of this type of debris at depths greater than the deepest sample collected indicates that contamination is certainly possible at depths below the depths sampled thus far. Based on this information, DTSC believes that further sampling needs to be considered to characterize the vertical extent of dioxin contamination at Site 12 between the Navy, DTSC, and the City of San Francisco; yet nothing further has been proposed as a result of those discussions.

**Please describe what further measures are being planned to characterize the vertical extent of dioxin contamination at Site 12 and include a proposed schedule for review.**

- Response:** The Navy concurs with the comment. The Navy is preparing a sampling plan to collect four additional samples to complete characterization of the vertical extent of dioxin contamination at Site 12. A schedule for sampling collection and analysis will be provided for review as planning proceeds.

2. **Comment:** Page 6, Section 6.0, Risk Characterization and Discussion. The Navy has provided estimates of excess cancer risk for a residential scenario by comparing the equivalent concentrations to the U.S. EPA Region IX Preliminary Remediation Goal for 2,3,7,8-tetrachloro-dibenzo-p-dioxin. Please also provide risk estimates based on the DTSC standard default parameters.

**Response:** The cancer risks presented in Table 2 of Section 6.0 of the "Draft Additional Dioxin Characterization Site 12 - Old Bunker Area Technical Memorandum" were provided as a screening level assessment to complement the comparison to the U.S. Environmental Protection Agency (EPA) Region 9 preliminary remediation goals (PRGs) presented in the text of Section 6.0. Based on a memorandum from DTSC to the Office of Military Facilities, "Recommended Outline for Using U.S. Environmental Protection Agency Region IX Preliminary Remediation Goals in Screening Risk Assessments at Military Facilities" (DTSC 1994), EPA Region 9 PRGs may be used for screening sites at military bases in California. Where California-modified PRGs are available, this memorandum recommends that they be used in lieu of EPA Region 9 PRGs; however, a Cal-modified PRG is not available for 2,3,7,8-TCDD. Consequently, the screening level risk estimates presented in Section 6 are based on EPA PRGs and do not include DTSC standard default parameters. An evaluation using DTSC standard default parameters will be presented in the baseline human health risk assessment for Site 12 as requested by DTSC.

#### Reference

Department of Toxic Substances Control. 1994. Memorandum Regarding Recommended Outline for Using U.S. Environmental Protection Agency Region IX Preliminary Remediation Goals in Screening Risk Assessments at Military Facilities. From Michael J. Wade, Senior Toxicologist. To Ken Smith, Office of Military Facilities. October 28.

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## 1.0 INTRODUCTION

Tetra Tech EM Inc. (TtEMI), formerly known as PRC Environmental Management, Inc. (PRC), received Contract Task Order (CTO) No. 242 under the Comprehensive Long-Term Environmental Action Navy Contract No. N62474-94-D-7609 (CLEAN II) from the Department of the Navy, Naval Facilities Engineering Command, Engineering Field Activity West (EFA WEST). CTO 242 requires TtEMI to perform additional dioxin and petroleum hydrocarbon sampling at Installation Restoration Site 12, the Old Bunker Area, at Naval Station Treasure Island (NAVSTA TI), San Francisco, California. This report summarizes the results of the additional dioxin sampling of Site 12 soils. The following sections provide the background, objectives, methods, results, and risk characterization of the dioxin sampling. The figure and tables cited in the text follow the list of references cited.

## 2.0 BACKGROUND

NAVSTA TI lies in San Francisco Bay, midway between San Francisco and Oakland, California. The facility consists of two contiguous islands; the northern island is Treasure Island (TI), which is approximately 403 acres, and the southern island is Yerba Buena Island (YBI), which is approximately 147 acres. TI is a manmade island constructed primarily of sediments dredged from San Francisco Bay; YBI is a natural island. In 1993, NAVSTA TI was designated for closure under the Base Realignment and Closure Act of 1990. The base was closed on September 30, 1997, and the property is in the process of being transferred to the City of San Francisco (City).

Site 12, the Old Bunker Area, is located on the northern portion of TI and includes areas of housing that the City plans to lease. From the 1940s to the 1960s, ammunition was stored in bunkers located within the site. A review of historical aerial photographs indicates that debris was disposed of in areas between the bunkers and other portions of Site 12 (U.S. Environmental Protection Agency [EPA] 1995).

A remedial investigation (RI) was conducted at Site 12 to investigate potential contamination associated with historical activities at the site. The primary objective of the RI at Site 12 was to assess the nature and extent of potential soil and groundwater contamination near the debris disposal areas, the former ammunition bunker areas, the former oil underground storage tank (UST), the former incinerator, and

other suspected or known areas of contamination. Soil and groundwater samples were collected in the vicinity of the suspected sources to delineate the extent of localized contamination (PRC 1997). The objectives of the RI were developed based on the land use assumptions in the City of San Francisco's original reuse plan, which designated future use of Site 12 as a wetland area or recreational park. However, the reuse plan was later revised and currently designates the Site 12 area for residential use (San Francisco Redevelopment Agency 1996). Because it was assumed that there may be greater potential for exposure to site contamination under the residential land use scenario, additional site characterization was conducted in the fall of 1997 at areas that were not investigated during the RI.

During the RI, seven soil samples were collected at depths of 3.25 to 5.25 feet below ground surface (bgs) at Site 12 and analyzed for dioxins. Shallow soil samples were not collected and analyzed for dioxins because historical information indicated that approximately the top 2 feet of soil at Site 12 may have been imported and placed as fill in preparation for housing construction (McCreary Koretsky Engineers 1965). Two of the seven soil samples contained measurable levels of dioxins. Both samples were located within a former debris disposal area near Westside Drive. Shallow soil sampling (1.3 feet bgs) conducted by the City in February 1998 confirmed the presence of dioxins in the vicinity of the former debris disposal area where dioxins were previously detected. The City also analyzed soil samples for dioxins from locations not previously targeted for dioxin sampling. At these locations, dioxins were detected at concentrations similar to or below the EPA-estimated background concentration for dioxins in soil (Geomatrix Consultants 1998). Because the City plans to lease housing within Site 12, the Department of Toxic Substances Control recommended that the Navy perform additional dioxin characterization of soils at Site 12.

### **3.0 OBJECTIVES**

The objectives of the additional dioxin sampling at Site 12 were to:

- Characterize the vertical distribution of dioxins in soil where it was previously detected
- Characterize the lateral extent of dioxins in soil at the debris disposal area near Westside Drive
- Provide a robust set of dioxin data for risk calculation

- Determine if dioxins are present in soils at two small debris disposal areas in the northern portion of the site and a suspected burn pit identified on historical aerial photographs (EPA 1995)

Table 1 summarizes the rationale for sampling at each boring location.

#### 4.0 METHODS

All field sampling activities for the additional dioxin sampling at Site 12 followed the additional characterization of dioxins field sampling plan addendum (TtEMI 1998). To accomplish the objectives of the additional dioxin characterization, 24 soil samples were collected from 15 Geoprobe boring locations (Figure 1). Soil samples were collected with a Geoprobe rig using a 4-foot-long, 1.5-inch-diameter Geoprobe sampling spoon with an acetate liner. Discrete soil samples were collected by cutting the acetate liner and capping the ends with Teflon sheets and plastic caps.

At most locations, soil samples were collected near the ground surface to characterize the shallow soil (0 to 2 feet bgs) and at the capillary fringe to characterize soils deeper than 2 feet. At sample locations 2, 14, and 15 (Figure 1), soil samples were not analyzed near the capillary fringe because groundwater was encountered at approximately 2 feet bgs. Geoprobe soil samples were submitted to a certified laboratory and analyzed for dioxins using EPA Method 8290. The headspace of soil samples was also screened with a flame ionization detector (FID) equipped with a carbon filter to measure the presence of methane gas. In addition, the top of the Geoprobe borehole was monitored for methane gas with the FID. The field sampling plan addendum (TtEMI 1998) provides additional details and rationale for methodology.

#### 5.0 RESULTS

The following sections summarize dioxin soil results by the six areas investigated (boring 12-HP118, debris disposal areas A, B, C, and D, and a suspected burn pit) (Figure 1). All dioxin soil results are reported as the calculated 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalents (TEQ) in picograms per gram ( $\mu\text{g/g}$ ). A 2,3,7,8-TCDD TEQ is calculated by multiplying the concentration of an individual dioxin or furan congener by its corresponding toxicity equivalency factor (TEF). The TEF for

2,3,7,8-TCDD is defined as unity (1.0); TEFs for all other dioxins and furans are less than 1.0, accounting for the lower potency of the other dioxin and furan congeners (EPA 1989). The 2,3,7,8-TCDD TEQ concentrations reported in this memorandum represent the sum of 2,3,7,8-TCDD TEQs for all congeners detected in a single soil sample. Figure 1 and Table 2 summarize the dioxin soil sampling results. The lithologic boring logs which include the FID readings for each location are presented in the appendix.

### **Boring 12-HP118 Area Results**

At previous boring 12-HP118, a dioxin concentration (2,3,7,8-TCDD TEQ) was detected in shallow soils (1.3 feet bgs) at 10.4  $\mu\text{g/g}$ . The additional sample collected at a depth of 1.75 feet bgs at this location (sample location 1) had a concentration of 0.85  $\mu\text{g/g}$ . The additional sample collected 50 feet north of 12-HP118 (sample location 2) at a depth of 0.5 feet bgs had a concentration of 0.9  $\mu\text{g/g}$ .

### **Debris Disposal Area A Results**

Within debris disposal area A, dioxin was previously detected in shallow soils at concentrations up to 47.4  $\mu\text{g/g}$  (12-HP133). Analytical results for the additional samples collected within the debris disposal area showed dioxin concentrations up to 139  $\mu\text{g/g}$  in shallow soil and 188.6  $\mu\text{g/g}$  in deeper soil (3.25 feet bgs) (sample location 4). Results of additional sampling outside debris disposal area A indicate that dioxin concentrations decrease laterally from 4.8  $\mu\text{g/g}$  in shallow soils (sample location 6) to 0.69  $\mu\text{g/g}$  in deeper soils (sample location 3) (Figure 1).

### **Debris Disposal Area B Results**

Soil sampling and analysis for dioxins were not previously performed in debris disposal area B. Soil sampling within the debris disposal area detected dioxin concentrations of 16.7  $\mu\text{g/g}$  in shallow soil and 3.5  $\mu\text{g/g}$  at depth (sample location 11). Results of additional sampling outside debris disposal area B indicate that dioxin concentrations decrease laterally to 6.3  $\mu\text{g/g}$  in shallow soils at sample location 10. A concentration of 12  $\mu\text{g/g}$  was detected in deeper soils at sample location 10 while a concentration of only 0.9  $\mu\text{g/g}$  was detected in the deep sample from location 12 (Figure 1).

### **Suspected Burn Pit Results**

Soil sampling and analysis for dioxins were not previously performed in the suspected burn pit. Results of soil sampling within the suspected burn pit showed dioxin concentrations of 50.5  $\mu\text{g/g}$  in shallow soils (0.5 feet bgs) and 57.5  $\mu\text{g/g}$  with depth (2.5 feet bgs) (sample location 13) (Figure 1). Additional sampling outside the area was not performed since the purpose of the sampling was to characterize potential dioxin levels within the suspected former burn pit identified in a 1947 aerial photograph (EPA 1995).

### **Debris Disposal Area C Results**

Soil sampling and analysis for dioxins were not previously performed in debris disposal area C. Results of soil sampling within the suspected debris disposal area showed dioxin concentrations of 3.3  $\mu\text{g/g}$  in shallow soils (0.25 feet bgs) (sample location 14) (Figure 1). A capillary fringe sample was not collected at this location due to the occurrence of groundwater at a shallow depth. Additional sampling immediately outside the suspected disposal area was not performed since the purpose of the sampling was to characterize potential dioxin levels within the suspected debris disposal area identified in a 1950 aerial photograph (EPA 1995). However, results of previous soil sampling approximately 100 feet south of debris disposal area C indicate that dioxin concentrations decrease laterally to 0.5  $\mu\text{g/g}$  in shallow soil (borings 12-MW03 and 12-HP163) (Figure 1).

### **Debris Disposal Area D Results**

Soil sampling and analysis for dioxins were not previously performed in debris disposal area D. Results of soil sampling within the suspected debris disposal area showed dioxin concentrations of 0.71  $\mu\text{g/g}$  in shallow soils (0.25 feet bgs) (sample location 15) (Figure 1). The occurrence of groundwater at a shallow depth at this location precluded collection of a deeper sample. Results of previous soil sampling immediately east of debris disposal area D indicated a dioxin concentration of 1.3  $\mu\text{g/g}$  in shallow soil (boring 12-MW02) (Figure 1).

## Headspace Sampling Results

Headspace readings were collected from vadose zone soil samples using a FID equipped with a carbon filter. The carbon filter is designed to filter out volatile organics except methane so that the resulting readings represent methane concentrations. Readings were also taken at each borehole. The headspace readings from vadose zone soil samples ranged from 0 to 100 parts per million (ppm). Readings from the borehole ranged from 0 to greater than 3,000 ppm. The highest readings were detected within debris disposal area A (12-HP187 and 12-HP189) and within the suspected burn pit area (12-HP193). Table 3 presents the FID readings for each location.

## 6.0 RISK CHARACTERIZATION AND DISCUSSION

Site 12 dioxin concentrations (2,3,7,8-TCDD TEQ) were compared to the EPA Region 9 residential preliminary remediation goal (PRG) for 2,3,7,8-TCDD of 3.8  $\mu\text{g/g}$  (EPA 1998). The calculated 2,3,7,8-TCDD TEQ was greater than the residential PRG for 11 of 24 soil samples collected during the additional dioxin characterization at Site 12. However, because the PRG for 2,3,7,8-TCDD corresponds to a risk of  $1 \times 10^{-6}$ , the cancer risk associated with a concentration that exceeds the PRG may still be within EPA's target risk range of  $10^{-4}$  to  $10^{-6}$ .

The cancer risks associated with potential residential exposure to dioxins detected at Site 12 were calculated based on the ratio of the total 2,3,7,8-TCDD TEQ for each sample to the residential soil PRG for 2,3,7,8-TCDD. The calculated risks associated with potential residential exposure to the 11 dioxin concentrations that exceeded the PRG were within EPA's target risk range. The risks associated with dioxin concentrations in the remaining 13 samples were below  $10^{-6}$ , and no calculated cancer risks exceeded  $10^{-4}$ . The calculated cancer risk for each sample is presented in Table 2. The results of the additional dioxin sampling effort will be incorporated into the final baseline human health risk assessment for Site 12 in the draft final operable unit 12 RI report.

## REFERENCES

- Geomatrix Consultants. 1998. "Results of Additional Soil Sampling, Installation Restoration Site 12, Treasure Island Naval Base, San Francisco, California." March 13.
- McCreary Koretsky Engineers. 1965. "Soils and Foundation Investigation for Appropriated Fund Quarters Fiscal Year 1966, at U.S. Naval Station, Treasure Island, San Francisco, California." December 7.
- PRC Environmental Management, Inc. 1997. "Draft Final Onshore Remedial Investigation Report, Naval Station Treasure Island, California." September.
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- Tetra Tech EM Inc. 1998. "Final Additional Characterization of Dioxins, Site 12 - Old Bunker Area, Field Sampling Plan Addendum, Naval Station Treasure Island, California." August 11.
- U.S. Environmental Protection Agency. (EPA). 1989. "Interim Procedures for Estimating Risks Associated with Exposure to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs)." EPA/625/3-89/16.
- EPA. 1995. "Aerial Photographic Analysis of Naval Station Treasure Island, San Francisco Bay, California." Characterization Research Division. Report No. TS-PIC-95707. June.
- EPA. 1998. Memorandum Regarding Region 9 Preliminary Remediation Goals. From Stanford J. Smucker, Regional Toxicologist. To Preliminary Remediation Goal Mailing List.

**FIGURE**

FIGURE 1 – PREVIOUS AND RECENT DIOXIN SOIL RESULTS

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EXTENSIVE RESEARCH WAS PERFORMED BY NAVFAC  
SOUTHWEST RECORDS OFFICE TO LOCATE THE MISSING  
FIGURE. THIS PAGE HAS BEEN INSERTED AS A  
PLACEHOLDER AND WILL BE REPLACED SHOULD THE  
MISSING ITEM BE LOCATED.

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**TABLES**

TABLE 1

SUMMARY OF SOIL SAMPLING LOCATIONS AND RATIONALE

Sample Location <sup>a</sup>	Boring Number	Sample Depth(s)	Rationale
1	12-HP181	Capillary fringe	Characterize potential vertical distribution of dioxins detected in shallow soils at boring 12-HP118
2	12-HP182	0.5 feet	Determine potential lateral extent of dioxins detected in shallow soils at boring 12-HP118
3	12-HP183	0.5 feet Capillary fringe	Determine potential lateral extent of dioxins south of debris disposal area on Westside Drive
4	12-HP184	0.5 feet capillary fringe	Characterize potential dioxin levels within southern portion of debris disposal area on Westside Drive
5	12-HP186	0.5 feet	Characterize potential vertical distribution of dioxins detected in deeper soils at boring 12-HP010
6	12-HP185	0.5 feet Capillary fringe	Determine potential lateral extent of dioxins southeast of debris disposal area on Westside Drive
7	12-HP188	0.5 feet Capillary fringe	Determine potential lateral extent of dioxins east of debris disposal area on Westside Drive
8	12-HP187	0.5 feet Capillary fringe	Characterize potential dioxin levels within middle of debris disposal area on Westside Drive
9	12-HP189	Capillary fringe	Characterize potential vertical distribution of dioxins detected in shallow soils of boring 12-HP138
10	12-HP190	0.5 feet Capillary fringe	Determine potential lateral extent of dioxins east of debris disposal area
11	12-HP191	0.5 feet Capillary fringe	Characterize potential dioxin levels within debris disposal area north of Lester Court
12	12-HP192	0.5 feet Capillary fringe	Determine potential lateral extent of dioxins northeast of debris disposal area north of Lester Court
13	12-HP193	0.5 feet Capillary fringe	Characterize potential dioxins at suspected burn pit identified on 1947 aerial photograph
14	12-HP194	0.5 feet	Characterize potential dioxins at debris disposal area identified on 1950 aerial photograph
15	12-HP195	0.5 feet	Characterize potential dioxins in soil at debris disposal area identified on 1963 aerial photograph

Note:

a See Figure 1 for sample location

**TABLE 2**  
**SUMMARY OF DIOXIN SOIL SAMPLE RESULTS**

Sample Location	Boring Number	Sample Depth (Feet bgs)	2,3,7,8-TCDD TEQ (pg/g)	Cancer Risk <sup>a</sup>
1	12-HP181	1.75 - 2.25	0.85	2.2E-07
2	12-HP182	0.5 - 1.0	0.9	2.4E-07
3	12-HP183	0.75 - 1.25	3.7	9.7E-07
3	12-HP183	2.0 - 2.5	0.69	1.8E-07
4	12-HP184	0.5 - 1.0	139	3.7E-05
4	12-HP184	3.25 - 3.75	188.6	5.0E-05
5	12-HP186	0.75 - 1.25	132.6	3.5E-05
6	12-HP185	0.5 - 1.0	4.8	1.3E-06
6	12-HP185	2.5 - 3.0	0.39	1.0E-07
7	12-HP188	0.5 - 1.0	1.5	3.9E-07
7	12-HP188	2.0 - 2.5	0.56	1.5E-07
8	12-HP187	0.5 - 1.0	3.3	8.7E-07
8	12-HP187	3.25 - 3.75	86.1	2.3E-05
9	12-HP189	3.5 - 4.0	1.4	3.7E-07
10	12-HP190	0.5 - 1.0	6.3	1.7E-06
10	12-HP190	3.5 - 4.0	12.0	3.2E-06
11	12-HP191	0.5 - 1.0	16.7	4.4E-06
11	12-HP191	3.0 - 3.5	3.5	9.2E-07
12	12-HP192	0.5 - 1.0	4.8	1.3E-06
12	12-HP192	3.25 - 3.75	0.92	2.4E-07
13	12-HP193	0.5 - 1.0	50.5	1.3E-05
13	12-HP193	2.5 - 3.0	57.5	1.5E-05
14	12-HP194	0.25 - 0.75	3.3	8.7E-07
15	12-HP195	0.25 - 0.75	0.71	1.9E-07

Notes:

a The cancer risk was calculated using the residential preliminary remediation goal for TCDD (3.8 pg/g) (EPA 1998).

bgs Below ground surface

pg/g Picogram per gram

TCDD Tetrachlorodibenzo-p-dioxin

TEQ Toxicity equivalents

**TABLE 3**  
**SUMMARY OF FLAME IONIZATION DETECTOR (FID) RESULTS**

Sample Location	Boring Number	Sample Depth(s) (Feet bgs)	FID w/Filter Concentration (ppm)
1	12-HP181	Borehole	0
		1.75	0
		2.50	0
2	12-HP182	Borehole	2
		1.75	0
		2.50	0
3	12-HP183	Borehole	100
		1.50	10
4	12-HP184	Borehole	5
		1.25	0
		3.75	50
5	12-HP185	Borehole	8
		2.00	0
6	12-HP186	Borehole	1
		3.00	0
7	12-HP187	Borehole	1,000
		3.75	100
8	12-HP188	Borehole	8
		1.75	1
9	12-HP189	Borehole	700
		2.75	0
10	12-HP190	Borehole	6
		3.25	0
11	12-HP191	Borehole	4
		2.75	3
12	12-HP192	Borehole	90
		2.75	0
13	12-HP193	Borehole	3,000
		1.25	0
		3.50	10
14	12-HP194	Borehole	1
		1.25	0
15	12-HP195	Borehole	0
		2.00	0

Notes:

bgs    Below ground surface  
ppm    Parts per million

**APPENDIX**  
**BORELOGS**

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242W002	9:05	0/NA	40/48	0		SM SP	SILTY SAND, brown, dry, with root material and some gravel
		0/NA		1			Poorly graded SAND, yellowish brown (10 IR 5/4), moist, fine- to medium-grained, subrounded to subangular
		0/NA		2		▼	Moisture content increases from wet to saturated  Trace amounts of shell fragments
							Total Depth of Boring = 4 feet bgs
				3			
				4			
				5			
				6			
				7			
				8			
				9			
				10			

Water Table  Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 Inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>4 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>2.25 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>	

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242WW003	9:25	0/NA	37/48	1		SM	SILTY SAND with root material
242WW004	9:35	0/NA		2		SP	Poorly graded SAND, yellowish brown (10YR 5/4), moist to wet, fine- to medium-grained, subrounded to subangular, shell fragments (trace amounts) throughout
		0/NA		3			Moisture content increases from wet to saturated
		0/NA		4			
				5			
				6			
				7			
				8			
				9			
				10			

Total Depth of Boring = 4 feet bgs

<input type="checkbox"/> Water Table <input checked="" type="checkbox"/> Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 Inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>4 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>2.25 Feet bgs</u>
	DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
		100/NA				AS	Asphalt
						GM	SILTY GRAVEL
242WW005	9:50		35/48	1		CL	SILTY CLAY, dark gray (10YR 4/1)
242WW006	10:00	10/NA		2			SILTY CLAY, reddish brown (5YR 4/3), with trace amounts of pebbles, color changes to dark gray (10YR 4/1)
				3			
				4		SM	SILTY SAND, dark grayish brown (10YR 4/2)
							Total Depth of Boring = 4 feet bgs
				5			
				6			
				7			
				8			
				9			
				10			

<input type="checkbox"/> Water Table <input checked="" type="checkbox"/> Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>089-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 Inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>4 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>2.5 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>	

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242W007	10:10	5/NA	36/48	1		SM	SILTY SAND, reddish brown (5YR 4/3), with root material
242W005	10:20	50/NA	8/24	4			<p>Color changes to grayish brown (10YR 4/2)</p> <p>Moisture content increases to moist, color changes to reddish brown (5YR 4/3), with broken glass</p> <p>Color changes to black (10YR 2/1), petroleum odor</p> <p>Glass pieces, wood, bits of metal throughout 3.5 to 5.25 feet bgs</p> <p>Hit resistance, forced to stop boring</p> <p>Total Depth of Boring = 6 feet bgs</p>

Water Table Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 Inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>6 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>4.5 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>	

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242WW015	12:05	8/14	33/48	1		SM	SILTY SAND, brown (10YR 4/3), with roots
242WW016	12:30	8/14		2		SP	Poorly graded SAND, yellowish brown (10YR 5/4), fine- to medium-grained
				3			Moisture content increases from wet to saturated, trace amounts of shells
							Total Depth of Boring = 4 feet bgs

<input type="checkbox"/> Water Table <input checked="" type="checkbox"/> Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 Inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>4 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>3.25 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>	

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242W009	10:55	NA	30/48	0-1		SM	SILTY SAND, brown (10YR 4/3), root material, dry
				1-2		SP	Poorly graded SAND, yellowish brown (10YR 5/4), fine- to medium-grained, with trace amounts of broken glass, clay ball
242W010	11:10	NA	6/48	3-4		SW	well-graded SAND, color changes to black (10YR 2/1), medium- to coarse-grained, with trace amounts of broken glass, moisture content increases from moist to wet
				4-8			Poor recovery from 4- to 8-foot interval, unable to sample
				8-10			Estimated from outside of acetate liner
							Total Depth of Boring = 8 feet bgs

Water Table Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 Inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>8 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>5.5 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>	

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242WW011	11:25	1000/NA	26/46	1		SM	SILTY SAND, brown (10YR 4/3), with root material
						SP	Poorly graded SAND, yellowish brown (10YR 5/4), dry, fine- to medium-grained
242WW012	11:35	100/NA	24/48	3		SW	Well-graded SAND, very dark gray (10YR 3/1), wet, fine- to coarse-grained, with trace amounts of broken glass
						SP	Poorly graded SAND, grayish brown (10YR 5/2), fine- to medium-grained, increase in shells
				4			Color changes to grayish brown (10YR 5/2)
				5			Trace clay balls
				6			Color changes to dark gray
				7			
				8			Total Depth of Boring = 8 feet bgs

<input checked="" type="checkbox"/> Water Table <input checked="" type="checkbox"/> Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul H. Bser</u>	BORING DIAMETER <u>1.5 Inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>8 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>5 Feet bgs</u>
	DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242WW013	12:10	8/NA	34/48	1		SM	SILTY SAND, brown (10YR 4/3)
242WW014	12:15	8/NA		2		SP	Poorly graded SAND, yellowish brown (10YR 5/4), moist, fine- to medium-grained
				3		SW	well-graded SAND, yellowish brown (10YR 5/4), fine- to coarse-grained, with trace amounts of shell fragments
Total Depth of Boring = 4 feet bgs							

Water Table

Lab Sample

PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 inches</u>
DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>4 Feet bgs</u>
DRILLER <u>Fast Tek</u>	WATER LEVEL <u>2.75 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242WW017	12:45	TOC/NA	33/48	1		SM	SILTY SAND, brown (10YR 4/3), with grass roots
						SP	Poortly graded SAND, yellowish brown (10YR 5/4), fine- to medium-grained
242WW018	12:50	G/NA		4			
			13/48				Color changes to black (10YR 2/1), piece of wood blocking shoe--causes poor recovery
				5			Estimated from outside of acetate liner
							Total Depth of Boring = 8 feet bgs

<input checked="" type="checkbox"/> Water Table <input checked="" type="checkbox"/> Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>8 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>5.5 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>	

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242WW019	13:15	6/NA	30/48	1		SM	SILTY SAND, brown (10YR 4/3), with roots
				2		SP	Poorly graded SAND, yellowish brown (10YR 5/4), dry, fine- to medium-grained
				3			
242WW020	13:20	0/NA		4		SW	well-graded SAND, yellowish brown (10YR 5/4), wet, fine- to coarse-grained
			35/48	5			
				6			
				7			
				8			
				9			
				10			

Total Depth of Boring = 8 feet bgs

Water Table Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 Inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>8 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>4.5 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>	

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242WW021	13:40	4/11A	30.45	0		SM	SILTY SAND, grayish brown (10YR 5/2)
				1			
				2			
242WW022	13:45	3/11A		3		SP	Poorly graded SAND, yellowish brown (10YR 5/4), fine- to medium-grained  Some clay balls
				4			
				5			
				6			
				7			
				8			
				9			
				10			

Total Depth of Boring = 4 feet bgs

 Water Table   Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 Inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>4 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>3.75 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>	

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242WW023	14:00	96/NA	37/48	1		SM	SILT? SAND, brown (10YR 5/3)
242WW024	14:05	0/NA	36/48	3		SP	Poorly graded SAND, yellowish brown (10YR 5/4), fine- to medium-grained, dry, with trace amounts of shell fragments
				4		SW	well-graded SAND, gray (10YR 5/1), trace amount of coarse-grained pebbles
				6		GW	GRAVEL, gray (10YR 5/1), subangular to angular
				7			yellowish rock stuck in end of shoe, prevents recovery from 7 to 8 feet
							Total Depth of Boring = 8 feet bgs

- Water Table
- Lab Sample

PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 Inches</u>
DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>8 Feet bgs</u>
DRILLER <u>Fast Tek</u>	WATER LEVEL <u>4.5 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242WW025	14:25	3000/NA	33/46	0		SM	SILTY SAND, brown (10YR 4/3), with root material
		0/NA		1		SW	Well-graded SAND, dark gray (10YR 4/1), fine- to coarse-grained, subangular to subrounded  Color changes to dark grayish brown (10YR 4/2), grain size increases to more coarse-grained sand, with traces of pebbles
242WW026	14:30	10/14		3			Color changes to very dark gray (10YR 3/1), saturated, possible staining, faint odor
							Total Depth of Boring = 4 feet bgs

Water Table  Lab Sample	PROJECT <u>Naval Station Treasure Island</u>	SAMPLING METHOD <u>NA</u>
	LOCATION <u>IR Site 12</u>	GROUND ELEVATION <u>NA</u>
	JOB NUMBER <u>069-242B05</u>	TOC ELEVATION <u>NA</u>
	LOGGED BY <u>Paul Hibser</u>	BORING DIAMETER <u>1.5 Inches</u>
	DATE DRILLED <u>8/17/98</u>	TOTAL DEPTH OF HOLE <u>4 Feet bgs</u>
	DRILLER <u>Fast Tek</u>	WATER LEVEL <u>3.25 Feet bgs</u>
DRILL METHOD <u>Geoprobe</u>	WELL INSTALLED? (Y/N) <u>N</u>	

Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242WW027	14:50	NA	3/48	0		SM	SILTY SAND, brown (10YR 4/3)
		G/NA		1		SW	well-graded SAND, yellowish brown (10YR 5/4), fine- to coarse-grained, with traces of subangular gravel
242WW028	14:55			2			
				3			
				4			
				5			
				6			
				7			
				8			
				9			
				10			

Total Depth of Boring = 4 feet bgs

 Water Table  Lab Sample	PROJECT <u>Naval Station Treasure Island</u> LOCATION <u>IR Site 12</u> JOB NUMBER <u>069-242B05</u> LOGGED BY <u>Paul Hibser</u> DATE DRILLED <u>8/17/98</u> DRILLER <u>Fast Tek</u> DRILL METHOD <u>Geoprobe</u>	SAMPLING METHOD <u>NA</u> GROUND ELEVATION <u>NA</u> TOC ELEVATION <u>NA</u> BORING DIAMETER <u>1.5 Inches</u> TOTAL DEPTH OF HOLE <u>4 Feet bgs</u> WATER LEVEL <u>2.5 Feet bgs</u> WELL INSTALLED? (Y/N) <u>N</u>
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Sample ID	Sample Time	FID/PID (ppm)	Inch Rec./Drv.	Depth (ft)	Sample Interval Graphic Log	USCS Code	MATERIALS DESCRIPTION
242ww029	1510	0/11A	20-48	0		SM	SILTY SAND, brown (10 IR 4/3)
242ww030	1515	0/11A		1		SW	well-graded SAND, grayish brown (10 IR 5/2), fine- to coarse-grained
				2			
				3			
				4			
				5			
				6			
				7			
				8			
				9			
				10			

Total Depth of Boring = 4 feet bgs

Water Table

Lab Sample

**PROJECT** Naval Station Treasure Island      **SAMPLING METHOD** NA  
**LOCATION** IR Site 12      **GROUND ELEVATION** NA  
**JOB NUMBER** 069-242B05      **TOC ELEVATION** NA  
**LOGGED BY** Paul Hibser      **BORING DIAMETER** 1.5 inches  
**DATE DRILLED** 6/17/98      **TOTAL DEPTH OF HOLE** 4 Feet bgs  
**DRILLER** Fast Tek      **WATER LEVEL** 1.75 Feet bgs  
**DRILL METHOD** Geoprobe      **WELL INSTALLED? (Y/N)** N