N00221_000390
MARE ISLAND
SSIC NO. 5090.3.A

Report

PRELIMINARY INVESTIGATION
LEAD CONTAMINATION

Mare Island Naval Shipyard

September 1985

390

September 17, 1985

AQUA TERRA Technologies

Mr. Ralph M. Lee, P.E.
Environmental Engineer
Public Works Department
Code 445, Stop Ø32
Mare Island Naval Shipyard
Vallejo, CA 94592

Subject: Preliminary Evaluation - Potential Lead Contamination of Groundwater

Dear Mr. Lee:

Aqua Terra Technologies' report describing results of our preliminary investigation of potential groundwater contamination by lead is attached. Services were provided under Contract N62474-85-C-Ø221.

The report summarizes observations made during our site reconnaissance and presents results and interpretation of groundwater analyses. Because lead contamination was detected at variable levels in four of the five locations sampled, recommendations for subsequent action are provided in the report.

We plan to review the contents of the report with you at our meeting on September 19, 1985, as we discussed. If you have any questions prior to our meeting, please telephone.

Sincerely,

Aqua Terra Technologies, Inc.

R. Wane Schneiter, Ph.D., P.E.
Project Manager

RWS:lg
Attachment

AQUA TERRA Technologies

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INTRODUCTION

This report presents results of preliminary investigations conducted at Mare Island Naval Shipyard. The investigations were conducted to assess the presence of soluble lead in groundwater underlying portions of the Shipyard. The lead contamination may have resulted from storage battery disposal. The preliminary investigation was performed by Aqua Terra Technologies in accordance with Contract Number N62474-85-C-Ø221.

The preliminary investigation involved 1) a site reconnaissance to identify areas where lead storage batteries had been disposed of or had been stored, and 2) drilling of five soil borings at suspected "hot spot" locations for recovery of groundwater grab samples. Groundwater grab samples were subsequently analyzed and analytical data were evaluated.

The express purpose of the preliminary investigation was to determine if lead contamination of groundwater had occurred; the magnitude of potential contamination was not addressed in this phase of work.

FIELD ACTIVITIES

Field activities consisted of a site reconnaissance and

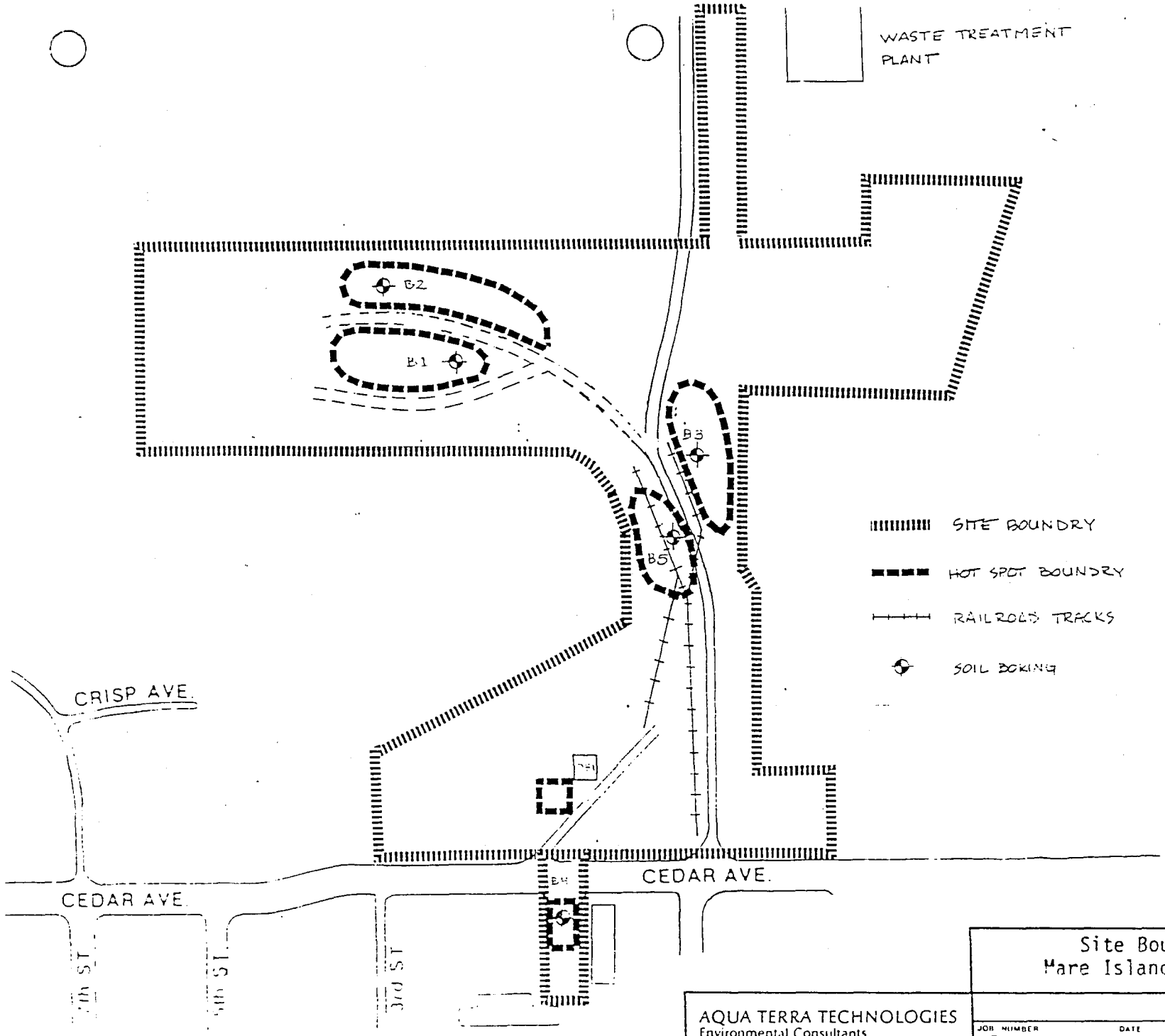
drilling five bore holes for groundwater sampling. A detailed description of the field activities is presented below.

Site Reconnaissance

On August 8 and 9, 1985, Aqua Terra personnel conducted a walk-through site reconnaissance of the area surrounding "A" Street southwest of Cedar Avenue, including the metal scrap yard, and the Building 489 storage bin area located northeast of Cedar Avenue. The area covered by the site reconnaissance is illustrated on Plate 1.

The reconnaissance involved thoroughly walking the site to observe any surface soil discoloration indicative of lead oxide contamination or evidence of storage battery elements and casings. The areas where observable evidence of lead oxide contamination was found were considered potential sources for groundwater contamination and identified for subsequent investigation. These activities resulted in the identification of six suspect sites as shown on Plate 1.

Two of the "hot spot" sites were located southeast of "A" Street in the area where prior disposal of waste oils occurred. A large amount of lead oxide contaminated materials and battery elements and casings were observed in these areas,



Site Boundry
Mare Island

AQUA TERRA TECHNOLOGIES
Environmental Consultants

JOB NUMBER	DATE	APPROVED	PLATE
518.1	9/11/85		1

and the contamination covered a relatively large area. Evidence observed at the site indicated that some of the lead contaminated materials had been buried under waste sand blasting shot.

Two other "hot spots" were identified on both sides of "A" Street near the southwest end of the railroad spurs. The material observed on the northwest side of "A" Street near the railroad spur extended along the tracks for about 100 feet. The material opposite "A" Street, near the railroad spur, was localized on both sides of the tracks. Surface soils in this area on the side of the tracks nearest "A" Street were recently excavated to a depth of a few inches.

The remaining two "hot spots" were observed in the scrap metal yard near Building 751 and in the Building 489 storage bin area. The contamination observed in the vicinity of Building 751 was confined to a small area and consisted of the characteristic lead oxide red coloration on the asphalt. The asphalt was not broken; no visible routes to soil contamination were observed. The contamination noted at Building 489 was confined to the first several storage bids near the Cedar Avenue gate, and to the asphalt pavement near to the gate and bins. The pavement in the Building 489 area is badly broken and soils are exposed.

Groundwater Sampling

Five soil borings were drilled at accessable "hot spot" locations as shown on Plate 1. A boring was drilled at each of the "hot spot" areas identified during the site reconnaissance except at Building 751. The contamination observed near Building 751 was in an area not easily accessable to drilling equipment and was confined to the asphalt in a localized area. Therefore, extra time and expense required to obtain a groundwater sample from this location was not warranted.

The soil borings were drilled to a depth of from 11 feet to 25 feet, allowing about two to five feet below the water table for groundwater sampling. Soil samples were collected from each boring at five foot intervals until groundwater was encountered. The soil samples were capped, sealed, and transmitted to a California Department of Health Services (DHS) certified laboratory for refrigerated storage. The samples will be stored for possible future analysis. Soil boring logs presented in Appendix A show details of boring depth, sampling depth, groundwater levels, and a description of the types of soils encountered.

A grab groundwater sample was collected from each boring for analysis. The groundwater samples were transmitted

to a DHS certified laboratory where analyses for soluble lead was performed. In addition to lead analyses, the salinity of the groundwater samples was measured in the field at the time of collection. An Atago hand refractometer was used for the salinity measurements.

Chain of Custody forms as required by DHS for soil and groundwater samples suspected of being hazardous waste were completed for and transmitted with all samples sent to the laboratory.

Hollow stem auger equipment, steam cleaned between each hole, was employed for the drilling which was completed on August 16, 1985.

SAMPLE ANALYTICAL RESULTS

Results of field salinity analyses and laboratory soluble lead analyses are presented in Table 1.

The salinity values measured in Shipyard groundwater samples are near or below values typically reported for sea water. Bay water typically contains approximately 3 to 7 ppt (g/L) salinity in the vicinity of Mare Island. All five of the bore holes samples yielded water containing from 3 ppt to 19 ppt salinity. These values indicate a very saline

groundwater in the areas of the borings. Therefore, this water would not be considered useable for domestic, industrial, or agricultural purposes.

The soluble lead concentrations show considerable variability among the bore holes. Nevertheless, Boring B-4 was the single boring with sampled groundwater below the analytical detection limit of 0.1 mg/L soluble lead. This level of lead likely does not represent significant contamination, hence it does not justify further investigation of groundwater in the vicinity of Building 489.

Groundwater collected from Boring B-3 and B-5 - these borings are located in relatively close proximity to each other - showed soluble lead concentrations at 0.3 mg/L and 0.79 mg/L, respectively. In addition, Boring B-1 groundwater contained soluble lead at 1.0 mg/L. These three samples are relatively close in lead concentration when compared to the 19 mg/L soluble lead detected in the groundwater sample collected from Boring B-2.

The DHS drinking water standard for lead is 0.05 mg/L. Also, EPA salt water aquatic life criteria for lead is 0.668 mg/L for acute toxicity and 0.025 mg/L for chronic toxicity (FR 45(231), 28 November 1980). Furthermore, the San Francisco Bay Regional Water Quality Control Board

RWQCB) Basin Plan of 1982 provides various criteria for lead according to use. Consistent with DHS standards, the RWQCB has assigned a value of 0.05 mg/L for municipal uses; the allowable concentration for livestock is 0.1 mg/L. With the exception of the Boring B-4 groundwater sample, all groundwater samples collected from the bore holes exceed DHS and RWQCB criteria levels. Also, the RWQXB may consider the levels of lead in the groundwater a potential discharge to the Bay. If so, more stringent criteria then those discussed here may apply.

The existence of below detection levels of lead in Boring B-4 groundwater suggests that the levels of lead detected in Borings B-1, B-3 and B-5 are not background levels as may be suspected when compared to the relatively high lead concentration detected in Boring B-2. Examination of the boring logs presented in Appendix A provides other evidence that the lead levels are the result of contamination.

The sample recovered at the five foot depth in Boring B-1 contained red, sandy particles suspected to be lead oxide. Groundwater occurred in Boring B-1 at below 10 feet. Floating oils were observed on the surface of groundwater samples collected from a depth of about 10 feet in each of Borings B-2 and B-5. The existence of the lead oxide particles in Boring B-1 and the observed floating oils in Boring

B-2 and B-5 are indicative of contamination, including lead, within the soil column and potentially the groundwater.

The existence of lead in the groundwater at the locations sampled likely does not represent an immediate hazard to human health, livestock, or aquatic life. However, the potential for environmental exposure of a sensitive saltwater species does exist via possible groundwater movement towards Bay waters. The high lead concentration associated with Boring B-2 was not confirmed by data from any other boring. The general levels of lead existing in the groundwater defined by the area sampled through the soil borings appears to be present at levels near or below 1.Ø mg/L. The 19 mg/L lead concentration detected in Boring B-2 may represent a localized "hot spot" area of higher lead concentrations, and not represent high groundwater lead levels in general.

RECOMMENDATIONS

Based on results of Aqua Terra's site reconnaisance and groundwater sampling and analyses discussed previously, the following action is recommended:

1. Prepare specifications and proceed with the removal of observable lead oxide materials and battery remnants from the areas in the vicinity of Borings

B-1 and B-2 and Borings B-3 and B-5. These activities should be limited to battery materials, soils excavation should not occur until results of additional investigations have been reviewed. These materials should be excavated and moved to a secure Class I landfill for disposal. The materials are currently located directly on surface soil and are uncovered, representing a potential level exposure source for lead contamination of groundwater.

2. Design and implement a program to assess the vertical and horizontal distribution of soluble lead in the groundwater. The program should provide data describing both saturated and unsaturated soil physical and chemical characteristics which may influence lead migration. The assessment should address toxicological factors regarding the potential biological receptors and provide interpretation of these data relative to regulatory policy and criteria. A hydrogeological evaluation should be conducted to determine the influence of such factors as perched groundwater and salt water intrusion on the distribution of the soluble lead in the groundwater.

Table 1. Summary of Field and Laboratory Analytical Results

Bore Hole Location	Soluble Lead (mg/L)	Salinity (ppt)
B-1	1.0	19
B-2	19.0	3
B-3	0.3	17
B-4	<0.1	12
B-5	0.79	6

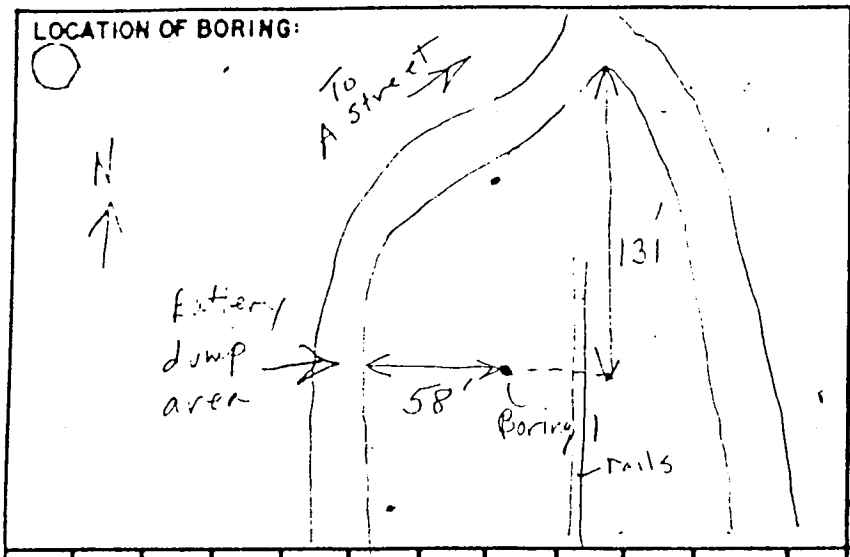
APPENDICIES

A. Soil Boring Logs

FIELD LOG OF BORING

SHEET 1 OF 2

LOCATION OF BORING:



PROJECT: Mare Island	BORING NO. 1
	TOTAL DEPTH: 16.5
JOB NO.: 17574.001.01	LOGGED BY: MAS
PROJ. MGR.: AMB	EDITED BY: [illegible]
DRILLING CONTRACTOR: Datum Exploration	
DRILL RIG TYPE: CME 75	
DRILLERS NAME: Jim Griggs	
SAMPLING METHODS: St. Pen and CA Mod	
HAMMER WT.: 140 lb	DROP: 30"
STARTED, TIME: 0841	DATE: 5/16/85
COMPLETED, TIME: 1000	DATE:
BORING DEPTH (ft.) 16.5	
CASING DEPTH (ft.)	
WATER DEPTH (ft.)	
TIME:	
DATE:	
BACKFILLED, TIME:	DATE: [illegible] BY: [illegible]
SURFACE ELEV.:	DATUM:
CONDITIONS: [illegible]	

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE CONDITION	DRILLING RATE (min/ft)				DEPTH IN FEET	GRAPHIC LOG	
												Metal straps - red lead oxide
										1		GRAY SANDY GRAVEL [illegible]
												[illegible]
										2		GRAY SILTY CLAY [illegible]
												[illegible]
										3		
										4		
												GRAY GREEN CLAYEY SILT
												(ML), moist, [illegible]
5'	[illegible] pen	5								5		[illegible]
		5										[illegible]
		6								6		
										7		
										8		
										9		
10'	[illegible]	2								10		

FF7

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FIELD LOG OF BORING (CONTINUED)

SHEET 2 OF 2

PROJECT: Mare Island | NO. 001 | BORING NO. 1

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG	
		1								11		BLACK CLAYEY SILT, (OL) wet soft,
	[illegible]	1										
										12		
										13		
										14		
										15		
15'	CA mod	8										GRAY CLAYEY SILT (OL) wet soft
		4								16		some gravel and sand at 16 feet
		4										
										17		bottom of hole 16.5'
										18		
										19		
										20		
										21		
										22		
										23		
										24		
										25		
										26		
										27		
										28		
										29		
										30		

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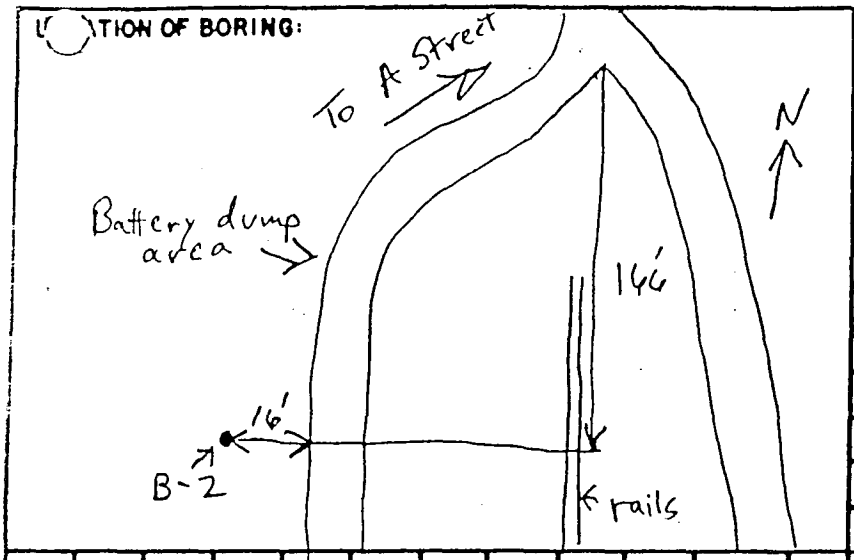
FIELD LOG OF BORING

SHEET 1 OF 2

LOCATION OF BORING:



PROJECT: Mare Island	BORING NO. 2
	TOTAL DEPTH: 12'
JOB NO.: 17574.001.02	LOGGED BY: NAS
PROJ. MGR.:	EDITED BY:
DRILLING CONTRACTOR: Dutra	
DRILL RIG TYPE: CME 75	
DRILLERS NAME: Jim Grippa	
SAMPLING METHODS: Standard Pen	
HAMMER WT.: 140 lb	DROP: 30"
STARTED, TIME: 1000	DATE: 8/16/85
COMPLETED, TIME: 1045	DATE: "
BORING DEPTH (ft.) 12'	
CASING DEPTH (ft.)	
WATER DEPTH (ft.)	
TIME:	
DATE:	
BACKFILLED, TIME:	DATE: 8/16/85 BY: Dutra
SURFACE ELEV.:	DATUM:
CONDITIONS: Zero is ground surface	

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE CONDITION	DRILLING RATE (min/ft)				DEPTH IN FEET	GRAPHIC LOG	
												Battery casings and red lead oxide
										1		
										2		Red SANDY GRAVEL (GP), dry gravel to ½ inch maximum size
										3		
										4		GRAY SANDY GRAVEL (GP), dry 25% sand (fill)
	St. Pen	9 50								5		
										6		GRAY CLAYEY SILT (OL) wet
										7		
										8		
										9		water level (approximate) GRAY CLAYEY SILT (OL), wet water has brown oil on surface
10		2								10		

HARDING LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED)

SHEET 2 OF 2

PROJECT: Mare Island | NO. 001 | BORING NO. 2

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	COND.	D.RATE				DEPTH	GRAPHIC LOG	
		3								1		
	st. pen	4										GRAY SANDY SILT (OL), moist mottled red
										2		← bottom of hole
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		

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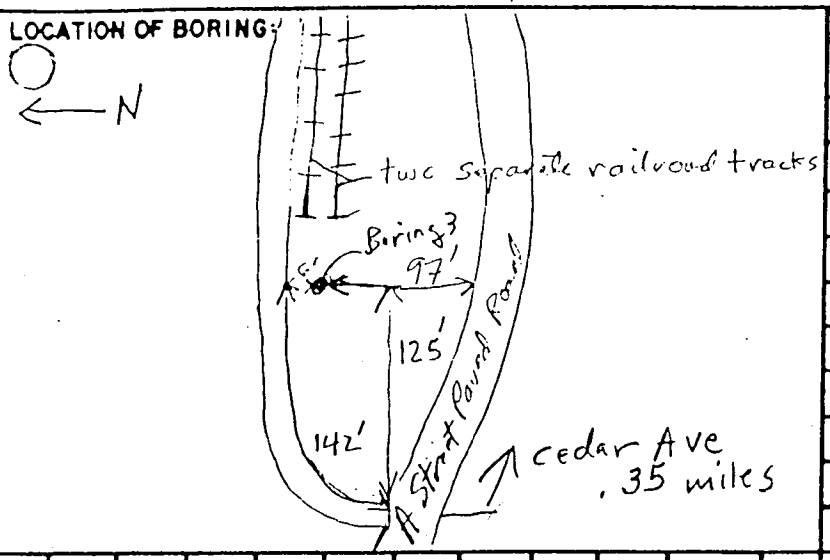
HARDING-LAWSON ASSOCIATES

FIELD LOG OF BORING

SHEET ____ OF ____

LOCATION OF BORING:



PROJECT: Mare Island – Aqua Terra	BORING NO. 3
	TOTAL DEPTH: 25
JOB NO.: 17574,001.02	LOGGED BY: NAS
PROJ. MGR.:	EDITED BY:
DRILLING CONTRACTOR: Datum	
DRILL RIG TYPE: CME 75	
DRILLERS NAME: Jim Gruppa	
SAMPLING METHODS: Standard Pen.	
HAMMER WT.: 140	DROP: 30"
STARTED, TIME: 1220	DATE: 8/16/85
COMPLETED, TIME: 1300	DATE:
BORING DEPTH (ft.) 25'	
CASING DEPTH (ft.)	
WATER DEPTH (ft.)	
TIME:	
DATE:	
BACKFILLED, TIME:	DATE: 8/16/85 BY: Datum
SURFACE ELEV.:	DATUM:
CONDITIONS: zero is ground surface	

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE CONDITION	DRILLING RATE (min/ft)				DEPTH IN FEET	GRAPHIC LOG	
												Battery casings and lead oxide – old electrical wire
										1		BROWN GRAVELLEY SAND (SP), Dry
										2		
										3		
										4		BROWN SANDY GRAVEL (GP)
5'	St. Pen.	1 2								5		
		1								6		GRAY CLAYEY SILT (OL), moist, very soft, roots
										7		
										8		
										9		
10'	St. Pen.	1								10		

FF7

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FIELD LOG OF BORING (CONTINUED)

SHEET 2 OF 2

PROJECT: Mare Island | NO. 031 | BORING NO. 3

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D.	COND.	D.RATE				DEPTH	GRAPHIC LOG	
		1								11		BLACK PEAT (Pt), moist
		1										
										12		
										13		
										14		
15	CA Mod	2								15		GRAY CLAYEY SILT (OL)
		2								16		moist, soft
		2										
										17		
										18		silt water w...
										19		
										20		
										21		Water level
										22		needed to drill deeper to get water in hole
										23		
										24		
										25		bottom of hole
										26		
										27		
										28		
										29		
										30		

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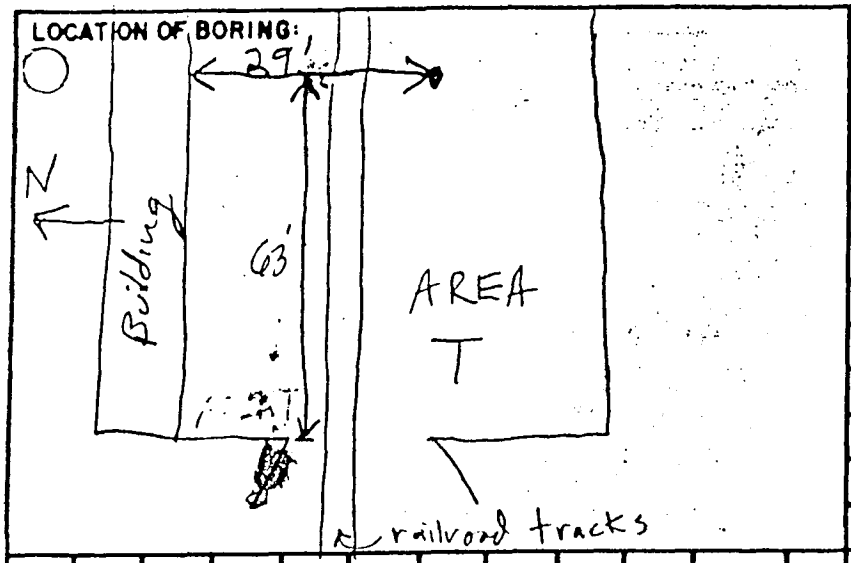
FIELD LOG OF BORING

SHEET 1 OF 2

LOCATION OF BORING:



PROJECT: Mare Island	BORING NO. 4
	TOTAL DEPTH: 11.5
JOB NO.: 17574001.02	LOGGED BY: NAS
PROJ. MGR.:	EDITED BY:
DRILLING CONTRACTOR: Datum Exploration	
DRILL RIG TYPE: CME 75	
DRILLERS NAME: Jim Gruppa	
SAMPLING METHODS: Standard Pen	
HAMMER WT.: 140 lb	DROP: 30"
STARTED, TIME: 1605	DATE: 8/16/85
COMPLETED, TIME: 1631	DATE:
BORING DEPTH (ft.) 11.5	
CASING DEPTH (ft.)	
WATER DEPTH (ft.)	
TIME:	
DATE:	
BACKFILLED, TIME:	DATE: 8/16/85 BY: Datum
SURFACE ELEV.:	DATUM:
CONDITIONS: zero is ground surface	

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE CONDITION	DRILLING RATE (min/ft)				DEPTH IN FEET	GRAPHIC LOG	
												GRAY GRAVEL (GW), dry; fill
										1		GRAY GREEN SANDY CLAY (CL)
										2		moist (10% sand)
										3		
										4		
5	Std Pen	3								5		GRAY CLAYEY SILT (OL), more
		2								6		soft, 1 thin peat lense (1/2")
		3										
										7		
										8		water level
										9		
10	Std Pen	3								10		

FF7

HARDING-LAWSON ASSOCIATES

FIELD LOG OF BORING (CONTINUED)

SHEET 2 OF 2

PROJECT: Mare Island | NO. 001 | BORING NO. 4

DEPTH	TYPE	BLOWS	DRIVEN	REC'V'D	COND.	D.RATE				DEPTH	GRAPHIC LOG	
		7								11		GRAY CLAYEY SILT (OL), wet, medium stiff, mussel shell fragments
	Stand Pen	5										
										12		bottom of HOLE
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		

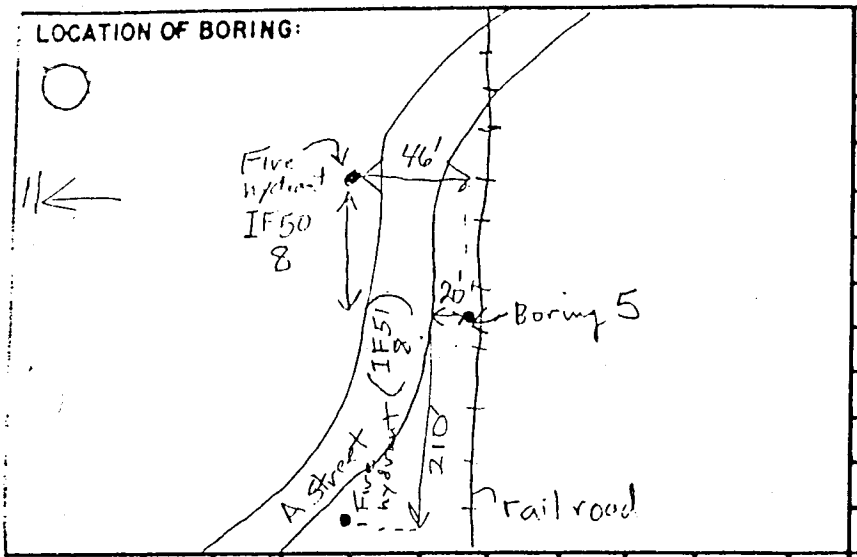
FF8

HARDING-LAWSON ASSOCIATES

FIELD LOG OF BORING

SHEET 1 OF 2

LOCATION OF BORING:



PROJECT: Mare Island Agua Terra	BORING NO. 5
	TOTAL DEPTH: 15'
JOB NO.: 17574.001.02	LOGGED BY: NAS
PROJ. MGR.:	EDITED BY:
DRILLING CONTRACTOR: Nation Exploration	
DRILL RIG TYPE: CME 75	
DRILLERS NAME: Jim Gripper	
SAMPLING METHODS: Standard Pen	
HAMMER WT.: 140	DROP: 30"
STARTED, TIME: 1400	DATE: 8/16/85
COMPLETED, TIME: 1417	DATE:
BORING DEPTH (ft.) 15'	
CASING DEPTH (ft.)	
WATER DEPTH (ft.)	
TIME:	
DATE:	
BACKFILLED, TIME:	DATE: 8/16/85 BY: [illegible]
SURFACE ELEV.:	DATUM:
CONDITIONS: Zero is ground surface	

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE CONDITION	DRILLING RATE (min/ft)				DEPTH IN FEET	GRAPHIC LOG	
										1		GRAY SILTY SAND (SM), dry, 10% silt (fill)
										2		
										3		
										4		BROWN SANDY GRAVEL [illegible] (fill)
5	St. Pen	1 1 1								5		
										6		GRAY CLAYEY SILT (OL), [illegible] roots
										7		
										8		
										9		
										10		→ approximate water level [illegible]
10	St. Pen	1										GRAY CLAYEY SILT (O[illegible]

FF7

HARDING-LAWSON ASSOCIATES

FIELD LOG OF BORING
BORING NO. 5
SHEET 2 OF 2

THIS SHEET IS NOT AVAILABLE.

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

FOR ADDITIONAL INFORMATION, CONTACT:

DIANE C. SILVA, COMMAND RECORDS MANAGER, CODE EV33
NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST
1220 PACIFIC HIGHWAY (NBSD BLDG. 3519)
SAN DIEGO, CA 92132

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