SOUTHWESTNAVFACENGCOM
Code 06CC.LM
San Diego, California

M60050.002513
MCAS EL TORO
SSIC #5090.3

File: etbctltr14.doc

TRANSMITTAL

Date: 14 November 2000

From: Lynn Marie Hornecker

To: **Glenn Kistner, Remedial Project Manager**
U.S. Environmental Protection Agency, Region IX
Hazardous Waste Management Division (SFD 8-2)
75 Hawthorne Street
San Francisco, CA 94105-3901

Triss Chesney
State of California Environmental Protection Agency
Department of Toxic Substances Control
Base Closure Unit
Southern California Operations
5796 Corporate Avenue
Cypress, CA 90630-4700

John Broderick
California Regional Water Quality Control Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3339

Subj: Anomaly Area 3
(APHO 59, APHO 60, APHO 61, APHO 62, APHO 63, APHO 64, APHO 65)
Marine Corps Air Station, El Toro

Transmitted as the attachment is the two-volume Technical Information Package for Anomaly Area 3 at the Marine Corps Air Station, El Toro. The Technical Information Package is intended for use in discussions pertaining to the future management of the site and contains information collected during the period from early 1999 through November 2000.

Anomaly Area 3 encompasses seven (7) aerial photograph anomaly (APHO) sites and is located in the northwestern section of the facility near Pusan Way adjacent to Agua Chinon Wash. The anomalies were identified by Science Applications International Corporation (SAIC) during a review of historical aerial photographs taken during the period from 1946 through 1992 (SAIC 1993).

Anomaly Area 3 has also been designated MSC R1 – a former refuse disposal area – in the Base Realignment and Closure (BRAC) Business Plan update.

Table 1 identifies the individual APHO sites that are included in Anomaly Area 3.

Table 1. APHOs included in Anomaly Area 3.

APHO identifier	SAIC identifier and brief description	Year of Aerial Photograph
APHO 59	**SAIC 20** Three areas of apparent extraction	1946
APHO 60	**SAIC 64** Quarried area (area of extraction)	1952
APHO 61	**SAIC 106** Quarry area (area of extraction)	1960
APHO 62	**SAIC 156** Areas of extraction near Agua Chinon Wash with possible refuse or liquid within the excavated area	1967
APHO 63	**SAIC 443** Area of extraction near Agua Chinon Wash that has been revegetated	1981
APHO 64	**SAIC 536** Former extraction area near Agua Chinon Wash that has been filled	1988
APHO 65	**SAIC 564** Graded area	1992

The activities identified in Table 2 have been conducted during the evaluation of Anomaly Area 3 during the period from 1999 through 2000. The results of the investigative activities are presented in the Technical Information Package.

Table 2. Investigation Activities At Anomaly Area 3.

Activity and Description of Selected Findings	Date(s)
Record Search	Early 1999
BRAC Cleanup Team (BCT) Site Visit and Visual Inspection	August 1999
Construction of Four (4) Perimeter Groundwater Monitoring Wells and Three (3) Vadose Zone Probes Groundwater is located between approximately 23.5 and 62 feet below ground surface near Anomaly Area 3. Groundwater was located at approximately 23.5 feet below ground surface in November 1999 at Well MSCR1-MW01 (adjacent to Agua Chinon Wash).	October 1999
Groundwater Sampling by USEPA Methods 8015M (total petroleum hydrocarbons (diesel and gasoline)), 8260A (Volatile Organic Compounds), 6010 (Metals), 7470 (Mercury), 300.0 (Nitrate), 160.0 (Total Dissolved Solids), 903.0 (Radium), 9310 (Gross Alpha and Gross Beta), 904.0 (Radium 228); other methods: CADHS Perchlorate, ASTM D3972 (Radionuclides), ASTM D5811M (Lead 210).	November 1999; April 2000
Vadose Zone (soil gas) Sampling	November 1999; July 2000

Table 2. Investigation Activities At Anomaly Area 3 (continued).

Activity and Description of Selected Findings	Date(s)
Geophysical Survey (survey area: approximately 9 acres) Trench feature identified along northwest side near Pusan Way and several areas of surface or buried debris identified.	February 2000
Limited Exploratory Trenching with Limited Soil Sampling Buried construction debris (including concrete and metallic debris) were encountered at depths exceeding 20 feet. Selected soil results presented in Table 3.	March 2000
Radiological Screening Survey during Exploratory Trenching	March 2000
Data Validation	May 2000

Selected laboratory test results for soil samples collected from trenches are presented in Table 3. All laboratory test reports and data validation reports are presented in the Technical Information Package.

Table 3. Selected Laboratory Test Results for Soil Samples from Anomaly Area 3.

Chemical	Concentration at Anomaly Area 3	USEPA Region IX Preliminary Remediation Goals of 1999 (mg/kg)	Sample Identification
Petroleum Hydrocarbons			
TPH-diesel	5,600 mg/kg	-	Sample 20242-1102 at 4 feet bgs
TPH-diesel	1,100 mg/k	-	Sample 20242-1115 at 35 feet bgs
Metals			
Lead	**677 mg/kg**	400 mg/kg (Residential)	Sample 20242-1096 at 16 feet bgs
USEPA Method 8270 – Semi-volatile organic compounds			
Benzo(a)pyrene	**230 ug/kg**	62 ug/kg (Residential) 290 ug/kg (Industrial)	Sample 20242-1111 at 7 feet bgs
USEPA Method 8290 – dioxins and furans			
1,2,3,4,6,7,8-HPCDD	39 pg/g		Sample 20242—1107 at 6 feet bgs
HPCDD (total)	66 pg/g		"

EXPLANATION:
Bold print indicates chemical concentration exceeded a USEPA Region IX Preliminary Remediation Goal (PRG)

pg/g picograms per gram
mgkg milligrams per kilogram
ug/kg micrograms per kilogram

Preliminary Findings:

- Soil Sampling: The results of the analyses of soil samples collected from trenches identified petroleum hydrocarbons at several locations. Lead and benzo(a) pyrene were identified above USEPA Region IX preliminary remediation goals (PRGs). Dioxins were identified. Construction debris and materials were identified in trenches at depths exceeding 20 feet.
- Site Area: Anomaly Area 3 encompasses an area of approximately 9 acres. The BRAC Business Plan identifies a surface area of 0.18 acres for MSC R1 (which is equivalent to Anomaly Area 3). The surface area over which geophysical surveys were conducted encompasses 9 acres, and anomalies were identified over much of the surveyed area. Consequently, it is recommended that the surface area for MSC R1 (which is equivalent to Anomaly Area 3) be changed to 9 acres in the next Business Plan update.

References:

- Science Applications International Corporation (SAIC). 1993. Final Report, Aerial Photograph Assessment, MCAS El Toro, Contract N68711-91-D-4658, Delivery Order 0002, SAIC Project No. 01-0892-0817.
- United States Marine Corps Air Station, El Toro. 2000. Base Realignment and Closure (BRAC) Business Plan.

Attachment:

Anomaly Area 3, Technical Information Package, Volumes I and II
(OHM, November 2000)

CF: w/attachment
Dean Gould (BRAC Environmental Coordinator, MCAS El Toro)
Content Arnold (Lead RPM, MCAS El Toro)
Polin Modanlou (County of Orange)
Greg Hurley (RAB Co-Chair)
Project File (MCAS El Toro)

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation

OHM TRANSMITTAL/DELIVERABLE RECEIPT

CONTRACT N68711-93-D-1459 **DOCUMENT CONTROL NO: SW9312**

TO: Contracting Officer
Naval Facilities Engineering Command
EFA West Division
Richard Selby, 02R1.RS
1220 Pacific Highway
San Diego, California 92132-5190

Date: 21-Nov-00

DO: 112

Location: MCAS EL TORO

FROM: Stewart Bornhoft, Program Manager

Edwin G. Bond, Contracts Manager

DESCRIPTION OF ENCLOSURE: ***Anomaly Area 3 Technical Information Package Volumes I and II, dated November 15, 2000***

TYPE: Contract Deliverable ( ) ($) DO Deliverable (**X**) (Tech) Request for Change ( ) Other (**X**)

VERSION: FINAL **REVISION:** 0

ADMIN RECORD: Yes ( ) No (**X**) Category ( ) Confidential ( )

SCHEDULED DELIVERY DATE: 21-Nov-00 **ACTUAL DELIVERY DATE:** 21-Nov-00

NUMBER OF COPIES SUBMITTED TO THE NAVY: 1/O, 5/C, 4/E
[AS REQUIRED/DIRECTED BY THE (SOW)]

COPIES TO:

SWDIV Name, Code	OHM Name, Location	OTHER Name, Company, Location
General Files, 02R1 (1C/1E)	File (1C/1E)	
L. Hornecker, 06CC.LH (1C/1E)	Chron (1C)	
G. Tinker, 06CC.GT (1C)	D. Rawal, Irv (1C/1E)	
C. Arnold, 06CC.CA (1C/1E)		
D. Gould, 06CC.DG (1C/1E)		

Date/Time Received: _____ / _____

Doc Class: D-03

Table of Contents

VOLUME I

Attachment A Groundwater and Soil Vapor Sampling Data

A-1 *FIGURES*
Figure A-1 Boring and Well Location Map
Figure A-2 Groundwater Level Map
A-2 *WELL PERMITS*
A-3 *BORING LOGS AND WELL CONSTRUCTION DIAGRAMS*
A-4 *WELL DEVELOPMENT LOGS*
A-5 *GROUNDWATER SAMPLE DATA SHEETS*
A-6 *TABLES*
Table A-1 Groundwater Well Construction Summary
Table A-2 Groundwater Levels
Table A-3 Summary of Groundwater Sample Analyses
Table A-4 Summary of Soil Vapor Analyses

Attachment B Trench Investigation Data

B-1 *GEOVISION SURVEY REPORT*
B-2 *FIGURES*
Figure B-1 Trench Location with Geophysical Survey
Figure B-2 Trench Sample Location Map
B-3 *TRENCH LOGS*
B-4 *TABLE B-1 SUMMARY OF TRENCH SOIL ANALYSES*
B-5 *RADIOLOGICAL SURVEY*

Attachment C Project Photographs

VOLUME II

Attachment D Laboratory Analytical Reports

D-1 *GROUNDWATER DATA*
D-2 *SOIL VAPOR DATA*
D-3 *TRENCH SOIL DATA*

Attachment E Grading Plan for Fill Depression Area (Anomaly Area 3)
Drawing No. 5-3943

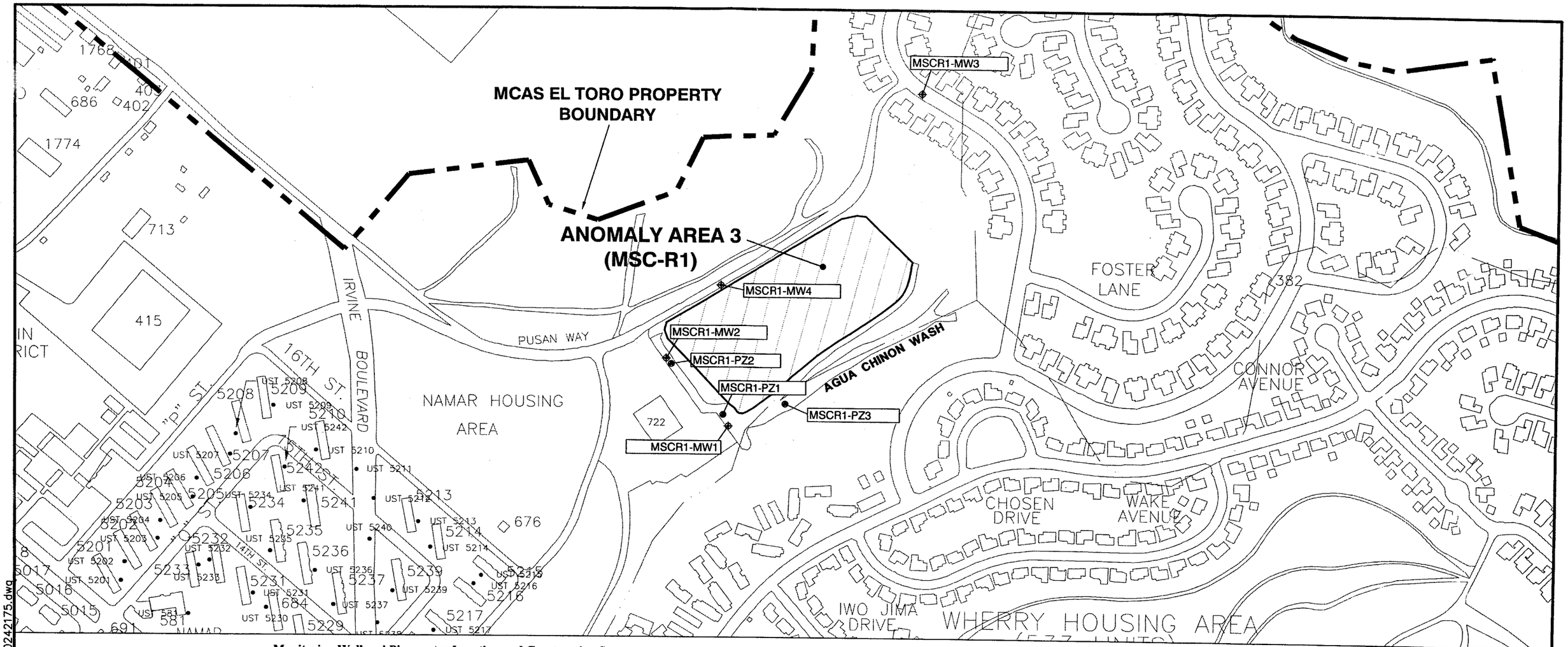
Attachment A
Groundwater and Soil Vapor Sampling Efforts

Contents:

A-1 *FIGURES*
Figure A-1 Boring and Well Location Map
Figure A-2 Groundwater Level Map
A-2 *WELL PERMITS*
A-3 *BORING LOGS AND WELL CONSTRUCTION DIAGRAMS*
A-4 *WELL DEVELOPMENT LOGS*
A-5 *GROUNDWATER SAMPLE DATA SHEETS*
A-6 *TABLES*
Table A-1 Groundwater Well Construction Summary
Table A-2 Groundwater Levels
Table A-3 Summary of Groundwater Sample Analyses
Table A-4 Summary of Soil Vapor Analyses

A-1 *FIGURES*

Figure A-1 Boring and Well Location Map
Figure A-2 Groundwater Level Map



Monitoring Well and Piezometer Location and Construction Summary

Well ID Number	Date Installed	Northing (NAD 83)	Easting (NAD 83)	Casing Elevation (ft amsl)	Surface Elevation (ft amsl)	Total depth (ft bgs)	Borehole Diameter (inches)	Screen Diameter (inches)	Screen Slot Size (inches)	Screen Material	Screened Interval (ft bgs)	Casing (ft bgs)	Casing Material	Sand Pack (ft bgs)	Bentonite Seal (ft bgs)	Grout Seal (ft bgs)
MW01	10/12/99	2194690.81	6116938.13	455.02	455.36	51.5	10	4	0.020	SS	16.5 - 46.5	0 -16.5	SCH 80 PVC	14 - 51.5	10.5 - 14	3 - 10.5
MW02	10/14/99	2194900.43	6116747.86	459.71	460.19	56.5	10	4	0.020	SS	21-51	0-21	SCH 40 PVC	18.5-56	14.5-18.5	3-14.5
MW03	10/18/99	2195723.50	6117525.67	500.31	500.85	86.5	10	4	0.020	SS	50 -70	0-50	SCH 40 PVC	47-85	42.8-47	3-42.8
							10	4	0.010	SS	70 - 80					
MW04	10/21/99	2195127.85	6116912.98	464.24	464.87	55.0	10	4	0.010	SS	25-45	0-25	SCH 40 PVC	22.5-51	19.5-22.5	2.5-19.5
PZ1	10/26/99	2194726.57	6116921.71	455.22	455.45	22.0	7	1	0.020	PVC	17 - 22	0 - 17	SCH 40 PVC	16 - 22	13 - 16	0 - 13
PZ2	10/26/99	2194883.44	6116763.11	459.93	460.09	30.0	7	1	0.020	PVC	25 - 30	0 - 25	SCH 40 PVC	24 - 30	20.5 - 24	0 - 20.5
PZ3	10/26/99	2194760.93	6117115.89	460.86	461.27	26.0	7	1	0.020	PVC	15 - 20	0 - 15	SCH 40 PVC	14 - 21	11 - 14	0 - 11

Explanation

NAD 83 North American Datum, 1983
SS Stainless steel
ft amsl Feet above mean sea level datum
ft bgs Feet below ground surface
bgs Below ground surface

EXPLANATION:

- GROUNDWATER MONITORING WELL
- UNDERGROUND STORAGE TANKS
- GROUNDWATER MONITORING WELL

TRUE NORTH
STATION NORTH
N
39°50'49"

GRAPHIC SCALE

0 150 300 600

(IN FEET)

REVISIONS			
REV. No.	DESCRIPTION	DATE	APPROVED
01	97102-MSCR1.DWG BY CALVADA SURVEYING, INC.	11/9/99	

CONTRACT NAME: SWDIV

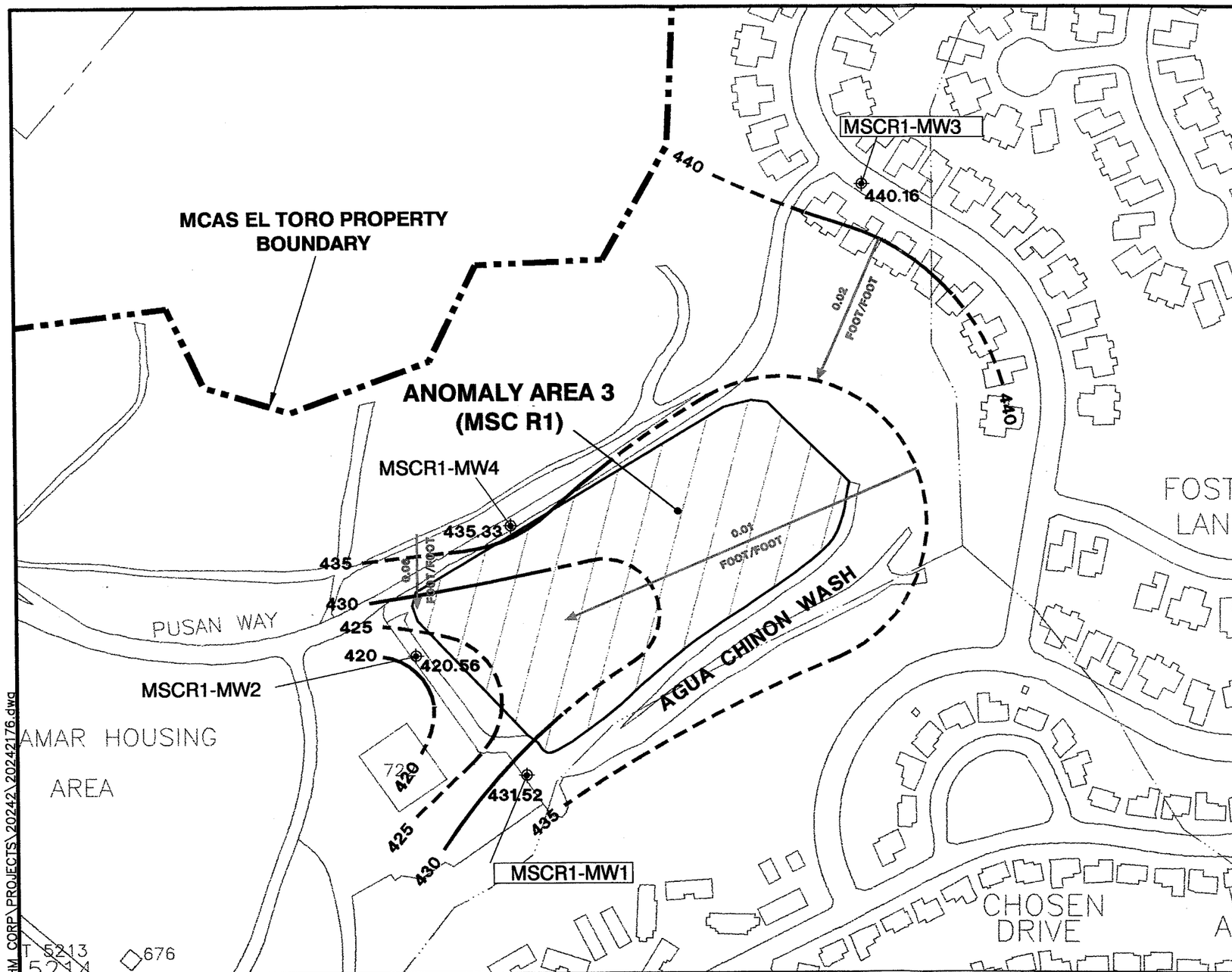
OHM Remediation Services Corp.
A Subsidiary of OHM Corporation
IRVINE, CA

DRAWN BY: MBMiller DATE: 11-9-00
CHECKED BY: DATE: 11-15-00
APPROVED BY: DATE: 11-15-00
PROJECT MANAGER: DATE: 11/15/00
AUTOCAD FILE No.: 20242175.DWG

SITE LOCATION MAP
ANOMALY AREA 3
(MSC R1)
MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

SCALE	SHEET	OF	DOCUMENT CONTROL No.	OHM PROJECT No.	DRAWING No.
1"=300'	1	1	SW9312	20242	FIG A-1

Nov 09, 2000 11:55:14 I:\OHM CORP\PROJECTS\20242\20242175.dwg



Groundwater Levels

Well ID Number	Date Installed	Measuring Point (ft amsl)	Total Depth (ft bgs)	Screened Interval (ft bgs)	Depth to Water November 1999 (ft bgs)	Groundwater Elevation November 1999 (ft amsl)	Depth to Water December 1999 (ft bgs)	Groundwater Elevation December 1999 (ft amsl)
MW01	10/12/99	455.02	51.5	16.5 - 46.5	23.50	431.52	24.05	430.97
MW02	10/14/99	459.71	56.5	21 - 51	39.15	420.56	39.64	420.07
MW03	10/18/99	500.31	86.5	50 - 80	60.15	440.16	61.02	439.29
MW04	10/21/99	464.24	55.0	25 - 45	28.91	435.33	29.57	434.67

Explanation

NAD 83 North American Datum, 1983
ft amsl Feet above mean sea level datum
ft bgs Feet below ground surface
bgs Below ground surface

EXPLANATION:

GROUNDWATER MONITORING WELL
435.52 GROUNDWATER ELEVATION
GROUNDWATER FLOW DIRECTION 0.04 foot/foot HYDROLOGIC GRADIENT
GROUNDWATER LEVEL CONTOUR, DASHED WHERE INFERRED.

TRUE NORTH
STATION NORTH
N 39°50'49"

GRAPHIC SCALE
0 100 200 400
(IN FEET)

REVISIONS			
REV. No.	DESCRIPTION	DATE	APPROVED
01	97102-MSCR1.DWG BY CALVADA SURVEYING, INC.	11/9/99	

CONTRACT NAME: SWDIV

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation
IRVINE, CA

DRAWN BY: MBMiller DATE: 11-9-00
CHECKED BY: DATE: 11-15-00
APPROVED BY: DATE: 11-15-00
PROJECT MANAGER: DATE: 11/15/00
AUTOCAD FILE No.: 20242176.DWG

GROUNDWATER LEVEL MAP
ANOMALY AREA 3
(MSC R1)
NOVEMBER 1999
MARINE CORPS AIR STATION
EL TORO, CALIFORNIA

SCALE	SHEET	OF	DOCUMENT CONTROL No.	OHM PROJECT No.	DRAWING No.
1"=300'	1	1	SW9312	20242	FIG A-2

Nov 09, 2000 - 11:56:23 I:\OHM_CORP\PROJECTS\20242\20242176.dwg

A-2 WELL PERMITS

APPLICATION FOR WELL CONSTRUCTION PERMIT

ORANGE COUNTY HEALTH CARE AGENCY
ENVIRONMENTAL HEALTH DIVISION
2009 E. EDINGER AVENUE
SANTA ANA, CA 92705-4720
(714) 667-3600
FAX: (714) 972-0749

CITY: SANTA ANA

DATE: 9-30-99

WELL PERMIT NUMBER

WELL LOCATION (ADDRESS IF AVAILABLE): MCAS, EL TORO NANAR HOUSING AREA

NAME OF WELL OWNER: MCAS ELTORO c/o DEAN GOULD

ADDRESS: P O Box 51718

CITY: IRVINE ZIP: 92619-1718 TELEPHONE: (949) 726-3470

NAME OF CONSULTING FIRM: OHM / IT CORPORATION

BUSINESS ADDRESS: 3347 MICHELSON DR. SUITE 200

CITY: IRVINE ZIP: 92612 TELEPHONE: (949) 261-6441

NAME OF DRILLING CO.: WATER DEVELOPMENT CORP. C-57 LICENSE NO.: 283326

CITY: WOODLAND, CA ZIP: 95776 TELEPHONE: 909-931-4014

TYPE OF WELL (CHECK)

- PRIVATE DOMESTIC ☐
- PUBLIC DOMESTIC ☐
- IRRIGATION ☐
- CATHODIC ☐
- MONITORING ☒
- SOIL BORING ☐
- OTHER ☐
- TOTAL NUMBER 3 THREE

A. WELLS – SUBMIT A WELL CONSTRUCTION DIAGRAM (INCLUDE DIMENSIONS) See Figure 2.

B. SOIL BORINGS AND PROBES –
TOTAL DEPTH
SEALING MATERIAL

C. PROPOSED START DATE 10-11-99

DIAGRAM OF WELL SITE (Use additional sheets and/or attachments)

Figure 1 is Site Plan.
Figure 2 is typical Monitoring Well Construction Diagram. Upon Completion of the Field Work Figure 2 will be followed by As-built Well Construction Diagram.

☒ SITE PLAN ATTACHED See Figure 1.

I hereby agree to comply in every respect with all requirements of the Health Care Agency and with all ordinances and laws of the County of Orange and of the State of California pertaining to well construction, reconstruction and destruction, including the requirements to maintain the integrity of all significant confining zones.

Lynn Marie Tornecker 10/5/99
APPLICANT'S SIGNATURE DATE

Lynn Marie Tornecker
PRINT NAME

6195324162 6195324160
PHONE NUMBER FAX NUMBER

FOR ACCOUNTING USE ONLY:

PO NO. CHECK NO.

DATE AMOUNT

FUND

APPROVAL BY OTHER AGENCIES:

JURISDICTION

REMARKS

AUTHORIZED SIGNATURE DATE

DISPOSITION OF PERMIT (DO NOT FILL IN):

☐ APPROVED SUBJECT TO THE FOLLOWING CONDITIONS:

A. NOTIFY THIS AGENCY AT LEAST 48 HOURS
- ☐ PRIOR TO START.
- ☐ PRIOR TO SEALING THE ANNULAR SPACE OR FILLING OF THE CONDUCTOR CASING.

B. ☐ SUBMIT TO THE AGENCY WITHIN 30 DAYS AFTER COMPLETION OF WORK, A WELL COMPLETION REPORT AND/OR DRILLING LOGS. PLEASE REFERENCE PERMIT NO.

C. ☐ SECURE ALL MONITORING WELLS TO PREVENT TAMPERING.

D. ☐ OTHER

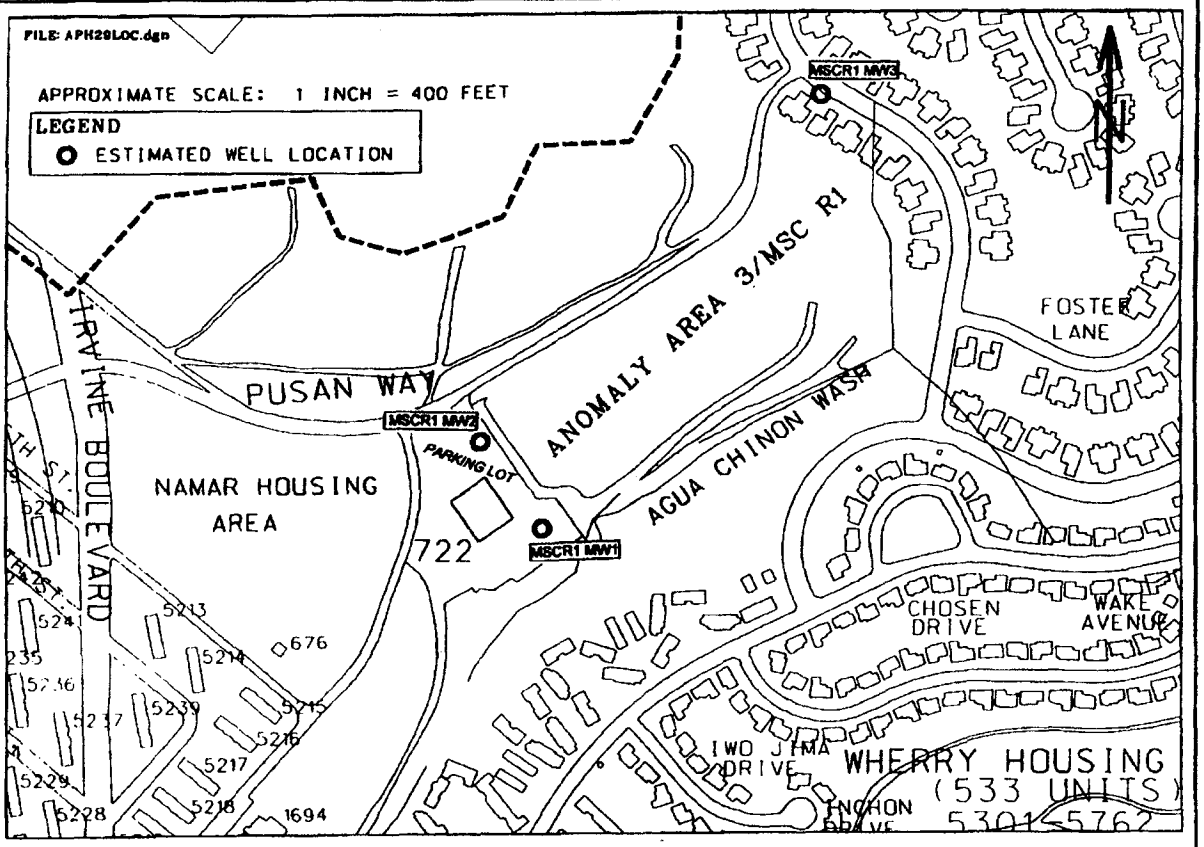
☐ DENIED

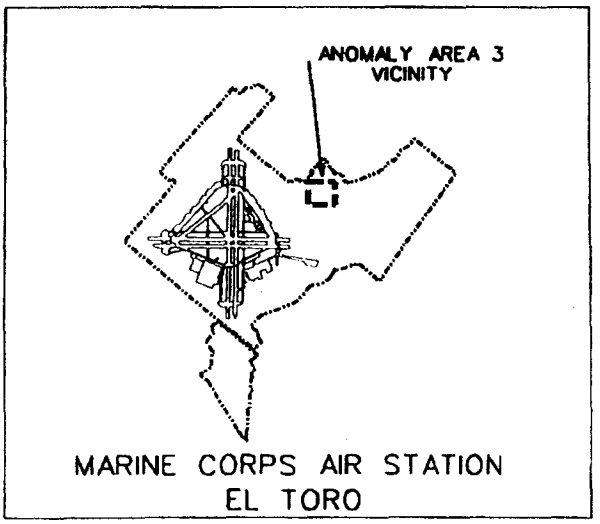
PERMIT ISSUED BY DATE

PRINT NAME PHONE NUMBER

WHEN SIGNED BY ORANGE COUNTY HEALTH CARE AGENCY REPRESENTATIVE, THIS APPLICATION IS A PERMIT.

172-09.0503 (R9/96)





NOTE: GROUND WATER FLOW IN THE VICINITY OF ANOMALY AREA 3/MSC R1 (THE SITE) IS BELIEVED TO BE TOWARD AGUA CHINON WASH (FROM THE NORTHWEST TO THE SOUTH-SOUTHEAST) DUE TOPOGRAPHIC CONTROLS. THE AREA NORTHWEST OF THE SITE IS TOPOGRAPHICALLY HIGHER. WELLS MSCR1 MW1 AND MSCR1 MW2 ARE INTENDED AS DOWNGRADIENT WELLS, AND WELL MSCR1 MW3 IS INTENDED AS AN UPGRADIENT WELL.

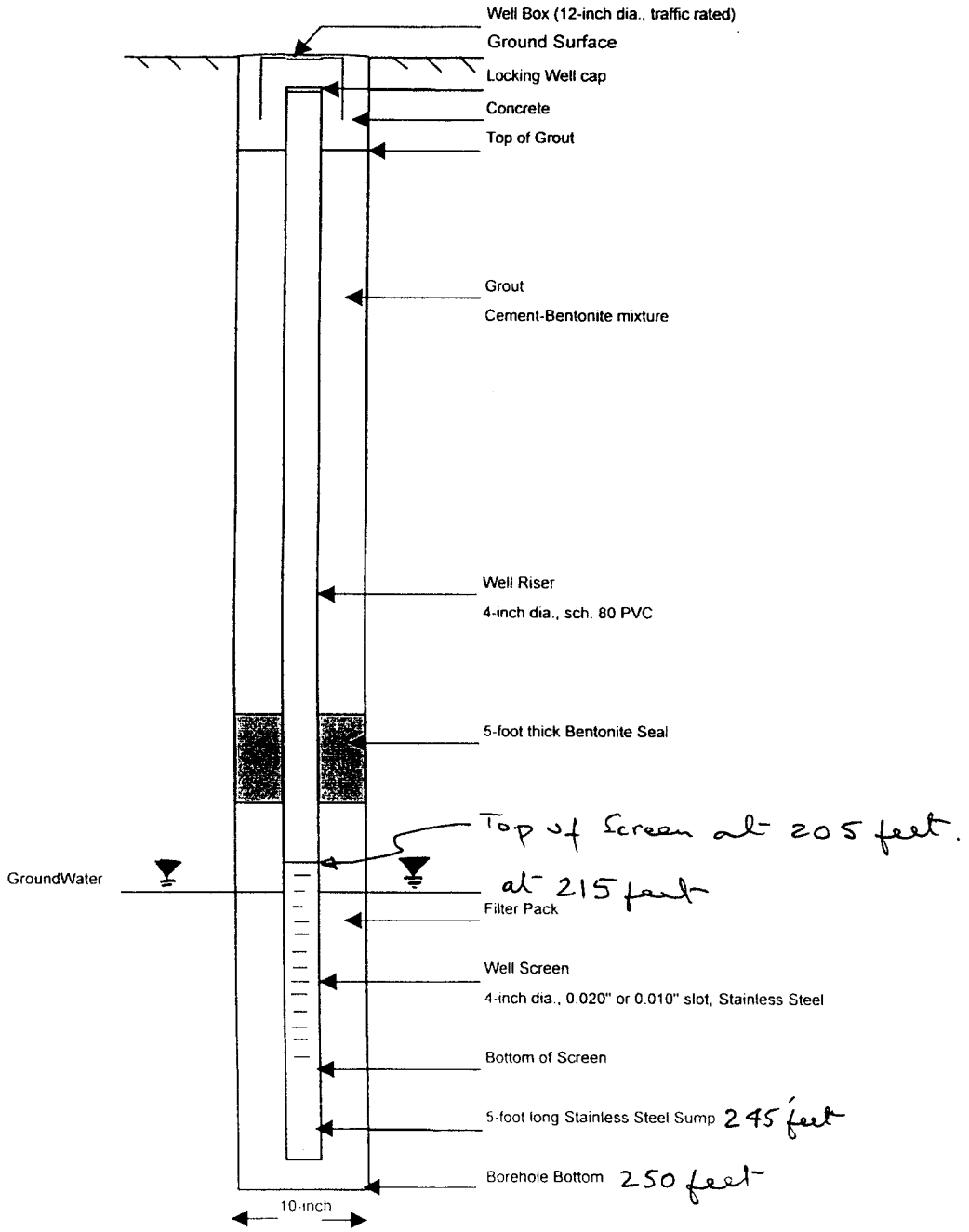
Figure 1.

AERIAL PHOTOGRAPH ANOMALY PROGRAM

PROPOSED WELL LOCATIONS AT ANOMALY AREA 3

MARINE CORPS AIR STATION, EL TORO

Well Construction Diagram



Not to Scale

NOTE: Depths are estimated and change in the field according to conditions.

Figure 2

A-3 BORING LOGS AND WELL CONSTRUCTION DIAGRAMS

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

<<TemplateID>> <<Format(<<Now>>,<<fdNumSlash>>)>>

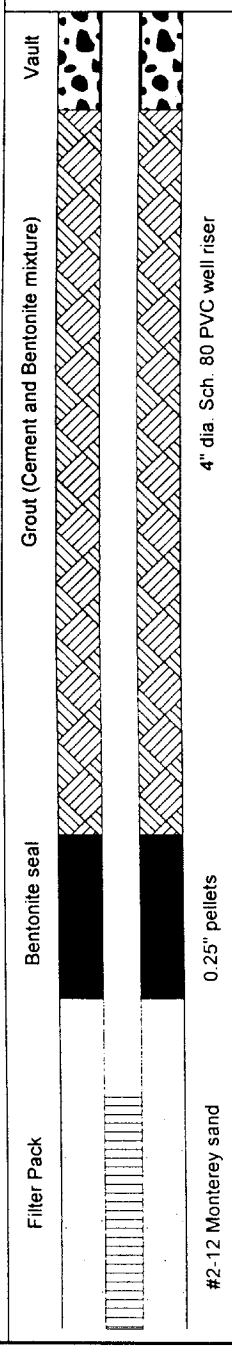
Geologic Log of Boring MSC R1-MW01

Project	MCAS, El Toro	Northing	2,194,690.809	Drilling Company	Water Development Corporation
Project Number		Easting	6,116,938.126	Drill Rig	SpeedStar
Client	SWDiv	TOC Elevation	455.02	Driller	Rod Koch
Location		GS Elevation	455.36	Drill Method	ARCH
Geologist	G. Berger	Hammer Weight & Drop	280 lb, 30 inches		
Borehole Diameter	10 inches	Total Depth of Borehole	51.5 feet	Depth to Water	24.3 feet bgs

Begin Drilling	10/12/99
End Drilling	10/12/99
Well Completion Date	10/13/99

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)
Top 10-feet hand augered for underground utilities clearance	0	SM					
	1						
	2						
	3						
	4						
Based on soil cuttings **Silty Sand (SM)**: Brown (10 YR 5/3); 85% fine to medium iron coated sand grains, 15% silt, dry, loose.	5	SM					
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
Clayey Sand (SC): Brown (10YR 4/3); 80% fine sand, 20% fines, moist, dense.	15	SC				13	6
	16					24	6
						28	6
	17						
Based on soil cuttings from cyclone **Silty Sand (SM)**: Brown (10YR 4/3); 85% fine sand, 15% fines, trace gravel, very moist, micaceous.	18	SM					
	19						
	20						

WELL DETAIL



OHM Remediation Services Corp.

GEOL_WELL_EL_TORO.GPJ EL_TORO.GDT 12/16/99

DRAFT

Geologic Log of Boring MSC R1-MW01

Project: MCAS, El Toro	Northing: 2,194,690.809	Drilling Company: Water Development Corporation	
Project Number	Easting: 6,116,938.126	Drill Rig: SpeedStar	Begin Drilling: 10/12/99
Client: SWDiv	TOC Elevation: 455.02	Driller: Rod Koch	End Drilling: 10/12/99
Location	GS Elevation: 455.36	Drill Method: ARCH	Well Completion Date: 10/13/99
Geologist: G. Berger	Hammer Weight & Drop: 280 lb, 30 inches		
Borehole Diameter: 10 inches	Total Depth of Borehole: 51.5 feet	Depth to Water: 24.3 feet bgs	

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)	WELL DETAIL
	20							
Based on soil cuttings from cyclone **Silty Sand (SM)**: Brown (10YR 4/3); 85% fine sand, 15% fines, trace gravel, very moist, micaceous.	21	SM						
	22							
	23							
	24 ▼							
Clayey Sand (SC): Brown (10YR 4/3); 60% fine sand, 40% fines, wet, loose, micaceous.	25	SC				2	6	
	26					3	6	
Based on soil cuttings. **Clayey Sand to Sandy Clay (SC/CL)**; Brown (10YR 4/3); 50% fine sand, 50% fines, wet.		SC/CL				3	6	
	27							
	28							
	29							
Poorly to Well Graded Sand (SP-SW): Grayish brown (10YR 3/2), 90% fine to medium to coarse sand, 10% gravel, wet, very dense, very micaceous. Becomes gravelly toward base, some clay clasts present.	30	SP-SW				18	6	
	31					50	6	
		SP				50	6	
	32							
	33							
	34							
Sand (SP); Light yellowish brown (2.5Y 6/4), 90% medium to coarse sand.	35	SP				18	6	
						20	6	
Silty Sand (SM); Light olive brown (2.5Y 5/6), 80% fine sand, 20% silt.	36	SM				20	6	
		SM						
	37							
	38							
	39							
	40							

4" dia. 0.020" wire-wound continuous wrap stainless steel screen

GEOL_WELL EL_TORO.GPJ EL_TORO.GDT 12/16/99

OHM Remediation Services Corp.

DRAFT

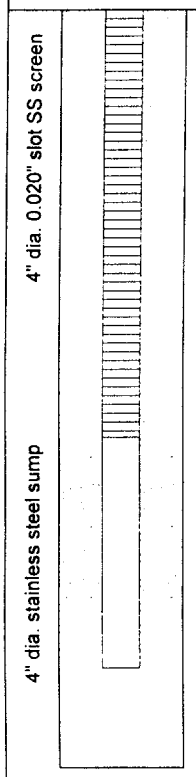
Geologic Log of Boring MSC R1-MW01

Project	MCAS, El Toro	Northing	2,194,690.809	Drilling Company	Water Development Corporation
Project Number		Easting	6,116,938.126	Drill Rig	SpeedStar
Client	SWDiv	TOC Elevation	455.02	Driller	Rod Koch
Location		GS Elevation	455.36	Drill Method	ARCH
Geologist	G. Berger	Hammer Weight & Drop	280 lb, 30 inches		
Borehole Diameter	10 inches	Total Depth of Borehole	51.5 feet	Depth to Water	24.3 feet bgs

Begin Drilling: 10/12/99
End Drilling: 10/12/99
Well Completion Date: 10/13/99

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)
	40						
	41						
	42						
	43						
	44						
Silty Sand (SM); Light yellowish brown (2.5Y 6/3) mottled to dark yellowish brown (10YR 4/6); 90% fine sand, 10% silt, trace gravel; wet, dense.	45	SM		X	0	29	6
						50	6
Weathered sandstone; Light greenish gray (5GY 7/1) mottled brownish yellow (10YR 6/8) silty fine sand, moist, very dense. Niguel Formation (Pliocene).	46	SS		X		50	6
		SS					
	47						
	48						
	49						
Sandstone, consolidatd Sand; Very dark gray (N3); very fine sand, micaceous, horizontally laminated; consolidated weakly indurated, very dense. Niguel Formation (Pliocene).	50			X		50	6
						50	6
	51					50/1	6

WELL DETAIL



Boring Ends at 51.5 ft.

OHM Remediation Services Corp.

GEOL_WELL EL_TORO.GPJ EL_TORO.GDT 12/16/99

DRAFT

Geologic Log of Boring MSC R1-MW02

Project	MCAS, El Toro	Northing	2,194,900.426	Drilling Company	Water Development Corporation
Project Number		Easting	6,116,747.858	Drill Rig	SpeedStar
Client	SWDiv	TOC Elevation	459.71	Driller	Rod Koch
Location		GS Elevation	460.19	Drill Method	ARCH
Geologist	G. Berger	Hammer Weight & Drop	280 lb, 30 inches		
Borehole Diameter	10 inches	Total Depth of Borehole	56.0 feet	Depth to Water	35.5 feet bgs

Begin Drilling	10/14/99
End Drilling	10/14/99
Well Completion Date	10/15/99

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)	WELL DETAIL
Hand auger to 10' for subsurface utility clearance.	0							Vault
	1							
	2							
	3							
Based on cuttings 5' to 10'.	4	SP-SM						
Poorly Graded Sand with Silt (SP-SM); Dark yellowish brown (10YR 4/4); 90% fine sand, 10% silt, micacious, moist.	5							Grout (cement and bentonite mixture)
	6							
	7							
	8							4" dia. Sch 40 PVC well riser
	9							
Based on cuttings 10' to 15'.	10	SP-SW						
Poorly to Well Graded Sand (SP-SW); Brown (10YR 5/3); 95%+ fine to medium grain quartz sand, trace dark minerals, trace fines, micaceous, dry.	11							
	12							
	13							
	14							
Gravelly Sand (SW); Brown (10YR 5/3); 90%+ fine to course iron coated quartz sand, 10% gravel, max. dia. 1", dry, dense.	15	SW			0	13	6	Bentonite Seal
	16					25	6	
Based on cuttings. **Gravelly Sand (SW-SM)**; Dark yellowish brown (10Y 4/4).		SW				29	6	3/8" pellets - coated
	17							
	18							
	19							Filter Pack #2-12 sand
	20							

OHM Remediation Services Corp.

GEOL_WELL EL_TORO.GPJ EL_TORO.GDT 12/16/99

DRAFT

Geologic Log of Boring MSC R1-MW02

Project	MCAS, El Toro	Northing	2,194,900.426	Drilling Company	Water Development Corporation
Project Number		Easting	6,116,747.858	Drill Rig	SpeedStar
Client	SWDiv	TOC Elevation	459.71	Driller	Rod Koch
Location		GS Elevation	460.19	Drill Method	ARCH
Geologist	G. Berger	Hammer Weight & Drop	280 lb, 30 inches		
Borehole Diameter	10 inches	Total Depth of Borehole	56.0 feet	Depth to Water	35.5 feet bgs

Begin Drilling: 10/14/99
End Drilling: 10/14/99
Well Completion Date: 10/15/99

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)	WELL DETAIL
Based on soil cuttings. **Gravelly Sand (SW)**	20, 21, 22, 23, 24	SW						
Gravelly Sand (SW); Brown (10YR 5/3); 90% fine to course quartz sand, 10% gravel, black, angular, max. dia. 3/4", moist, dense.	25, 26	SW		X	0	25 31 54	6 6 6	4" dia. 0.020" wire-wound continous wrap stainless steel screen
Based on cuttings. **Gravelly Sand (SW-SM)**; similar to above, moist.	27, 28, 29, 30, 31, 32, 33, 34	SW						
Poorly Graded Sand with Silt (SP-SM); Brown (10YR 4/3); 85% fine to medium sand, 10% silt, 5% gravel, micacious, wet, dense.	35, 36, 37, 38, 39, 40	SP-SM SP-SM		X	0	18 27 39	6 6 6	

GEOL_WELL EL_TORO.GPJ EL_TORO.GDT 12/16/99

DRAFT

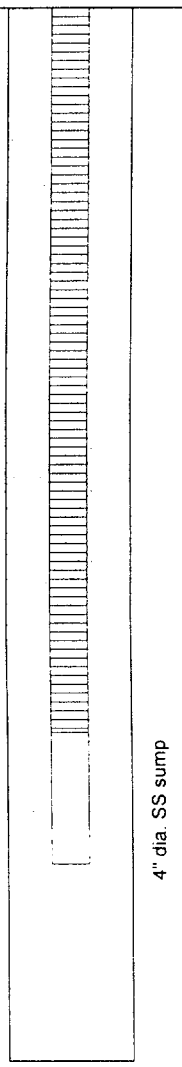
Geologic Log of Boring MSC R1-MW02

Project	MCAS, El Toro	Northing	2,194,900.426	Drilling Company	Water Development Corporation
Project Number		Easting	6,116,747.858	Drill Rig	SpeedStar
Client	SWDiv	TOC Elevation	459.71	Driller	Rod Koch
Location		GS Elevation	460.19	Drill Method	ARCH
Geologist	G. Berger	Hammer Weight & Drop	280 lb, 30 inches		
Borehole Diameter	10 inches	Total Depth of Borehole	56.0 feet	Depth to Water	35.5 feet bgs

Begin Drilling: 10/14/99
End Drilling: 10/14/99
Well Completion Date: 10/15/99

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)
Well Graded Sand (SW); Grayish brown (10YR 5/2); 90% fine to coarse sand, 10% gravel, wet, medium dense.	40	SW				7	6
					0	18	6
Silty Sand (SM); Dark grayish brown (10YR 6/2); 80% fine to medium sand, 20% silt with some clay, trace gravel, 1" max. dia., wet, medium dense.	41	SM				24	6
	42						
	43						
	44	SP					
	45						
Poorly Graded Sand (SP); Brown (10YR 5/3); 100% fine to coarse sand, wet, medium dense.	46	SP				7	6
					0	13	6
Silty Sand with Gravel (SM); 60% fine to medium sand, 20% silt and clay, 20% gravel, wet medium dense.	47	SM				25	6
	48						
Weathered bedrock and Alluviun contact at 49'.	49	GW					
Well Graded Gravel with Sand (GW); 60% gravel, 2" max. dia.	50					25	6
						50	6
Weathered Sandstone; Light brownish gray (2.5Y 6/2), mottled to olive yellow (2.5Y 6/6). Niguel Formation (Pliocene).	51	SS					0
	52						
	53						
	54						
Weathered Sandstone; Light gray (2.5Y 7/3) mottled to yellowish brown (10YR 6/8); fine grained well sorted sand. Niguel Formation (Pliocene).	55	SS				39	6
	56					50	6
							0
Boring Ends at 56.5 ft.							

WELL DETAIL



OHM Remediation Services Corp.

GEOL_WELL_EL_TORO.GPJ EL_TORO.GDT 12/16/99

DRAFT

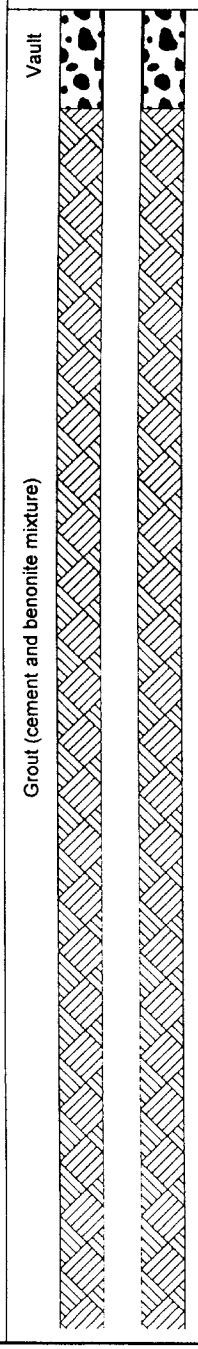
Geologic Log of Boring MSC R1-MW03

Project	MCAS, El Toro	Northing	2,195,723.495	Drilling Company	Water Development Corporation
Project Number		Easting	6,117,525.667	Drill Rig	SpeedStar
Client	SWDiv	TOC Elevation	500.31	Driller	Rod Koch
Location		GS Elevation	500.85	Drill Method	ARCH
Geologist	G. Berger	Hammer Weight & Drop	280 lb, 30 inches		
Borehole Diameter	10 inches	Total Depth of Borehole	86.5 feet	Depth to Water	59.5 feet bgs

Begin Drilling: 10/18/99
End Drilling: 10/19/99
Well Completion Date: 10/19/99

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)
Note: This boring is in units of the NIguel Formation (Pliocene).	0	SP-SM					
Hand augered to 10' for subsurface utility clearance.	1						
Based on cuttings 0' - 5' **Poorly Graded Sand with Silt (SP-SM)**: Light yellowish brown (2.5Y 6/4); 90% fine sand, well sorted, 10% silt, moist, appears similar to Niguel Formation (Pliocene).	2						
	3						
	4						
	5						
	6						
	7						
Based on cuttings 5' - 10'. **Poorly Graded Sand with Silt (SP-SM)**: Light olive brown (2.5Y 5/3); 90% fine to medium grain sand, 10% silt, trace gravel, max dia. 0.25".	8	SP-SM					
	9						
	10						
	11						
	12						
	13						
	14						
Siltstone, Niguel Formation, comprised of interbedded laminae:	15	ML				36	6
Sandy Silt (ML): Light olive brown (2.5Y 5/3); 60% silt, 40% fine sand.		SM			0	50	6
Silty Sand (SM): Light brown gray (2.5Y 6/2) mottles light yellowish brown (2.5Y 6/4); 60% fine sand, 40% silt.	16	CL				80	6
Sandy Clay (CL); Olive gray (5Y 5/2); 60% clay - stiff hard, 40% silt and sand, few gravel.		SM/ML					
	17						
Based on cuttings. **Silty Sand/Sandy Silt (SM/ML)**; Dark grayish brown (10YR 4/2); 50% silt 50% fine sand, moist, micaceous.	18						
	19						
	20						

WELL DETAIL



OHM Remediation Services Corp.

GEOL_WELL EL_TORO.GPJ EL_TORO.GDT 12/16/99

DRAFT

Geologic Log of Boring MSC R1-MW03

Project	MCAS, El Toro	Northing	2,195,723.495	Drilling Company	Water Development Corporation
Project Number		Easting	6,117,525.667	Drill Rig	SpeedStar
Client	SWDiv	TOC Elevation	500.31	Driller	Rod Koch
Location		GS Elevation	500.85	Drill Method	ARCH
Geologist	G. Berger	Hammer Weight & Drop	280 lb, 30 inches		
Borehole Diameter	10 inches	Total Depth of Borehole	86.5 feet	Depth to Water	59.5 feet bgs

Begin Drilling: 10/18/99
End Drilling: 10/19/99
Well Completion Date: 10/19/99

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)	WELL DETAIL
Based on cuttings. **Silty Sand/Sandy Silt (SM/ML)**; Dark grayish brown (10YR 4/2); 50% silt, 50% fine sand, moist, micaceous.	20	SM/ML						Grout (cement and benonite mixture); 4" dia. Sch 40 PVC well riser
	21							
	22							
	23							
	24							
Claystone, Niguel Formation, comprised of interbedded: **Clayey Silt/Silty Clay (ML/CL)**; Brown (10YR 5/3); 50% clay, 50% silt, moist, soft.	25	ML/CL				5	6	
Clayey Sand (SC); Brown (10YR 4/2); 50% fine sand, 50% silt and clay, micaceous. **Clay (CH)**; Brown (10YR 4/5); clay, very moist-plastic.	26	SC CH			0	8 16	6 6	
	27							
	28							
Based on soil cuttings. **Silty Sand (SM)**	29	SM						
	30							
	31							
	32							
	33							
	34							
Sandstone, Niguel Formation, comprised of: **Very Silty Sand (SM)**; Light olive brown (2.5Y 5/4); 60% fine sand, 40% silt with small amount of clay.	35	SM				10	6	
	36				0	16 21	6 6	
	37							
	38							
	39							
	40							

GEOL_WELL_EL_TORO.GPJ EL_TORO.GDT 12/16/99

DRAFT

Geologic Log of Boring MSC R1-MW03

Project	MCAS, El Toro	Northing	2,195,723.495	Drilling Company	Water Development Corporation
Project Number		Easting	6,117,525.667	Drill Rig	SpeedStar
Client	SWDiv	TOC Elevation	500.31	Driller	Rod Koch
Location		GS Elevation	500.85	Drill Method	ARCH
Geologist	G. Berger	Hammer Weight & Drop	280 lb, 30 inches		
Borehole Diameter	10 inches	Total Depth of Borehole	86.5 feet	Depth to Water	59.5 feet bgs

Begin Drilling	10/18/99
End Drilling	10/19/99
Well Completion Date	10/19/99

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)	WELL DETAIL
	40							
	41							
	42							
	43							
	44							
Sandstone, Niguel Formation, comprised of:								
Poorly Graded Sand (SP); Olive yellow (10YR 6/6); 90% sand, 10% fine to med gravel, moist, some iron staining, very dense.	45	SP				25	6	Bentonite Seal; 0.25" pellets
	46				0	34	6	
						56	6	
	47							
	48							
Based on cuttings. **Well Graded Sand (SW)**; Light olive brown (10YR 5/4); 90% fine to coarse sand, 10% gravel, moist.	49	SW						Filter Pack #2-12 Monterey sand
	50							
	51							
	52							
	53							
	54							
Well Graded Sand (SW); Light olive brown (2.5Y 5/4) mottled olive yellow; fine to coarse sand and gravelly in places, some iron staining. Niguel Formation (Pliocene).	55	SW				32	6	4" dia. 0.020" wire-wound continuous wrap SS screen (50' total)
	56					50	6	
						50	6	
	57							
Based on soil cuttings. **Poorly Graded Sand (SP)**; Yellow brown (10YR 6/6); 100% fine to medium sand, wet, possible water table.	58	SP						
	59							
	60							

OHM Remediation Services Corp.

GEOL_WELL EL_TORO.GPJ EL_TORO.GDT 12/16/99

DRAFT

Geologic Log of Boring MSC R1-MW03

Project	MCAS, El Toro	Northing	2,195,723.495	Drilling Company	Water Development Corporation
Project Number		Easting	6,117,525.667	Drill Rig	SpeedStar
Client	SWDiv	TOC Elevation	500.31	Driller	Rod Koch
Location		GS Elevation	500.85	Drill Method	ARCH
Geologist	G. Berger	Hammer Weight & Drop	280 lb, 30 inches		
Borehole Diameter	10 inches	Total Depth of Borehole	86.5 feet	Depth to Water	59.5 feet bgs

Begin Drilling: 10/18/99
End Drilling: 10/19/99
Well Completion Date: 10/19/99

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)	WELL DETAIL
Based on soil cuttings. **Poorly Graded Sand (SP)**: Yellow brown (10YR 5/6); 100% fine to medium sand, wet.	60	SP						
	61							
	62							
	63							
	64							
Poorly Graded Sand with Silt (SP-SM); Light olive brown (2.5Y 5/4); fine to medium sand, dense. Becomes gravelly towards the base, iron stained.	65	SP-SM				12	6	
	66					26	6	
						46	6	
Based on cuttings. **Poorly Graded Sand (SP)**: Fine to coarse sand with clay pebbles.	67	SP						
	68							
	69							
Gravelly Silty Sand (SM); Mottled olive yellow (2.5Y 6/8), dark yellow (10YR 6/8), light brown (2.5Y 5/4); 70% fine sand, 15% silt, 15% gravel, wet, dense.	70	SM				15	6	
	71				0	26	6	
						30	6	
	72	SM						
	73							
	74							
Silty Sand (SM); Light olive brown (2.5Y 5/4); 83% fine sand, 10% silt, 7% gravel, max. dia. 1", wet.	75	SM					0	
	76				0		0	
							0	
Based on cuttings. **Silty Sand (SM)**: Gravel becomes coarser with depth.	77	SM						
	78							
	79							
	80							

4" dia. 0.010" wire-wound continuous wrap SS screen (70' to 80')

GEOL_WELL EL_TORO.GPJ EL_TORO.GDT 12/16/99

DRAFT

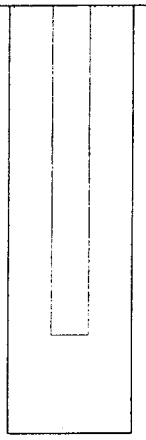
Geologic Log of Boring MSC R1-MW03

Project	MCAS, El Toro	Northing	2,195,723.495	Drilling Company	Water Development Corporation
Project Number		Easting	6,117,525.667	Drill Rig	SpeedStar
Client	SWDiv	TOC Elevation	500.31	Driller	Rod Koch
Location		GS Elevation	500.85	Drill Method	ARCH
Geologist	G. Berger	Hammer Weight & Drop	280 lb, 30 inches		
Borehole Diameter	10 inches	Total Depth of Borehole	86.5 feet	Depth to Water	59.5 feet bgs

Begin Drilling: 10/18/99
End Drilling: 10/19/99
Well Completion Date: 10/19/99

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)
Silty Sand (SM); Olive (5Y 5/4), mottled olive yellow (2.5Y 6/8); 85% very fine sand, 15% silt, trace gravel, wet, very dense.	80	SM		X		27	6
						40	6
	81					50	6
		SM					
	82						
	83						
	84						
Silty Sand (SM); Pale olive (5Y 6/4); 80% very fine to fine sand, 10% silt, 10% gravel, max. dia. 2", wet.	85	SM		X			0
	86						0
							0
Boring Ends at 86.5 ft.							

WELL DETAIL



GEOL_WELL EL_TORO.GPJ EL_TORO.GDT 12/16/99

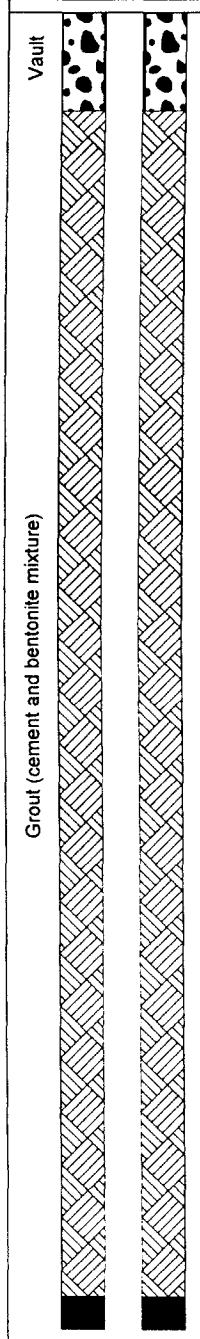
DRAFT

Geologic Log of Boring MSC R1-MW04

Project: MCAS, El Toro	Northing: 2,195,127.846	Drilling Company: Water Development Corporation	
Project Number	Easting: 6,116,912.976	Drill Rig: SpeedStar	Begin Drilling: 10/20/99
Client: SWDiv	TOC Elevation: 464.24	Driller: Rod Koch	End Drilling: 10/20/99
Location	GS Elevation: 464.87	Drill Method: ARCH	Well Completion Date: 10/21/99
Geologist: J. Jameson	Hammer Weight & Drop: 280 lb, 30 inches		
Borehole Diameter: 10 inches	Total Depth of Borehole: 56.5 feet	Depth to Water: 28.8 feet bgs	

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)
Top 10 feet hand augered for subsurface utility clearance.	0						
	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	9						
	10						
	11						
	12						
	13						
	14						
Poorly Graded Sand with Silt (SP-SM): Light brown (7.5YR 6/4), 85% fine to medium grained sand, 15% fines, trace fine subrounded gravel, slightly moist, very dense.	15	SP-SM			0	25	6
	16					50	6
		SP-SM				25	6
	17						
	18						
	19						
	20						

WELL DETAIL



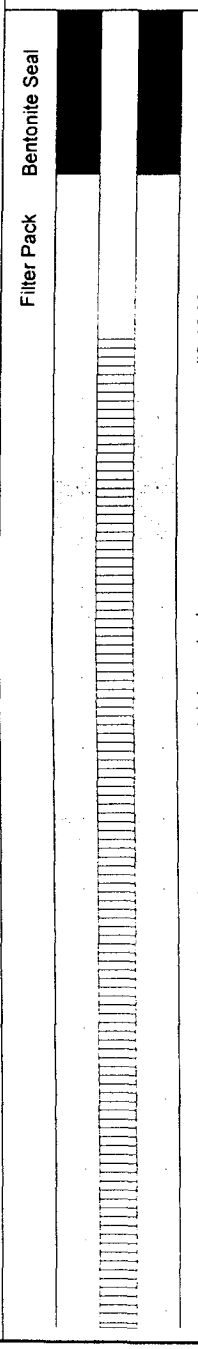
DRAFT

Geologic Log of Boring MSC R1-MW04

Project: MCAS, El Toro	Northing: 2,195,127.846	Drilling Company: Water Development Corporation	
Project Number	Easting: 6,116,912.976	Drill Rig: SpeedStar	Begin Drilling: 10/20/99
Client: SWDiv	TOC Elevation: 464.24	Driller: Rod Koch	End Drilling: 10/20/99
Location	GS Elevation: 464.87	Drill Method: ARCH	Well Completion Date: 10/21/99
Geologist: J. Jameson	Hammer Weight & Drop: 280 lb, 30 inches		
Borehole Diameter: 10 inches	Total Depth of Borehole: 56.5 feet	Depth to Water: 28.8 feet bgs	

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)
	20	SP-SM					
	21						
	22						
	23						
	24						
Claystone: Olive (5Y 5/3), 100% low plastic fines, trace fine grained sand and fine gravel,slightly moist, very stiff. Niguel Formation (Pliocene).	25	CL			0	10	6
	26					10	6
	27					10	6
	28						
	29						
	30						
	31						
	32						
	33						
	34						
Claystone: Olive (5Y 5/3), 100% low plastic fines, trace fine grained sand and fine gravel,slightly moist, very stiff. Niguel Formation (Pliocene).	35	CL			0	10	6
	36					10	6
	37					10	6
	38						
	39						
	40						

WELL DETAIL



OHM Remediation Services Corp.

GEOL_WELL_EL_TORO.GPJ EL_TORO.GDT 12/16/99

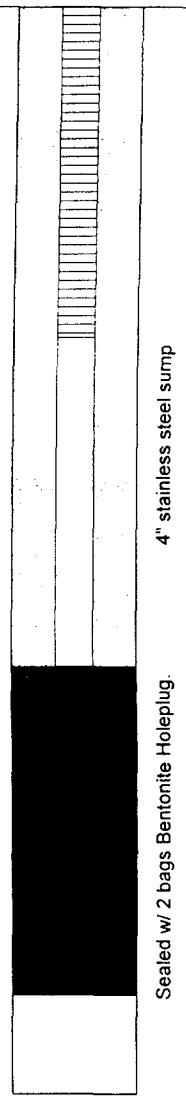
DRAFT

Geologic Log of Boring MSC R1-MW04

Project: MCAS, El Toro	Northing: 2,195,127.846	Drilling Company: Water Development Corporation	
Project Number	Easting: 6,116,912.976	Drill Rig: SpeedStar	Begin Drilling: 10/20/99
Client: SWDiv	TOC Elevation: 464.24	Driller: Rod Koch	End Drilling: 10/20/99
Location	GS Elevation: 464.87	Drill Method: ARCH	Well Completion Date: 10/21/99
Geologist: J. Jameson	Hammer Weight & Drop: 280 lb, 30 inches		
Borehole Diameter: 10 inches	Total Depth of Borehole: 56.5 feet	Depth to Water: 28.8 feet bgs	

DESCRIPTION	Depth (feet)	Soil Group	Graphic Log	Samples	PID/FID (ppm)	Blows/6 in.	Recovery (inches)
Claystone; Olive (5Y 5/3); high plasticity; 50% dark olive brown to black silty clay, laminated, wet, very stiff. Niguel Formation (Pliocene).	40	CL			0	10	6
						10	6
	41					10	6
	42						
	43						
	44						
Claystone; Very dark gray (5Y 5/1); silty clay, moist, hard, low plasticity. Niguel Formation (Pliocene).	45	CL				15	6
						25	6
	46					27	6
	47						
	48						
	49						
Claystone; Very dark gray (5Y 3/1); slightly moist, hard, low plasticity. Niguel Formation (Pliocene).	50	CL				11	6
						15	6
	51					22	6
	52						
	53						
	54						
Claystone; Very dark gray; silty clay, dry, hard, low plasticity. Niguel Formation (Pliocene).	55	CL				13	6
						18	6
	56					33	6
Boring Ends at 56.5 ft.							

WELL DETAIL



OHM Remediation Services Corp.

GEOL_WELL_EL_TORO.GPJ EL_TORO.GDT 12/16/99

DRAFT

OHM REMEDIATION SERVICES CORP.

LOCATION: MSCR1 - PZ-1

DATE: 10/7/99

BOREHOLE NUMBER: PZ1

SHEET ___ OF 1

Logged by: J Jamison

Drill Co: Li

Drill Rig: Mobil CME85

Method: Hollowstem

Hole Dia: 4"

TIME	DEPTH	PID/FID HNU OVA (PPM)	BLOWS/ 6 IN PRESSURE (PSI)	RECOVERY	SAMPLE NUMBER	SAMPLE INTERVAL	WELL DETAIL	SOIL/ROCK SYSMBOL	GRAPHIC LOG	FIELD SOIL DESCRIPTION
										Hand Auger to 10'
										10YR ~~5/3~~ 4/2 ~~Dark~~ grayish brown silty sand, subrounded to subangular, dry, micaceous.
1145	10			1.0'						10YR 5/3 Brown silty sand, subrounded to subangular, dry, micaceous
1150	15			1.0'						10YR 4/3 Brown silty sand, fine, moderate moisture.
1200	20			1.0'						10YR 4/3 brown silty sand, moderate moisture, micaceous.
										TD: 22'
										SI 17-22'
										Filter to 16'
	5									
	0									

<C:/EXCEL/BORELOG.xls>

OHM REMEDIATION SERVICES CORP.

LOCATION: [illegible]-2

DATE: 10 [illegible]

BOREHOLE NUMBER: [illegible]-2

SHEET ___ OF ___

TIME	DEPTH	PID/FID HNU OVA (PPM)	BLOWS/ 6 IN PRESSURE (PSI)	RECOVERY	SAMPLE NUMBER	SAMPLE INTERVAL	WELL DETAIL	SOIL/ROCK SYSMI	GRAPHIC LOG	FIELD SOIL DESCRIPTION
										Hole by J. Jamison. Well by CMCES method Hollowstem Auger 4"
	15		6 7 4							10YR 5/3 brown clean sand, fine w/ moderate to low moisture
	10		8 11 14							10YR 4/4 dark yellowish brown silty sand w/ low plasticity and moderate moisture.
	15		10 10 17	1.5'	10 10 17		10' 1" Bentonite Chips			10YR 5/3 brown gravelly SAND approx 5-10% sub angular gravel with maximum size (3%) angular gravel with approx 1/2" to 1" diameter.
	20		9 14 15	10.4'			Sand			
	25		10 11 20	10.4'			Filter Screen			10YR 5/3 Brown gravely sands, fine to coarse sands approx 3% angular to sub angular gravel
	30		8 10 15	10.4'						10YR 4/4 Dark yellow brown gravely sands, fine to coarse sands approx 10% angular to sub angular brick gravel.
	40									TD 30' SI 25'-30' Water @ 24'
	50									

<C:/EXCEL/deepBORELOG>

OHM REMEDIATION SERVICES CORP.

LOCATION: PE-3

DATE:

BOREHOLE NUMBER: PE3

1 OF 1

Proj # 92C24C
Logged by Jim Jameson

Driller: Bx
Drilling Equip: 25
Method: Hollowstem
Hole Dia: 8" 4"

TIME	DEPTH	PID/FID HNU OVA (PPM)	BLOWS/ 6 IN PRESSURE (PSI)	RECOVERY	SAMPLE NUMBER	SAMPLE INTERVA	WELL DETAIL	SOIL/ROCK SYSMB	GRAPHIC LOG	FIELD SOIL DESCRIPTION
	5		9 11 12	10"						10YR 5/3 Brown clayey sand fine, low moisture, low plasticity, micaceous.
	10		10 12 14	10"						10YR 4/3 Brown silty clay, low moisture & low plasticity, micaceous.
	15		9 14 16	10"						10YR 4/3 Brown silty clay, low moisture low plasticity.
	20 ~~120~~		10 14 16	10"			sand Backfill			10YR 4/3 Brown clayey sand wet 20% subangular gravel ranging from 1/4" to 1" in diameter.
	30 ~~120~~									
	40 ~~180~~									
	50 ~~140~~									

<C:/EXCEL/deepBORELOG>

A-4 WELL DEVELOPMENT LOGS

Site: MW-1 Total Well Depth: 50.45 Screen Interval: Filterpack Interval: Casing Volume: ~~35 gal~~ 18 gal

DO Number: 112 Well Dia.: 4" Depth to water: 23.19 One Well Volume: 23 Gallons (115)

Project Number: Borehole Dia.: 10" Pump Depth: One well volume is well casing volume + 25% of filterpack annulus

Datum: TOC GS Other(describe) Pump Type: Total gallons Purged: 425

Subcontractor: Water Development Subcontractor Representative: Bill

Sample Collected: Yes (No) Duplicate Collected: Yes (No) Rinsate Colleected: Yes (No)

Sample No. N/A Duplicate Sample No. N/A Rinsate Sample No. N/A

TIME	Amount purged (gal)	Temp (°F)	Conductivity micro cm/Sec	pH	Turbidity (NTU)	Pumping Rate (gpm)	Comments
0814	65	70.4	2.39	7.62	E3	3	
0911	80	69.9	2.38	7.88	E3	6	
0913	95	70.2	2.24	7.87	E3	6	
0915	110	70.5	2.21	7.95	E3	6	
0917	125	70.6	2.24	7.89	E3	6	
~~0919~~	140	70.7	2.20	7.86	E3	6	
0921	155	70.7	2.29	7.76	E3	6	
0924	170	70.5	2.32	7.89	E3	6	
0929	185	70.3	2.25	7.96	E3	6	
0949	215	72.0	2.32	8.31	E3	6	
0951	230	71.8	2.26	8.17	E3	6	
1115	240	81.9	2.29	~~8.~~ 7.74	E3	3	
1118	265	78.7	2.29	7.76	E3	3	
1120	275	78.1	2.32	7.70	E3	3	
1124	290	77.4	2.31	7.65	E3	3	
1127	300	76.4	2.38	7.72	E3	3	
1132	315	77.1	2.37	7.83	E3	3	
1134	330	78.6	2.47	7.91	E3	3	
1141	345	77.9	2.46	7.80	E3	3	
1220	349	84.2	2.78	7.54	76.7	2	
1225	359	83.0	2.50	7.61	26.5	2	
1230	369	79.6	2.51	7.61	58.0	2	
1235	379	79.9	2.59	7.57	37.3	2	
1240	389	79.7	2.47	7.65	16.4	2	
1245	399	79.7	2.47	7.43	6.38	2	
1250	409	79.4	2.58	7.63	6.58	2	
1255	419	79.5	2.48	7.53	6.58	2	

Well Development

Groundwater sampling log, MCAS, El Toro

Date: 10/27/99
Client: El Toro
Site: MSR1-MW2
DO Number: 112
Project Number:
Datum: ___TOC ___GS ___ Other(describe)
Subcontractor: Water D
Sample Collected: Yes (No) Duplicate Collected: Yes (No) Rinsate Colleected: Yes (No)
Sample No. Duplicate Sample No. Rinsate Sample No.

Well Number: MW2
Total Well Depth: 92.80
Well Dia.: 4"
Borehole Dia.: 10"

Screen Interval: 21 - 51'
Filterpack Interval:
Depth to water: 38.83
Pump Depth:
Pump Type:
Subcontractor Representative:

OHM/IT Representative: Warren Goldshine
Casing Volume: 13
One Well Volume: 21 Gallons 105
One well volume is well casing volume + 25% of filterpack annulus
Total gallons Purged: 404

TIME	Amount purged (gal)	Temp (°F)	Conductivity micro cm/Sec	pH	Turbidity (NTU)	Pumping Rate (gpm)	Comments
0828	50	68.8	2.54	7.55	E3		
0830	65	71.3	2.61	7.56	E3		
0833	80	72.5	2.60	7.52	E3		
0835	90	71.7	2.58	7.61	E3		Moved scale to x1000 from x10
0838	105	71.9	2.55	7.50	E3		
0922	110	70.3	2.59	7.77	E3		
0923	120	72.1	2.61	7.72	E3		
0926	130	73.4	2.58	7.65	E3		
0930	140	74.1	2.67	7.65	E3		
0931	150	74.5	2.54	7.62	E3		
0934	160	75.3	2.67	7.69	E3		
0938	170	75.1	2.67	7.66	845		1:1 Dilution
0941	180	74.4	2.70	7.64	233		1:1 Dilution
1027	190	78.3	2.86	7.80	E3		
1030	200	77.3	2.96	7.71	E3		1:1 Dilution
1032	210	77.0	2.86	7.76	873		1:1 Dilution
1036	220	77.3	2.80	7.61	971		w/o Dilution
1039	230	76.6	2.72	7.67	957		
1041	240	77.0	2.77	7.72	932		
1059	250	77.6	2.85	7.81	1000		Flashing display
1102	260	78.7	2.79	7.83	742		
1104	270	78.7	2.81	7.67	793		
1108	280	78.3	2.84	7.66	703		
1143 1148	290	85.4	2.99	7.53	128	2	
1148	300	83.2	2.87	7.41	69.6		
1153	310	81.4	2.84	7.49	21.1		
1158	320	81.0	2.87	7.36	13.0		
1205	334	81.4	2.91	7.39	9.29		
1210	344	81.2	2.82	7.37	5.57		
1215	354	81.7	2.87	7.38	4.19		

Well Number: MW 2 | Screen Interval: 21 51 | Casing Volume: 10

1W2 | Total Well Depth: 52.80 | Filterpack Interval: | One Well Volume: 21 Gallons 105 min

112 | Well Dia.: 4" | Depth to water: 38.83 | One well volume is well casing volume + 25% of filterpack annulus

ber: | Borehole Dia.: 10" | Pump Depth: | Total gallons Purged: 404

TOC GS Other(describe) | Pump Type:

ontractor: Water D | Subcontractor Representative:

ample Collected: Yes (No) Duplicate Collected: Yes (No) Rinsate Colleected: Yes (No)

Sample No. Duplicate Sample No. Rinsate Sample No.

TIME	Amount purged (gal)	Temp (°F)	Conductivity micro cm/Sec	pH	Turbidity (NTU)	Pumping Rate (gpm)	Comments
1220	364	81.3	2.80	7.38	2.86	2	
1225	374	81.7	2.89	7.37	1.90		
1230	384	81.4	2.87	7.38	1.69		
1235	394	81.3	2.88	7.36	1.28		
1240	404	81.3	2.90	7.37	1.07		

Site: ~~MW-4~~ MW-3 Total Well Depth: 84.95 Screen Interval: _____ Casing Volume: ~~55.39~~ 16.27

Filterpack Interval: _____ One Well Volume: 55 Gallons (275)

DO Number: 112 Well Dia.: 4" Depth to water: 60.0 One well volume is well casing volume + 25% of filterpack annulus

Project Number: _____ Borehole Dia.: 10" Pump Depth: 41' Total gallons Purged: 465

Datum: ___TOC ___GS ___ Other(describe) Pump Type: _____

Subcontractor: Water Development Subcontractor Representative: _____

Sample Collected: Yes (No) Duplicate Collected: Yes (No) Rinsate Colleected: Yes (No)

Sample No. N/A Duplicate Sample No. N/A Rinsate Sample No. N/A

TIME	Amount purged (gal)	Temp (°F)	Conductivity micro cm/Sec	pH	Turbidity (NTU)	Pumping Rate (gpm)	Comments
0745	50	73.7	2.39	7.36	E3	4	
0752	75	73.9	2.26	7.49	E3	4	
0756	100	72.8	2.21	7.55	E3	4	
0840	125	70.2	2.12	7.92	E3	4	
0846	150	71.3	2.05	7.76	E3	4	
0850	175	71.3	2.08	7.74	E3	4	
0855	200	71.5	2.07	7.57	E3	4	
0925	225	70.1	2.05	7.91	E3	4	
0938	250	71.9	2.10	7.54	E3	4	
1015	295	72.5	2.10	7.78	406	2.5	
1021	325	73.7	2.12	7.73	225	2.5	
1025	335	73.9	2.27	7.41	81.2	2.5	
1033	355	74.0	2.19	7.16	26.2	2.5	
1037	370	73.4	2.15	7.63	26.2	2.5	
1043	380	74.8	2.18	7.60	9.92	2.5	
1051	400	75.4	2.29	7.60	6.11	2.5	
1059	420	75.6	2.26	7.61	4.38	2.5	
1105	435	75.6	2.28	7.53	3.61	2.5	
1109	445	75.5	2.30	7.60	2.93	2.5	
1113	455	75.8	2.30	7.61	3.04	2.5	
1117	465	75.9	2.29	7.54	2.58	2.5	

10/25/99

Page 1 of 1

Development

Groundwater sampling log, MCAS, El Toro

Date: 10/24/99 X

Client: MC - El Toro MW4

Site: MSCRI - ~~MW4 MW13~~

DO Number: 112

Project Number: _____

Datum: ___TOC ____GS ___ Other(describe)

Well Number: MSCRI - MW4

Total Well Depth 55' (48.25')

Well Dia.: ~~10"~~ 4"

Borehole Dia.: 10"

Screen Interval: 25'-45'

Filterpack Interval: 3.0' - 22.5'

Depth to water: 28.17

Pump Depth: ~~cl~~

OHM/IT Representative: Juli Jameson

Casing Volume: 116 gallons

One Well Volume: 237 Gallons

One well volume is well casing volume + 25% of filterpack annulus

Total gallons Purged: 102 on 10/24 (185)

Pump Type: _____

Subcontractor: _____ Subcontractor Representative: Bill

Sample Collected: Yes No Duplicate Collected: Yes No Rinsate Colleected: Yes No

Sample No. _____ Duplicate Sample No. _____ Rinsate Sample No. _____

TIME	Amount purged (gal)	Temp (°F)	Conductivity micro cm/Sec	pH	Turbidity (NTU)	Pumping Rate (gpm)	Comments
1202	40	86.2	3.73	7.59	E3 *	5gpm	—
1205	55	83.6	3.90	7.68	E3 *	5gpm	—
1302	70	86.4	3.49	7.54	E3*	2.3gpm	—
1306	75	85.2	3.53	7.63	E3*	2.3gpm	—
1310	78	84.9	3.58	7.70	629 (50% dilution)		E3 was registered - diluted 1:1 to receive 629 NTU
1443	88	86.5	3.59	7.60	E3		with a 1:1 dilution.
1447	98	~~85.4~~ 86.4	3.41	7.62	E3		—
1450	102	84.3	3.41	7.61	E3		with a 1:1 dilution
		Nothing Follows					

* Turbidity ... + /minute ...

Well Development

Groundwater sampling log, MCAS, El Toro

Date: ~~10/25/99~~ X

Client: El Toro

Site: MCAS El - MW4

DO Number: 112

Project Number: _____

Datum: ___TOC ___GS ___ Other(describe)

Well Number: MCAS El-MW4

Total Well Depth: 48.25

Well Dia.: 4"

Borehole Dia.: 10"

Screen Interval: 25 - 45'

Filterpack Interval: 3.0 - 22.5

Depth to water: 28.17

Pump Depth: 40

Pump Type: _____

OHM/IT Representative: Julie Anderson

Casing Volume: 16 gallons

One Well Volume: 37 Gallons

One well volume is well casing volume + 25% of filterpack annulus

Total gallons Purged: _____ (185)

Subcontractor: _____ Subcontractor Representative: _____

Sample Collected: Yes No Duplicate Collected: Yes No Rinsate Colleected: Yes No

Sample No. _____ Duplicate Sample No. _____ Rinsate Sample No. _____

TIME	Amount purged (gal)	Temp (°F)	Conductivity micro cm/Sec	pH	Turbidity (NTU)	Pumping Rate (gpm)	Comments
0803	112	74.4	3.13	7.71	E3	3.0	
0806	120	74.6	3.06	7.63	E3	3.0	
0808	126	74.2	3.00	7.58	E3	3.0	
0810	129	73.0	2.92	7.64	786	3.0	Using A 1:1 dilution factor.
0812	132	74.0	2.99	7.65	675	3.0	First reading that is not over OR equal dilution
0935	137	75.1	2.92	7.75	203	1.5	
0938	142	76.2	3.01	7.70	365	1.5	
0940	147	76.5	2.99	7.69	588	1.5	
0942	152	76.3	2.93	7.68	153	1.5	
0945	155	75.7	2.92	7.76	654	1.5	
1214	157	84.1	3.24	7.33	5.40	.5	Begin Pumping. 1214
1218	1159	83.9	3.08	7.41	4.49	.5	1218
1220	1160	83.9	3.15	7.26	3.38	.5	1220
1222	1161	84.9	3.26	7.33	3.13	.5	1222
1228	1164	85.3	3.35	7.37	2.75	.5	1228
1236	1168	86.1	3.19	7.39	5.05	.5	1236
1248	174	84.5	3.51	7.45	8.26	.5	1248
1258	179	83.3	3.35	7.46	5.92	.5	1258
1310	185	83.6	3.25	7.49	4.52	.5	
1322	191	84.3	3.31	7.49	3.57	.5	Pumping Stopped

A-5 GROUNDWATER SAMPLE DATA SHEETS

GROUNDWATER SAMPLING LOG
MCAS EL TORO, SANTA ANA, CALIFORNIA

Well Identification: MW1
Delivery Order: 112
Project Number: 20242

Date: 11-4-99
Site Location: Anomaly Area 3

IT Field Representative: W. Jefferson

Sample Number: 20242-987
COC Number: A-10036

Static Water Level:(swl) 23.50
Total Depth:(td) 50.54
Measuring Device: — serial number: —
Measuring Point: TOC (GS)
Casing Material:

Subcontractor: Water Development Corp
Rig Number: —
Sampling Pump: grundfos
Pump Number: 1

Water Column: (wc) 27.04 = td-swl
Well Diameter: (d) 4"
d² (2-inch = .163) (4-inch = .653) (6-inch = 1.469)
Casing Volume:(cv) 17.55 = (wc)(d²)
Total Gallons to Purge: 112 gal = (cv)(number of casing volumes to be purged)
Actual Gallons Purged: 112 gal

Pump Depth: Above Sump
Feet Discharge Pipe:

Number of Bottles Collected: 13
Duplicate Collected: (Yes) No
Duplicate Sample Number: 20242-990
Rinsate Sample Number: 20242-986
MS/MSD: Yes (NO)

10 min reading in between.

Time	Pumping Rate (gpm)	Gallons purged	EC (us/cm x 100)	pH	Temp F°	Turbidity (NTU)	%DO	Comments Water level
0735	2 gal/min	Start	Purging				NA	
0745	2	20	2.50	7.11	70.1	2.21	↓	27.54
0755	2	40	2.47	7.18	69.3	2.85	↓	27.90
0805	2	60	2.31	7.26	69.3	1.31	↓	28.15
0815	2	80	2.42	7.12	69.5	0.86	↓	29.25
0825	2	100	2.38	7.44	69.0	0.63	↓	28.30
0835	2	112	2.29	7.25	69.4	0.52	↓	28.35

W.J. 11-4-99

GROUNDWATER SAMPLING LOG
MCAS EL TORO, SANTA ANA, CALIFORNIA

Well Identification: MW-2
Delivery Order: 112
Project Number: 20242

Date: 11-3-99
Site Location: Anomaly Area 3

IT Field Representative: Waylynn Jefferson

Sample Number: 20242-984
COC Number: A100025

Static Water Level:(swl) 39.15'
Total Depth:(td) 52.80'
Measuring Device: — serial number: —
Measuring Point: TOC GS
Casing Material:

Subcontractor: Water Dev Corp
Rig Number: —
Sampling Pump: grundfos
Pump Number: 1

Water Column: (wc) 13.65 = td-swl
Well Diameter: (d) 4'
d" (2-inch = .163) (4-inch = .653) (6-inch = 1.469)
Casing Volume:(cv) 8.89 = (wc)(d")
Total Gallons to Purge: 126 gal = (cv)(number of casing volumes to be purged)
Actual Gallons Purged: 126 gal

Pump Depth: above Sump
Feet Discharge Pipe: —

Number of Bottles Collected: 13
Duplicate Collected: Yes (No)
Duplicate Sample Number: N/A
Rinsate Sample Number: 20242-983
MS/MSD: Yes (No)

Collect parameter every 15 min.

Time	Pumping Rate (gpm)	Gallons purged	EC (uS/cm) X1000	pH	Temp F°	Turbidity (NTU)	%DO	Comments Water level
0910	1.0	begin	Purging				N/A	
0925	1.0	15	2.78	6.92	73.6	3.49		39.25'
0940	1.0	30	2.76	7.20	72.3	2.58		39.25
0955	1.0	45	2.75	7.08	72.0	2.00		39.29
1010	1.0	60	2.77	7.05	71.6	1.73		39.40
1025	1.0	75	2.78	7.28	72.6	1.34		39.28
1040	1.0	90	2.76	7.25	73.0	0.81		39.27
1055	1.0	105	2.79	7.27	74.4	0.52		39.38
1110	1.0	120	2.73	7.23	76.1	0.51		39.18
1126	1.0	126	2.91	7.30	78.9	0.52		39.31
		W.J.	11-3-99					

GROUNDWATER SAMPLING LOG
MCAS EL TORO, SANTA ANA, CALIFORNIA

Well Identification: MW-4
Delivery Order: 112
Project Number: 20242

Date: 11/2/99
Site Location: Anomaly Area 3

IT Field Representative: Lisa Bienkowski

Sample Number: 20242-981
COC Number: A10028

Static Water Level:(swl) ~~50.32'~~ 28.91' (TOC)
Total Depth:(td) 50.32' (GS)
Measuring Device: — serial number: —
Measuring Point: TOC (GS)
Casing Material:

Subcontractor: Water Dev. Corp.
Rig Number: —
Sampling Pump: grundfos
Pump Number: 1

Water Column: (wc) 21.41 = td-swl
Well Diameter: (d) 4"
d² (2-inch = .163) (4-inch = .653) (6-inch = 1.469)
Casing Volume:(cv) 13.98 = (wc)(d²)
Total Gallons to Purge ~~44.96~~ 3 = (cv) (number of casing volumes to be purged)
Actual Gallons Purged: 96 gallons collect parameters every 15 minutes

Pump Depth: above sump
Feet Discharge Pipe: —

Number of Bottles Collected: 13
Duplicate Collected: Yes (No)
Duplicate Sample Number: N/A
Rinsate Sample Number: 20242-980
MS/MSD: Yes (No)

Time	Pumping Rate (gpm)	Gallons purged	EC (mS/cm) x1000	pH	Temp F°	Turbidity (NTU)	%DO	Comments water level
0910	0.5	began purging					N/A	
1033	0.5	7.5	3.28	7.15	85.9	2.71		32.90
1048	0.5	15	3.32	7.21	81.7	2.85		33.00
1103	0.5	22.5	3.17	7.24	79.5	0.06		33.50
1118	0.5	30.0	3.30	7.23	81.5	1.95		33.65
1133	0.5	37.5	3.23	7.32	82.0	1.35		34.35
1148	0.5	45	3.28	7.26	83.4	1.11		34.32
1203	0.5	52.5	3.29	7.30	82.8	1.09		34.55
1218	0.5	60	3.33	7.01	84.8	0.92		34.55
1233	0.5	67.5	3.30	7.22	84.2	1.02		34.55
1248	0.5	75	3.41	7.25	87.2	0.69		34.71
1303	0.5	82.5	3.54	7.19	89.4	0.97		35.00
1318	0.5	90	3.42	7.23	87.5	0.81		34.98
1330	0.5	96	3.41	7.24	86.0	0.86		35.00

GROUNDWATER SAMPLING LOG
MCAS EL TORO, SANTA ANA, CALIFORNIA

Well Identification: MW-93
Delivery Order: D0112
Project Number: 20242

Date: 11-4-99
Site Location: Anomaly Area 3

IT Field Representative: W. Jefferson

Sample Number: 20242-984
COC Number: A100336

Static Water Level:(swl) 60.15
Total Depth:(td) 86.06
Measuring Device: — serial number: —
Measuring Point: TOC (GS)
Casing Material:

Subcontractor: Water development corp
Rig Number: G
Sampling Pump: Grundfos
Pump Number: 1

Water Column: (wc) 24.90 = (td-swl)
Well Diameter: (d) 4'
(d" (2-inch = .163) (4-inch = .653) (6-inch = 1.469))
Casing Volume:(cv) 16.26 = (wc)(d")
Total Gallons to Purge: 200 gal = (cv)(number of casing volumes to be purged)
Actual Gallons Purged: 200 gal

Pump Depth: above Sump
Feet Discharge Pipe: —

Number of Bottles Collected: 13
Duplicate Collected: Yes (No)
Duplicate Sample Number: N/A
Rinsate Sample Number: N/A
MS/MSD: Yes (No)

Collect parameters every 10min

Time	Pumping Rate (gpm)	Gallons purged	EC uS/cm X1000	pH	Temp F°	Turbidity (NTU)	%DO	Comments Water level
1112	2.5	begin Purging					NA	
1122	2.5	~~25~~ 25	2.71	7.27	89.1	5.35		62.10
1132	2.5	50	2.54	7.33	87.4	3.01		62.32
1142	2.5	75	2.53	7.29	86.8	1.85		62.48
1152	2.5	100	2.56	7.31	87.6	1.46		62.60
1202	2.5	125	2.61	7.29	86.5	1.07		62.58
1212	2.5	150	2.71	7.29	86.7	0.93		62.67
1222	2.5	~~200~~ 175	2.63	7.26	85.9	0.77		62.63
1232	2.5	200	2.55	7.28	85.5	0.67		62.93

GROUNDWATER SAMPLING LOG
MCAS EL TORO, SANTA ANA, CALIFORNIA

W.J. MW2

Well Identification: ~~AMW 1 WI~~	Date: ~~4-19-00~~ 4-20-00		IT Field Representative: W. Jefferson
Delivery Order: DO 112	Site Location: AA3		
Project Number: 20242			
Sample Number: 20242-~~H20~~ WJ	Static Water Level:(swl) 40.00		
Cert Number: A 10845	Total Depth:(td) 52.00		Subcontractor: BC 2
	Measuring Device: Sounder serial number: —		Rig Number: CA118305
	Measuring Point: (TOC) GS		Sampling Pump: ~~Pump~~ Grundfos
	Casing Material:		Pump Number: Pump A 11
Water Column: (wc) 12.6 = td-swl	Pumo Depth: 50 ft		
Well Diameter: (d) .653	Feet Discharge Pipe: 50 ft		Number of Bottles Collected: 9
d* (2-inch = .163) (4-inch = .653) (6-inch = 1.469)			Duplicate Collected: Yes (No)
Casing Volume:(cv) 8.2288 (cv) = (wc)(d*)			Duplicate Sample Number: —
Total Gallons to Purge: ~~125 gal~~ 54 gal = (cv)(number of casing volumes to be purged)			Rinsate Sample Number: —
Actual Gallons Purged:			MS/MSD: Yes (No)

Time	Pumping Rate (gpm)	Gallons purged	EC ( )	pH	Temp F°	Turbidity (NTU)	%DO	Comments
1417	Start	Purging						
1422	2.0	Purge	Rate Stabilized.					
~~1427~~ (WJ)	2.0							
430	2.0	16 gal	3.82	6.01	83.7	29.3	—	40.5
435	2.0	26	3.71	7.34	81.4	29.9	—	40.15
440	2.0	36	3.64	7.65	80.2	18.4	—	40.15
445	2.0	46	3.59	7.22	79.1	16.8	—	40.3
450	2.0	56	3.58	7.29	78.8	14.1		40.45
452	2.0	60	3.59	7.33	78.2			40.45
1454	Collect Sample							
1515	Finish Collecting Samples.							

IT Corporation

GROUNDWATER SAMPLING LOG
MCAS EL TORO, SANTA ANA, CALIFORNIA

W.S.

Well Identification: ~~MW-2~~ MW1
Delivery Order: D0112
Project Number: 20242

Date: 4-20-00
Site Location: AA3

IT Field Representative: W Jefferson

Sample Number: 20242-1123
CCC Number: A10814

Static Water Level:(swl) 24.1
Total Depth:(td) 50.25
Measuring Device: Sounder serial number: —
Measuring Point: TOC GS
Casing Material:

Subcontractor: BC2
Rig Number: CA118305
Sampling Pump: Grundfos
Pump Number:

Water Column: (wc) 26.15 = td-swl
Well Diameter: (d) 6.53
d² (2-inch = .163) (4-inch = .653) (6-inch = 1.469)
Casing Volume:(cv) 17.08 = (wc)(d²)
Total Gallons to Purge: ~~52 gal~~ = (cv)(number of casing volumes to be purged) 39 gal
Actual Gallons Purged: 117 gal

Pump Depth: 43ft.
Feet Discharge Pipe: 40ft

Number of Bottles Collected: 12
Duplicate Collected: Yes (No)
Duplicate Sample Number: —
Rinsate Sample Number:
MS/MSD: Yes No

Time	Pumping Rate (gpm)	Gallons purged	EC ( )	pH	Temp F°	Turbidity (NTU)	%DO	Comments
1205	Start Purging							27.2
1210	2.0	Purge Rate	Stabilized					27.6
1215	2.0	10 gal	3.03	6.44	76.1	3.34	—	27.85
1220	2.0	20 gal						27.95
1225	2.0	30 gal	3.12	7.28	77.2	3.09		28.05
1230	2.0	40 gal	3.02	7.40	76.2	1.83		28.10
1235	2.0	50 gal	↓	↓	↓	↓		28.15
1245	2.0	70 gal	3.11	7.44	77.5	1.70		28.20
1255	2.0	90 gal	3.12	7.39	78.0	1.35		28.25
1305	2.0	110	3.16	7.46	79.2	1.05		28.25
1310	2.0	120 gal	3.15	7.41	79.9	1.08		28.25
1312	Collect Sample.							
1330	finish Collecting Sample.							

IT Corporation

GROUNDWATER SAMPLING LOG
MCAS EL TORO, SANTA ANA, CALIFORNIA

W Identification: HW-3	Date: 4-19-00	IT Field Representative: W. Jefferson
Delivery Order: D0112	Site Location: AA3	
Project Number: 20242		
Sample Number: 20242-1120	Static Water Level:(swl) 61.6	
COC Number: A10845	Total Depth:(td)(w) ~~61.6~~ 85.00	Subcontractor: BC2
	Measuring Device: Sounder serial number:	Rig Number: CA118305
	Measuring Point: TOC GS	Sampling Pump: Grundfos
	Casing Material:	Pump Number: Pump B
Water Column: (wc) 23.4 = td-swl	Pump Depth: 80 ft	
Well Diameter: (d) .653	Feet Discharge Pipe: 80 ft	Number of Bottles Collected: 11
d* (2-inch = .163) (4-inch = .653) (6-inch = 1.469)		Duplicate Collected: Yes No
Casing Volume:(cv) 15.28 = (wc)(d*)		Duplicate Sample Number: —
Total Gallons to Purge: 105 gal = (cv)(number of casing volumes to be purged)		Rinsate Sample Number: 20242-1119
Actual Gallons Purged:		MS/MSD: Yes No

Time	Pumping Rate (gpm)	Gallons purged	~~EC~~ 1000 uS/cm	pH	Temp F°	Turbidity (NTU)	%DO	Comments Water Level
1136	2.0	0	0	0	0	0	0	61.18
00	Put in another Pump because Pump "A" was not working. - Control Box Read UCI so replacing new Pump							
39	Start	New Pump "B"						61.6
43	2.0 gal	Stabalize Purge Data			—	—	—	
150	2.0 gal	20 gal	2.33	6.87	76.7	3.10	—	63.4
1212	2.0 gal	64 gal	2.37	7.35	76.3	3.33		63.4
1217	2.0 gal	74 gal	2.37	7.24	78.5	1.20	—	63.4
1225	2.0 gal	90 gal	2.41	7.33	79.3	4.10	—	63.8
1230	2.0 gal	100 gal	2.40	7.40	77.7	0.33		63.8
1235	2.0 gal	110 gal	2.39	7.31	76.8	0.55		63.9
1240	2.0 gal	Collected Sample						62.8

IT Corporation

GROUNDWATER SAMPLING LOG
MCAS EL TORO, SANTA ANA, CALIFORNIA

Well Identification: MW-9
Delivery Order: D0112
Project Number: 20247
Sample Number: 20242-~~H21~~ 1122
Chain Number: A10845

Date: ~~4-19-00~~ W.S. 4-20-00
Site Location: AA-3
Static Water Level:(swl) 30.0
Total Depth:(td) 50.05
Measuring Device: Sounder serial number: —
Measuring Point: TOC GS
Casing Material:

IT Field Representative: W. Jefferson
Subcontractor: BC.2
Rig Number: CA118305
Sampling Pump: Grundfos
Pump Number: — Pump B

Water Column: (wc) 20.05 = td-swl
Well Diameter: (d) .653
d* (2-inch = .163) (4-inch = .653) (6-inch = 1.469)
Casing Volume:(cv) 13.09 = (wc)(d*)
Total Gallons to Purge: ~~115 gal~~ = (cv)(number of casing volumes to be purged)
Actual Gallons Purged: 90 gal

Pump Depth: 48 ft
Feet Discharge Pipe: 50 ft

Number of Bottles Collected:
Duplicate Collected: Yes No
Duplicate Sample Number:
Rinsate Sample Number:
MS/MSD: Yes No

Time	Pumping Rate (gpm)	Gallons purged	EC ( ) 1000us/cm	pH	Temp F°	Turbidity (NTU)	%DO	Comments Water Level
~~H~~ W.S.	~~0.5~~ W.S.							30.0
45	0.80	Stabilize purging						35.1
~~0850~~	Pump had stopped.							33.7
~~0855~~ 0902	Start purging again							W.S. ~~37.9~~ 35.9
0905	<1.0							35.9
0910	<1.0	5 gal	328	5.87	71.8	~~22~~ W.S. 20.2	—	35.8
0915	<1.0	10 gal						35.1
25	<1.0	20 gal	337	7.12	69.8	10.2	—	34.95
940	<1.0	35 gal	339	7.22	69.4	4.0		34.00
50	≈1.0	45						37.7
55	≈1.0	50 gal	359	7.20	77.7	3.75		37.9
00	≈1.0	55 gal						37.8
05	≈1.0	60 gal						37.5
5	≈1.0	70 gal	362	7.62	77.9	4.9		37.5

IT Corporation

GROUNDWATER SAMPLING LOG
MCAS EL TORO, SANTA ANA, CALIFORNIA

Job Number: D0112 Date: 4-20-00 OHM Representatives: W. Jefferson

Well Identification: MW-4 Site Location: AA3

Time	Pumping Rate	Gallons purged	EC	pH	Temp F°	Turbidity	%DO	Comments Water Level
1025	≈1.0	80 gal	3.63	7.13	77.5	3.1	—	37.7
1035	≈1.0	90 gal	3.64	7.42	79.8	1.83	—	37.6
1037		Collect	Sample					
1050	Finish	Collecting	Sample.					

IT Corporation

A-6 *TABLES*

Table A-1 Groundwater Well Construction Summary
Table A-2 Groundwater Levels
Table A-3 Summary of Groundwater Sample Analyses
Table A-4 Summary of Soil Vapor Analyses

Table A-1
Construction Summary for Groundwater Monitoring Wells and Piezometers
Anomaly 3, MSC R1, Groumdwdater Investigation, MCAS El Toro

Construction Details by Depth (details per well completion logs and reported in feet unless otherwise noted)													Reference Point Elevation[a]			
Well ID Number	Date Installed	Total depth feet (bgs)	Brorehole Diameter (inches)	Screen Diameter (inches)	Screen Slot Size (inches)	Screen Material	Screened Interval (ft bgs)	Blank Casing (ft bgs)	Blank Casing Material	Sand Pack (bgs)	Bentonite Seal (ft bgs)	Grout/ Concrete Seal (ft bgs)	NAD 83 Northing	NAD 83 Easting	Casing (ft)	Surface
Anomaly 3, Refuse Area, MSC R1																
MW-01	10/12/99	51.5	10	4	0.020	SS	16.5 - 46.5	0 -16.5	SCH 80 PVC	14 - 51.5	10.5 - 14	3 - 10.5	2194690.81	6116938.13	455.02	455.36
MW-02	10/14/99	56.5	10	4	0.020	SS	21-51	0-21	SCH 40 PVC	18.5-56	14.5-18.5	3-14.5	2194900.43	6116747.86	459.71	460.19
MW-03	10/18/99	86.5	10	4	0.020	SS	50 -70	0-50	SCH 40 PVC	47-85	42.8-47	3-42.8	2195723.50	6117525.67	500.31	500.85
					0.010	SS	70 - 80									
MW-04	10/21/99	55.0	10	4	0.010	SS	25-45	0-25	SCH 40 PVC	22.5-51	19.5-22.5	2.5-19.5	2195127.85	6116912.98	464.24	464.87
PZ-1	10/26/99	22.0	7	1	0.020	PVC	17 - 22	0 - 17	SCH 40 PVC	16 - 22	13 - 16	0 - 13	2194726.57	6116921.71	455.22	455.45
PZ-2	10/26/99	30.0	7	1	0.020	PVC	25 - 30	0 - 25	SCH 40 PVC	24 - 30	20.5 - 24	0 - 20.5	2194883.44	6116763.11	459.93	460.09
PZ-3	10/26/99	26.0	7	1	0.020	PVC	15 - 20	0 - 15	SCH 40 PVC	14 - 21	11 - 14	0 - 11	2194760.93	6117115.89	460.86	461.27

Explanation

NAD 83 North American Datum, 1983
SS Stainless steel
ft amsl Feet above mean sea level datum
ft bgs Feet below ground surface
bgs Below ground surface
PVC Poly vinyl chloride

Table A-2
Groundwater Level Measurements
Anomaly 3, MSC R1, Groumdwdater Investigation, MCAS El Toro

Construction Summary								Groundwater Level Measurements						
Well ID Number	Date Installed	Northing (NAD 83)	Easting (NAD 83)	Surface Elevation (ft amsl)	Total depth feet (bgs)	Screen Diameter (inches)	Screened Interval (ft bgs)	Measuring Point Elevation (TOC ft amsl)	Depth to Groundwater November 1999 (ft bgs)	Groundwater Elevation November 1999 (ft amsl)	Depth to Groundwater December 8, 1999 (ft bgs)	Groundwater Elevation December 8, 1999 (ft amsl)	Depth to Groundwater April 20, 2000 (ft bgs)	Groundwater Elevation April 20, 2000 (ft amsl)
Anomaly 3, Refuse Area, MSC R1														
MW-01	10/12/99	2194690.81	6116938.13	455.36	51.5	4	16.5 - 46.5	455.02	23.50	431.52	24.05	430.97	24.10	430.92
MW-02	10/14/99	2194900.43	6116747.86	460.19	56.5	4	21 - 51	459.71	39.15	420.56	39.64	420.07	40.00	419.71
MW-03	10/18/99	2195723.50	6117525.67	500.85	86.5	4	50 - 80	500.31	60.15	440.16	61.02	439.29	61.60	438.71
MW-04	10/21/99	2195127.85	6116912.98	464.87	55.0	4	25 - 45	464.24	28.91	435.33	29.57	434.67	30.00	434.24

Explanation

NAD 83 North American Datum, 1983
ft amsl Feet above mean sea level datum
ft bgs Feet below ground surface
bgs Below ground surface

Table A-3
Summary of Groundwater Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification		20242-987	20242-990 (Dup)	20242-1123	20242-984	20242-1124	20242-989	20242-1120
Location Code		AA3-MW-01	AA3-MW-01	AA3-MW-01	AA3-MW-02	AA3-MW-02	AA3-MW-03	AA3-MW-03
Date Sampled		11/04/99	11/04/99	04/20/00	11/03/99	04/20/00	11/04/99	04/19/00
	Unit							
CA LUFT 8015M								
TPH as Diesel	mg/L	.095 U	.095 U	.096 U	.095 U	.092 U	.095 U	.094 U
TPH as Gasoline	mg/L	.1 U	.1 U	.1 U	.1 U	.1 U	.1 U	.1 U
EPA 8260A								
1,1,1-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Butanone (MEK)	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
2-Chloroethyl vinyl ether	µg/L	50 U	50 U	50 UJ	50 U	50 UJ	50 U	50 UJ
2-Hexanone	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
4-Methyl-2-pentanone (MIBK)	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Acetone	µg/L	50 UJ	50 UJ	50 U	50 U	50 U	50 UJ	50 U
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	µg/L	5 UJ	5 UJ	5 U	5 U	5 U	5 UJ	5 U
Chloroform	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloromethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methyl tert-butyl ether (MTBE)	µg/L	2.6 J	2.5 J	10 U	10 U	10 U	10 U	10 U
Methylene chloride	µg/L	5 U	5 U	5.2 U	5 U	5.1 U	5 U	5 U
Styrene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U

Table A-3
Summary of Groundwater Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification		20242-987	20242-990 (Dup)	20242-1123	20242-984	20242-1124	20242-989	20242-1120
Location Code		AA3-MW-01	AA3-MW-01	AA3-MW-01	AA3-MW-02	AA3-MW-02	AA3-MW-03	AA3-MW-03
Date Sampled		11/04/99	11/04/99	04/20/00	11/03/99	04/20/00	11/04/99	04/19/00
	Unit							
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl acetate	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Vinyl chloride	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
EPA 6010								
Antimony	µg/L	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Arsenic	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Barium	µg/L	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Beryllium	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cadmium	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chromium	µg/L	50 U	50 U	50 U	50 U	357	50 U	50 U
Cobalt	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Copper	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Lead	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Manganese	µg/L	80.2	77.1	20 U	259	433	20.9	20 U
Molybdenum	µg/L	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Nickel	µg/L	150 U	150 U	150 U	150 U	150 U	150 U	150 U
Selenium	µg/L	5.47 J	9.32 J	12.9 U	18 U	11.8 U	50.3	37.7
Silver	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Thallium	µg/L	400 U	400 U	400 U	400 U	400 U	400 U	400 U
Vanadium	µg/L	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Zinc	µg/L	20 U	20 U	20 U	29.4	20 U	20 U	20 U
EPA 7470A								
Mercury	µg/L	.2 U	.2 U	.2 U	.2 U	.2 U	.2 U	.2 U

Table A-3
Summary of Groundwater Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification Location Code Date Sampled	Unit	20242-987 AA3-MW-01 11/04/99	20242-990 (Dup) AA3-MW-01 11/04/99	20242-1123 AA3-MW-01 04/20/00	20242-984 AA3-MW-02 11/03/99	20242-1124 AA3-MW-02 04/20/00	20242-989 AA3-MW-03 11/04/99	20242-1120 AA3-MW-03 04/19/00
EPA 300.0								
Nitrate (NO^3)	mg/L	1.33	1.32	NA	3.23	NA	1.14	NA
CADHS CLOR4METH/EPA 300.0								
Perchlorate	µg/L	4 U	4 U	4 U	4 U	4 U	4 U	4 U
ASTM D3972								
Americium 241	pCi/L	NA	NA	0.026±0.018	NA	0.016±0.015	NA	0.018±0.021
Thorium 228	pCi/L	NA	NA	0.056±0.072 U	NA	0.097±0.086 U	NA	0.04±0.12 U
Thorium 230	pCi/L	NA	NA	0.119±0.051 U	NA	0.130±0.050 U	NA	0.114±0.059 U
Thorium 232	pCi/L	NA	NA	0.008±0.040 U	NA	0.015±0.018 U	NA	0.011±0.034 U
Uranium 234	pCi/L	NA	NA	20.0±2.8	NA	16.2±2.3	NA	25.1±3.5
Uranium 235	pCi/L	NA	NA	1.20±0.27	NA	1.03±0.24	NA	1.92±0.37
Uranium 238	pCi/L	NA	NA	17.2±2.5	NA	14.4±2.1	NA	23.0±3.2
ASTM D5811M								
Lead 210	pCi/L	NA	NA	0.49±0.25 J	NA	0.45±0.21 J	NA	0.51±0.26 J
EPA 160.0								
Total Dissolved Solids (TDS)	mg/L	1760	1860	NA	1920	NA	1740	NA
EPA 903.0								
Total (Radium 226)	pCi/L	NA	NA	0.09±0.10	NA	0.10±0.10	NA	0.02±0.08
EPA 9310								
Gross Alpha	pCi/L	34.6±5.27	35.3±5.41	27.6±6.0	23.5±4.29	28.3±6.0	35.5±5.23	35.7±6.8
Gross Beta	pCi/L	11.4±1.88	11.5±1.88	21.8±5.4	34.7±3.29	22.7±5.4	12.8±1.84	30.0±5.9
EPA 904.0								
Radium 228	pCi/L	NA	NA	0.66±0.54	NA	0.29±0.72	NA	-0.01±0.60

Table A-3
Summary of Groundwater Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification		20242-981	20242-1122
Location Code		AA3-MW-04	AA3-MW-04
Date Sampled		11/02/99	04/20/00
	Unit		
CA LUFT 8015M			
TPH as Diesel	mg/L	.098 U	.092 U
TPH as Gasoline	mg/L	.1 U	.1 U
EPA 8260A			
1,1,1-Trichloroethane	µg/L	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U	5 U
1,1,2-Trichloroethane	µg/L	5 U	5 U
1,1-Dichloroethane	µg/L	5 U	5 U
1,1-Dichloroethene	µg/L	5 U	5 U
1,2-Dichloroethane	µg/L	5 U	5 U
1,2-Dichloropropane	µg/L	5 U	5 U
2-Butanone (MEK)	µg/L	50 U	50 U
2-Chloroethyl vinyl ether	µg/L	50 U	50 UJ
2-Hexanone	µg/L	50 U	50 U
4-Methyl-2-pentanone (MIBK)	µg/L	50 U	50 U
Acetone	µg/L	50 U	50 U
Benzene	µg/L	5 U	5 U
Bromodichloromethane	µg/L	5 U	5 U
Bromoform	µg/L	5 U	5 U
Bromomethane	µg/L	5 U	5 U
Carbon disulfide	µg/L	5 U	5 U
Carbon tetrachloride	µg/L	5 U	5 U
Chlorobenzene	µg/L	5 U	5 U
Chloroethane	µg/L	5 U	5 U
Chloroform	µg/L	5 U	5 U
Chloromethane	µg/L	5 U	5 U
cis-1,2-Dichloroethene	µg/L	5 U	5 U
cis-1,3-Dichloropropene	µg/L	5 U	5 U
Dibromochloromethane	µg/L	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U
Methyl tert-butyl ether (MTBE)	µg/L	10 U	10 U
Methylene chloride	µg/L	5 U	5.9 U
Styrene	µg/L	5 U	5 U
Tetrachloroethene	µg/L	5 U	5 U

Table A-3
Summary of Groundwater Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification		20242-981	20242-1122
Location Code		AA3-MW-04	AA3-MW-04
Date Sampled		11/02/99	04/20/00
	Unit		
Toluene	µg/L	5 U	5 U
trans-1,2-Dichloroethene	µg/L	5 U	5 U
trans-1,3-Dichloropropene	µg/L	5 U	5 U
Trichloroethene	µg/L	5 U	5 U
Vinyl acetate	µg/L	50 U	50 U
Vinyl chloride	µg/L	5 U	5 U
Xylenes (total)	µg/L	5 U	5 U
EPA 6010			
Antimony	µg/L	500 U	500 U
Arsenic	µg/L	26.4	23.2
Barium	µg/L	100 U	100 U
Beryllium	µg/L	10 U	10 U
Cadmium	µg/L	10 U	10 U
Chromium	µg/L	50 U	50 U
Cobalt	µg/L	50 U	50 U
Copper	µg/L	50 U	50 U
Lead	µg/L	10 U	10 U
Manganese	µg/L	48.1	20 U
Molybdenum	µg/L	100 U	100 U
Nickel	µg/L	150 U	150 U
Selenium	µg/L	22.8	19.4 U
Silver	µg/L	50 U	50 U
Thallium	µg/L	400 U	400 U
Vanadium	µg/L	100 U	100 U
Zinc	µg/L	20 U	20 U
EPA 7470A			
Mercury	µg/L	.2 U	.2 U

Table A-3
Summary of Groundwater Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification		20242-981	20242-1122
Location Code		AA3-MW-04	AA3-MW-04
Date Sampled		11/02/99	04/20/00
	Unit		
EPA 300.0			
Nitrate (NO^3)	mg/L	5.52	NA
CADHS CLOR4METH/EPA 300.0			
Perchlorate	µg/L	4 U	4 U
ASTM D3972			
Americium 241	pCi/L	NA	0.012±0.015
Thorium 228	pCi/L	NA	0.027±0.058 U
Thorium 230	pCi/L	NA	0.144±0.50 U
Thorium 232	pCi/L	NA	0.057±0.030 U
Uranium 234	pCi/L	NA	28.2±3.9
Uranium 235	pCi/L	NA	1.51±0.30
Uranium 238	pCi/L	NA	26.3±3.7
ASTM D5811M			
Lead 210	pCi/L	NA	0.93±0.29 J
EPA 160.0			
Total Dissolved Solids (TDS)	mg/L	2290	NA
EPA 903.0			
Total (Radium 226)	pCi/L	NA	0.35±0.15
EPA 9310			
Gross Alpha	pCi/L	50.0±7.33	45.9±8.5
Gross Beta	pCi/L	20.5±2.64	34.8±7.1
EPA 904.0			
Radium 228	pCi/L	NA	0.13±0.58

Table A-3
Summary of Groundwater Sample Analyses — MSC R1 (Anomaly Area 3)

Explanation:
AA3 - Anomaly Area 3
CA LUFT - California Leaking Underground Fuel Tank
EPA - United States Environmental Protection Agency
J - estimated
M - Modified
MDL - method detection limit
mg/l - milligrams per liter
NA - not analyzed
OHM - OHM Remediation Services Corp.
piC/L - picoCuries per liter
TPH - total petroleum hydrocarbons
U - not detected above or equal to the stated reporting limit
µg/l - micrograms per liter
UJ - the sample detection limit is an estimated value

Table A-3
Summary of Groundwater QC Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification Location Code Date Sampled	Unit	20242-980 Equipment Rinsate 11/02/99	20242-982 Trip Blank 11/02/99	20242-983 Equipment Rinsate 11/03/99	20242-985 Equipment Rinsate 11/03/99	20242-986 Trip Blank 11/03/99	20242-988 Equipment Rinsate 11/04/99	20242-991 Trip Blank 11/04/99
CA LUFT 8015M								
TPH as Diesel	mg/L	.98	NA	.095 U	.097 U	NA	.096 U	NA
TPH as Gasoline	mg/L	.1 U	NA	.1 U	.1 U	NA	.1 U	NA
EPA 160.0								
Total Dissolved Solids (TDS)	mg/L	10 U	NA	290	65	NA	65	NA
EPA 300.0								
Nitrate (NO^3)	mg/L	.1 U	NA	.399	.101	NA	.1 U	NA
EPA 6010								
Antimony	µg/L	500 U	NA	500 U	500 U	NA	500 U	NA
Arsenic	µg/L	10 U	NA	10 U	10 U	NA	10 U	NA
Barium	µg/L	100 U	NA	100 U	100 U	NA	100 U	NA
Beryllium	µg/L	10 U	NA	10 U	10 U	NA	10 U	NA
Cadmium	µg/L	10 U	NA	10 U	10 U	NA	10 U	NA
Chromium	µg/L	50 U	NA	50 U	50 U	NA	50 U	NA
Cobalt	µg/L	50 U	NA	50 U	50 U	NA	50 U	NA
Copper	µg/L	50 U	NA	50 U	50 U	NA	50 U	NA
Lead	µg/L	10 U	NA	10 U	10 U	NA	10 U	NA
Manganese	µg/L	20 U	NA	20 U	20 U	NA	20 U	NA
Molybdenum	µg/L	100 U	NA	100 U	100 U	NA	100 U	NA
Nickel	µg/L	150 U	NA	150 U	150 U	NA	150 U	NA
Selenium	µg/L	10 U	NA	10 U	10 U	NA	10 U	NA
Silver	µg/L	50 U	NA	50 U	50 U	NA	50 U	NA
Thallium	µg/L	400 U	NA	400 U	400 U	NA	400 U	NA
Vanadium	µg/L	100 U	NA	100 U	100 U	NA	100 U	NA
Zinc	µg/L	20 U	NA	33.8	24.3	NA	20 U	NA
EPA 7470A								
Mercury	µg/L	.2 U	NA	.2 U	.2 U	NA	.2 U	NA
EPA 8260A								
1,1,1-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U

Table A-3
Summary of Groundwater QC Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification Location Code Date Sampled	Unit	20242-980 Equipment Rinsate 11/02/99	20242-982 Trip Blank 11/02/99	20242-983 Equipment Rinsate 11/03/99	20242-985 Equipment Rinsate 11/03/99	20242-986 Trip Blank 11/03/99	20242-988 Equipment Rinsate 11/04/99	20242-991 Trip Blank 11/04/99
1,2-Dichloropropane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-Butanone (MEK)	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
2-Chloroethyl vinyl ether	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
2-Hexanone	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
4-Methyl-2-pentanone (MIBK)	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Acetone	µg/L	50 U	50 U	50 U	50 U	50 U	50 UJ	50 UJ
Benzene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	µg/L	5 U	5 U	12	6.4	5 U	5 U	5 U
Bromoform	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromomethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon disulfide	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon tetrachloride	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 UJ	5 UJ
Chloroform	µg/L	5 U	5 U	14	7.2	5 U	5 U	5 U
Chloromethane	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	µg/L	5 U	5 U	8.2	4.6 J	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methyl tert-butyl ether (MTBE)	µg/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Styrene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Tetrachloroethene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,2-Dichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl acetate	µg/L	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Vinyl chloride	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes (total)	µg/L	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CADHS CLOR4METH/EPA 300.0								
Perchlorate	µg/L	4 U	NA	4 U	4 U	NA	4 U	NA U

Table A-3
Summary of Groundwater QC Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification **Location Code** **Date Sampled**		20242-980 Equipment Rinsate 11/02/99	20242-982 Trip Blank 11/02/99	20242-983 Equipment Rinsate 11/03/99	20242-985 Equipment Rinsate 11/03/99	20242-986 Trip Blank 11/03/99	20242-988 Equipment Rinsate 11/04/99	20242-991 Trip Blank 11/04/99
	Unit							
EPA 9030								
Gross Alpha	pCi/L	0.215±0.385	NA	1.80±0.696	0.716±0.391	NA	0.246±0.211	NA
Gross Beta	pCi/L	1.05±2.34	NA	2.36±0.722	8.30±1.17	NA	1.41±0.630	NA

Table A-3
Summary of Groundwater QC Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification **Location Code** **Date Sampled**		20242-1119 Equipment Rinsate 04/19/00	20242-1121 Equipment Rinsate 04/20/00	20242-1125 Trip Blank 04/20/00
	Unit			
CA LUFT 8015M				
TPH as Diesel	mg/L	.094 U	.092 U	NA
TPH as Gasoline	mg/L	.1 U	.1 U	NA
EPA 160.0				
Total Dissolved Solids (TDS)	mg/L	NA	NA	NA
EPA 300.0				
Nitrate (NO^3)	mg/L	NA	NA	NA
EPA 6010				
Antimony	µg/L	500 U	500 U	NA
Arsenic	µg/L	10 U	10 U	NA
Barium	µg/L	100 U	100 U	NA
Beryllium	µg/L	10 U	10 U	NA
Cadmium	µg/L	10 U	10 U	NA
Chromium	µg/L	71	50 U	NA
Cobalt	µg/L	50 U	50 U	NA
Copper	µg/L	50 U	50 U	NA
Lead	µg/L	10 U	10 U	NA
Manganese	µg/L	20 U	20 U	NA
Molybdenum	µg/L	100 U	100 U	NA
Nickel	µg/L	150 U	150 U	NA
Selenium	µg/L	10 U	10 U	NA
Silver	µg/L	50 U	50 U	NA
Thallium	µg/L	400 U	400 U	NA
Vanadium	µg/L	100 U	100 U	NA
Zinc	µg/L	20 U	20.6	NA
EPA 7470A				
Mercury	µg/L	.2 U	.2 U	NA
EPA 8260A				
1,1,1-Trichloroethane	µg/L	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	µg/L	5 U	5 U	5 U
1,1,2-Trichloroethane	µg/L	5 U	5 U	5 U
1,1-Dichloroethane	µg/L	5 U	5 U	5 U
1,1-Dichloroethene	µg/L	5 U	5 U	5 U
1,2-Dichloroethane	µg/L	5 U	5 U	5 U

Table A-3
Summary of Groundwater QC Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification **Location Code** **Date Sampled**		20242-1119 Equipment Rinsate 04/19/00	20242-1121 Equipment Rinsate 04/20/00	20242-1125 Trip Blank 04/20/00
	Unit			
1,2-Dichloropropane	µg/L	5 U	5 U	5 U
2-Butanone (MEK)	µg/L	50 U	50 U	50 U
2-Chloroethyl vinyl ether	µg/L	50 UJ	50 UJ	50 UJ
2-Hexanone	µg/L	50 U	50 U	50 U
4-Methyl-2-pentanone (MIBK)	µg/L	50 U	50 U	50 U
Acetone	µg/L	50 U	50 U	50 U
Benzene	µg/L	5 U	5 U	5 U
Bromodichloromethane	µg/L	5 U	5 U	5 U
Bromoform	µg/L	5 U	5 U	5 U
Bromomethane	µg/L	5 U	5 U	5 U
Carbon disulfide	µg/L	5 U	5 U	5 U
Carbon tetrachloride	µg/L	5 U	5 U	5 U
Chlorobenzene	µg/L	5 U	5 U	5 U
Chloroethane	µg/L	5 U	5 U	5 U
Chloroform	µg/L	5 U	5 U	5 U
Chloromethane	µg/L	5 U	5 U	5 U
cis-1,2-Dichloroethene	µg/L	5 U	5 U	5 U
cis-1,3-Dichloropropene	µg/L	5 U	5 U	5 U
Dibromochloromethane	µg/L	5 U	5 U	5 U
Ethylbenzene	µg/L	5 U	5 U	5 U
Methyl tert-butyl ether (MTBE)	µg/L	10 U	10 U	10 U
Methylene chloride	µg/L	5 U	5 U	6 U
Styrene	µg/L	5 U	5 U	5 U
Tetrachloroethene	µg/L	5 U	5 U	5 U
Toluene	µg/L	5 U	5 U	5 U
trans-1,2-Dichloroethene	µg/L	5 U	5 U	5 U
trans-1,3-Dichloropropene	µg/L	5 U	5 U	5 U
Trichloroethene	µg/L	5 U	5 U	5 U
Vinyl acetate	µg/L	50 U	50 U	50 U
Vinyl chloride	µg/L	5 U	5 U	5 U
Xylenes (total)	µg/L	5 U	5 U	5 U
CADHS CLOR4METH/EPA 300.0				
Perchlorate	µg/L	NA	NA	NA

Table A-3
Summary of Groundwater QC Sample Analyses — MSC R1 (Anomaly Area 3)

Sample Identification		20242-1119	20242-1121	20242-1125
Location Code		Equipment Rinsate	Equipment Rinsate	Trip Blank
Date Sampled		04/19/00	04/20/00	04/20/00
	Unit			
EPA 9030				
Gross Alpha	pCi/L	NA	NA	NA
Gross Beta	pCi/L	NA	NA	NA

Table A-3
Summary of Groundwater QC Sample Analyses — MSC R1 (Anomaly Area 3)

Explanation:
CA LUFT - California Leaking Underground Fuel Tank
EPA - United States Environmental Protection Agency
J - estimated
M - Modified
MDL - method detection limit
mg/l - milligrams per liter
NA - not analyzed
OHM - OHM Remediation Services Corp.
piC/L - picoCuries per liter
TPH - total petroleum hydrocarbons
U - not detected above or equal to the stated reporting limit
µg/l - micrograms per liter
UJ - the sample detection limit is an estimated value

Table A-4
Summary of Soil Vapor Analyses — MSC R1 (Anomaly Area 3)

Sample Identification		18708-1516	20242-1134	18708-1517	20242-1136	18708-1515	20242-1137
Location Code		AA3-PZ-01	AA3-PZ-01	AA3-PZ-02	AA3-PZ-02	AA3-PZ-03	AA3-PZ-03
Date Sampled		11/04/99	07/24/00	11/04/99	07/24/00	11/04/99	07/24/00
	Unit						
ASTM D 1946							
Carbon dioxide	%v/v	3.2	2.6	3.8	1.6	3.2	1.5
Carbon monoxide	%v/v	0.0010 U	NA	0.0010 U	NA	0.0010 U	NA
Methane	%v/v	0.00020 U	.001 U	0.00020 U	0.001 U	0.00020 U	0.001 U
Nitrogen	%v/v	78	78	77	77	79	78
Oxygen	%v/v	19	18	19	19	18	19
EPA TO-14							
1,1,1-Trichloroethane	µg/L	0.011 U	0.054 U	0.011 U	0.011 U	0.011 U	0.011 U
1,1,2,2-Tetrachloroethane	µg/L	0.014 UJ	0.052 U	0.014 UJ	0.01 U	0.014 UJ	0.01 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	0.015 U	0.076 U	0.015 U	0.015 U	0.015 U	0.015 U
1,1,2-Trichloroethane	µg/L	0.011 U	0.054 U	0.011 U	0.011 U	0.011 U	0.011 U
1,1-Dichloroethane	µg/L	0.0081 U	0.040 U	0.0081 U	0.0081 U	0.0081 U	0.011
1,1-Dichloroethene	µg/L	0.0079 U	0.040 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U
1,2,4-Trichlorobenzene	µg/L	0.15 U	0.074 U	0.15 U	0.015 U	0.15 U	0.015 U
1,2,4-Trimethylbenzene	µg/L	0.0098 U	0.049 U	0.0098 U	0.012	0.0098 U	0.012
1,2-Dibromoethane (EDB)	µg/L	0.015 U	0.077 U	0.015 U	0.015 U	0.015 U	0.015 U
1,2-Dichlorobenzene	µg/L	0.012 U	0.06 U	0.012 U	0.012 U	0.012 U	0.012 U
1,2-Dichloroethane	µg/L	0.0081 U	0.040 U	0.0081 U	0.0081 U	0.0081 U	0.0081 U
1,2-Dichloropropane	µg/L	0.0092 U	0.046 U	0.0092 U	0.0092 U	0.0092 U	0.0092 U
1,3,5-Trimethylbenzene	µg/L	0.0098 U	0.049 U	0.0098 U	0.010 U	0.0098 U	0.010 U
1,3-Dichlorobenzene	µg/L	0.012 U	0.06 U	0.012 U	0.012 U	0.012 U	0.012 U
1,4-Dichlorobenzene	µg/L	0.012 U	0.06 U	0.012 U	0.012 U	0.012 U	0.012 U
2-Butanone (MEK)	µg/L	0.029 U	0.15 U	0.029 U	0.029 U	0.029 U	0.029 U
2-Hexanone	µg/L	0.12 U	0.61 U	0.12 U	0.12 U	0.12 U	0.12 U
4-Ethyltoluene	µg/L	0.0098 U	0.049 U	0.0098 U	0.010 U	0.0098 U	0.011
4-Methyl-2-pentanone (MIBK)	µg/L	0.041 U	0.21 U	0.041 U	0.041 U	0.041 U	0.041 U
Acetone	µg/L	0.024 U	0.121 U	0.026	0.053	0.024 U	0.051
Benzene	µg/L	0.0064 U	0.032 U	0.0064 U	0.0064 U	0.0064 U	0.013
Benzyl chloride	µg/L	0.052 UJ	0.21 U	0.052 UJ	0.052 U	0.052 UJ	0.052 U
Bromodichloromethane	µg/L	0.013 U	0.067 U	0.013 U	0.013 U	0.013 U	0.013 U
Bromoform	µg/L	0.021 U	0.1 U	0.021 U	0.021 U	0.021 U	0.021 U
Bromomethane	µg/L	0.0078 U	0.039 U	0.0078 U	0.0078 U	0.0078 U	0.0078 U
Carbon disulfide	µg/L	0.031 U	0.16 U	0.031 U	0.037	0.031 U	0.073
Carbon tetrachloride	µg/L	0.013 U	0.063 U	0.013 U	0.013 U	0.013 U	0.013 U

Table A-4
Summary of Soil Vapor Analyses — MSC R1 (Anomaly Area 3)

Sample Identification		18708-1516	20242-1134	18708-1517	20242-1136	18708-1515	20242-1137
Location Code		AA3-PZ-01	AA3-PZ-01	AA3-PZ-02	AA3-PZ-02	AA3-PZ-03	AA3-PZ-03
Date Sampled		11/04/99	07/24/00	11/04/99	07/24/00	11/04/99	07/24/00
	Unit						
Chlorobenzene	µg/L	0.0092 U	0.046 U	0.0092 U	0.0092 U	0.0092 U	0.0092 U
Chloroethane	µg/L	0.011 U	0.053 U	0.011 U	0.011 U	0.011 U	0.011
Chloroform	µg/L	0.0097 U	0.049 U	0.0097 U	0.012	0.0097 U	0.010
Chloromethane	µg/L	0.0082 U	0.49	0.0082 U	0.19	0.0082 U	0.5
cis-1,2-Dichloroethene	µg/L	0.0079 U	0.040 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U
cis-1,3-Dichloropropene	µg/L	0.0091 U	0.045 U	0.0091 U	0.0091 U	0.0091 U	0.0091 U
Dibromochloromethane	µg/L	0.017 U	0.085 U	0.017 U	0.017 U	0.017 U	0.017 U
Dichlorodifluoromethane	µg/L	0.033	0.049 U	0.28	0.01 U	0.0099 U	0.29
Ethylbenzene	µg/L	0.0087 U	0.043 U	0.0087 U	0.0087 U	0.0087 U	0.01
Freon 114	µg/L	0.014 U	0.07 U	0.014 U	0.014 U	0.014 U	0.014 U
Hexachlorobutadiene	µg/L	0.043 U	0.21 U	0.043 U	0.043 U	0.043 U	0.043 U
m/p-Xylene	µg/L	NA	0.05	NA	0.024	NA	0.033
Methyl tert-butyl ether (MTBE)	µg/L	0.036 U	0.18 U	0.036 U	0.037 U	0.036 U	0.036 U
Methylene chloride	µg/L	0.0069 U	0.035 U	0.0069 U	0.0069 U	0.0069 U	0.0069 U
o-Xylene	µg/L	NA	0.043 U	NA	0.0087 U	NA	0.012
Styrene	µg/L	0.0085 U	0.043 U	0.0085 U	0.0085 U	0.0085 U	0.0085 U
Tetrachloroethene	µg/L	0.014 U	0.068 U	0.014	0.014 U	0.014 U	0.014 U
Toluene	µg/L	0.019 UJ	0.42	0.019 UJ	0.17	0.019 UJ	0.38
trans-1,2-Dichloroethene	µg/L	0.0079 U	0.040 U	0.0079 U	0.0079 U	0.0079 U	0.0079 U
trans-1,3-Dichloropropene	µg/L	0.0091 U	0.045 U	0.0091 U	0.0091 U	0.0091 U	0.009 U
Trichloroethene	µg/L	0.011 U	0.054 U	0.011 U	0.011 U	0.011 U	0.011 U
Trichlorofluoromethane	µg/L	0.011 U	0.056 U	0.011 U	0.011 U	0.011 U	0.011 U
Vinyl acetate	µg/L	0.035 UJ	0.18 U	0.035 UJ	0.035 U	0.035 UJ	0.035 U
Vinyl chloride	µg/L	0.0051 U	0.026 U	0.0051 U	0.0051 U	0.0051 U	0.0056
Xylenes (total)	µg/L	0.0087 U	NA	0.0087 U	NA	0.0087 U	NA

Table A-4
Summary of Soil Vapor Analyses — MSC R1 (Anomaly Area 3)

Explanation:
AA3 - Anomaly Area 3
CA LUFT - California Leaking Underground Fuel Tank
EPA - United States Environmental Protection Agency
J - estimated
M - Modified
NA - not analyzed
OHM - OHM Remediation Services Corp.
TO - toxic organic
U - not detected above or equal to the stated reporting limit
µg/l - micrograms per liter
UJ - the sample detection limit is an estimated value
% v/v - percent volume per volume

Table A-4
Summary of QC Soil Vapor Analyses — MSC R1 (Anomaly Area 3)

Sample Identification		18708-1518	20242-1135
Location Code		AA3-Ambient	AA3-Ambient
Date Sampled		11/04/99	07/24/00
	Unit		
ASTM D 1946			
Carbon dioxide	%v/v	0.042	0.04
Carbon monoxide	%v/v	0.0010 U	NA
Methane	%v/v	0.00024	.001 U
Nitrogen	%v/v	78	77
Oxygen	%v/v	22	21
EPA TO-14			
1,1,1-Trichloroethane	µg/L	0.011 U	0.011 U
1,1,2,2-Tetrachloroethane	µg/L	0.014 UJ	0.01 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	0.015 U	0.015 U
1,1,2-Trichloroethane	µg/L	0.011 U	0.011 U
1,1-Dichloroethane	µg/L	0.0081 U	0.0081 U
1,1-Dichloroethene	µg/L	0.0079 U	0.0079 U
1,2,4-Trichlorobenzene	µg/L	0.15 U	0.015 U
1,2,4-Trimethylbenzene	µg/L	0.0098 U	0.010 U
1,2-Dibromoethane (EDB)	µg/L	0.015 U	0.015 U
1,2-Dichlorobenzene	µg/L	0.012 U	0.012 U
1,2-Dichloroethane	µg/L	0.0081 U	0.0081 U
1,2-Dichloropropane	µg/L	0.0092 U	0.0092 U
1,3,5-Trimethylbenzene	µg/L	0.0098 U	0.010 U
1,3-Dichlorobenzene	µg/L	0.012 U	0.012 U
1,4-Dichlorobenzene	µg/L	0.012 U	0.012 U
2-Butanone (MEK)	µg/L	0.029 U	0.029 U
2-Hexanone	µg/L	0.12 U	0.12 U
4-Ethyltoluene	µg/L	0.0098 U	0.010 U
4-Methyl-2-pentanone (MIBK)	µg/L	0.041 U	0.041 U
Acetone	µg/L	0.033	0.049
Benzene	µg/L	0.0064 U	0.0064 U
Benzyl chloride	µg/L	0.052 UJ	0.052 U
Bromodichloromethane	µg/L	0.013 U	0.013 U
Bromoform	µg/L	0.021 U	0.021 U
Bromomethane	µg/L	0.0078 U	0.0078 U
Carbon disulfide	µg/L	0.031 U	0.031 U
Carbon tetrachloride	µg/L	0.013 U	0.013 U

Table A-4
Summary of QC Soil Vapor Analyses — MSC R1 (Anomaly Area 3)

Sample Identification		18708-1518	20242-1135
Location Code		AA3-Ambient	AA3-Ambient
Date Sampled		11/04/99	07/24/00
	Unit		
Chlorobenzene	µg/L	0.0092 U	0.0092 U
Chloroethane	µg/L	0.011 U	0.011 U
Chloroform	µg/L	0.0097 U	0.010
Chloromethane	µg/L	0.0082 U	0.0082 U
cis-1,2-Dichloroethene	µg/L	0.0079 U	0.0079 U
cis-1,3-Dichloropropene	µg/L	0.0091 U	0.0091 U
Dibromochloromethane	µg/L	0.017 U	0.017 U
Dichlorodifluoromethane	µg/L	0.0099 U	0.01 U
Ethylbenzene	µg/L	0.0087 U	0.009 U
Freon 114	µg/L	0.014 U	0.014 U
Hexachlorobutadiene	µg/L	0.043 U	0.043 U
m/p-Xylene	µg/L	NA	0.0087
Methyl tert-butyl ether (MTBE)	µg/L	0.036 U	0.036 U
Methylene chloride	µg/L	0.0069 U	0.0069 U
o-Xylene	µg/L	NA	0.0087 U
Styrene	µg/L	0.0085 U	0.0085 U
Tetrachloroethene	µg/L	0.014 U	0.014 U
Toluene	µg/L	0.019 UJ	0.012
trans-1,2-Dichloroethene	µg/L	0.0079 U	0.0079 U
trans-1,3-Dichloropropene	µg/L	0.0091 U	0.0091 U
Trichloroethene	µg/L	0.011 U	0.011 U
Trichlorofluoromethane	µg/L	0.011 U	0.011 U
Vinyl acetate	µg/L	0.035 UJ	0.035 U
Vinyl chloride	µg/L	0.0051 U	0.0051 U
Xylenes (total)	µg/L	0.0087 U	NA

Table A-4
Summary of QC Soil Vapor Analyses — MSC R1 (Anomaly Area 3)

Explanation:
AA3 - Anomaly Area 3
CA LUFT - California Leaking Underground Fuel Tank
EPA - United States Environmental Protection Agency
J - estimated
M - Modified
NA - not analyzed
OHM - OHM Remediation Services Corp.
TO - toxic organic
U - not detected above or equal to the stated reporting limit
µg/l - micrograms per liter
UJ - the sample detection limit is an estimated value
% v/v - percent volume per volume

Attachment B
Trench Investigation Data

Contents:

B-1 *GEOVISION SURVEY REPORT*
B-2 *FIGURES*
Figure B-1 Trench Location with Geophysical Survey
Figure B-2 Trench Sample Location Map
B-3 *TRENCH LOGS*
B-4 *TABLE B-1 SUMMARY OF TRENCH SOIL ANALYSES*
B-5 *RADIOLOGICAL SURVEY*

B-1 GEOVISION SURVEY REPORT

GEOVision
geophysical services
a division of Blackhawk Geometrics

GEOPHYSICAL INVESTIGATION

Aerial Photographic Anomaly Area 3 (MSC R1)
MCAS El Toro, California

GEOVision Project No. 0240

Prepared for

The IT Group
3347 Michelson Drive, Suite 200
Irvine, California 92612-1692

Prepared by

GEO*Vision* Geophysical Services
1785 Pomona Rd, Suite B
Corona, CA 92880-7600
(909) 549-1234

March 10, 2000

TABLE OF CONTENTS

1 INTRODUCTION 1

2 GEOPHYSICAL TECHNIQUES 2

2.1 MAGNETIC METHOD 2
2.2 ELECTROMAGNETIC INDUCTION METHOD 3

3 FIELD PROCEDURES 5

3.1 SITE PREPARATION 5
3.2 MAGNETIC SURVEY 5
3.3 GEONICS EM-31 SURVEY 6

4 DATA PROCESSING AND INTERPRETATION 7

4.1 DATA PROCESSING 7
4.2 INTERPRETATION 8

5 CONCLUSIONS 10

6 CERTIFICATION 11

APPENDIX A GEOPHYSICAL TECHNIQUES FOR SHALLOW ENVIRONMENTAL INVESTIGATIONS

LIST OF FIGURES

FIGURE 1 SITE MAP WITH GEOPHYSICAL INTERPRETATION
FIGURE 2 CONTOUR MAP OF TOTAL MAGNETIC FIELD INTENSITY
FIGURE 3 CONTOUR MAP OF GEONICS EM-31 CONDUCTIVITY RESPONSE
FIGURE 4 CONTOUR MAP OF GEONICS EM-31 IN-PHASE RESPONSE

1 INTRODUCTION

A geophysical investigation was conducted on February 9 to 18, 2000 at the approximate 9-acre Aerial Photographic Anomaly Area 3 (MSC R1), MCAS El Toro, California. The purpose of the investigation was to screen the site for buried metallic debris and fill soils. Historically, the site was used for borrow material. Records indicate that some of the borrow pits/trenches were backfilled with construction debris and later covered with 5 feet, or more, of fill soil.

The geophysical survey area consisted of an open dirt field bound to the northwest (NW) and southwest (SW) by a chain link fence, southeast (SE) by the Agua Chinon Wash, and northeast (NE) by a slope. There was no surficial evidence of disposal activities at the site. With the exception of sparse metallic debris on the surface and the fence bounding a portion of the site, there were no cultural features within the survey area that could adversely affect the geophysical data.

Geophysical techniques used during this investigation included magnetic and electromagnetic (EM) induction methods. These techniques complement one another as each responds to different physical properties and has different strengths and limitations. The magnetic method was applied to this investigation because it has the greatest depth of investigation of the geophysical methods typically applied to mapping buried metallic debris. However, this greater depth of investigation comes at the expense of lateral resolution. The EM induction technique was applied to this investigation because it can map both shallow buried metallic debris and variations in soil conductivity. Changes in soil conductivity may be used to infer the presence of fill soils, providing the fill has a different composition than native soils.

Two other geophysical methods are often applied to mapping buried debris; ground penetrating radar (GPR) and time domain electromagnetic (TDEM) techniques. Although these techniques have much better lateral resolution than the magnetic method, they were not applied to this investigation due to limited depth of investigation. The metallic debris at this site was expected to be at least 5 feet deep. GPR has excellent lateral resolution and can be used to map both metallic and nonmetallic debris; however, at most sites in southern California it can only image the upper 3 to 8 feet. Depth of investigation may be limited to less than 3 feet in fine-grained, clayey soils. The TDEM method, specifically the Geonics EM-61 metal detector, also has very good lateral resolution, but can only image buried metallic debris in the upper 10 feet. The magnetic method can often map buried, ferrous, metallic debris to much greater depths.

Geophysical techniques used during the investigation are discussed in Section 2. Field procedures are described in Section 3. Data processing and interpretation are discussed in Section 4. Conclusions are presented in Section 5, and our professional certification is presented in Section 6.

2 GEOPHYSICAL TECHNIQUES

This section presents background information on the magnetic and EM methods used during this investigation. A description of the geophysical methods used during this investigation, common applications of the methods, photographs of the instruments, and example applications are included in Appendix A.

2.1 Magnetic Method

The magnetometers used during this investigation consisted of a Geometrics G858 cesium magnetic gradiometer (G858) and a GEM GSM-19 base station magnetometer. These instruments measure the intensity of the earth's magnetic field in nanoteslas (nT).

The earth's magnetic field is believed to originate in convection currents in the earth's liquid outer core. The magnetic field varies in intensity from about 25,000 nT at the equator, where it is parallel to the earth's surface to about 70,000 nT at the poles where it perpendicular to the earth's surface. The intensity of the earth's magnetic field in North America varies from about 45,000 to 60,000 nT, and has an associated inclination that varies from about 60 to 75 degrees. The earth's magnetic field undergoes low-frequency diurnal variations (drift) caused by the earth's rotation. The magnetic field can also undergo short-period, high-amplitude variations during periods of sunspot activity called magnetic storms. Often magnetic field intensity can be so variable during a magnetic storm that meaningful magnetic data cannot be acquired. When necessary to correct for magnetic drift a base station magnetometer is set up in a quiet portion of the site and programmed to record total magnetic field intensity at fixed increments (i.e. 5-second intervals) throughout the day. This base station data is then used to remove the effects of drift from the field data. In small survey areas where the data is acquired over a small amount of time and the anomalies have large amplitudes correction for magnetic drift is not necessary.

Buried ferromagnetic objects give rise to local perturbations (anomalies) in the earth's magnetic field. In North America, these anomalies are often dipolar with a positive response south and a negative response north of the object. The dimensions and amplitude of a magnetic anomaly are a function of the size, mass, depth and magnetic properties of the source. Magnetometers can typically locate a metallic object the size of a 55-gallon drum to a depth of about 10 feet providing background noise levels are not too high and the object is not significantly corroded. Larger metallic objects can be located to greater depths. The magnetic anomaly due to an object the size of a 55-gallon drum is expected to have dimensions of greater than 10- by 10-feet. Magnetometers are not able to detect nonferrous metals such as aluminum or brass.

Typical applications of the magnetic method include:

- Locating pits and trenches containing ferrous metallic debris
- Locating buried drums, tanks and pipes
- Delineating boundaries of landfills containing ferrous debris
- Locating abandoned well casing
- Detecting unexploded ordnance
- Mapping basement faults and geology

- Mapping archeological sites.

Some advantages of magnetic surveys are:

- Rapid – modern instruments can acquire up to 10 readings per second as the operator walks down survey lines
- Depth of investigation – magnetometers can often locate buried ferrous metallic objects to greater depths than other methods
- Anomalies are much larger than the source allowing for larger line spacing in some situations

Some limitations of the magnetic surveys are:

- Unable to detect nonferrous metals such as aluminum or brass
- Magnetic anomalies are unsymmetrical and much larger than the source and it can, therefore, be difficult to determine the precise locations and size of the source
- Ineffective in areas having extensive metallic debris at the surface as no distinction can be made between anomalies caused by surface and buried debris
- Metallic structures such as buildings, fences, reinforced concrete, and light posts interfere with the measurements
- High voltage powerlines can often strongly interfere with the measurements
- Data can be very noisy in areas containing volcanic rock, specifically basalt

2.2 Electromagnetic Induction Method

EM induction equipment used during this investigation consisted of a Geonics EM-31 terrain conductivity meter (EM-31) coupled to a digital data logger. The EM-31 consists of a transmitter and receiver coil, one at each end of 12-foot long boom. An alternating current is applied to the transmitter coil, causing the coil to radiate a primary EM field. This primary EM field generates eddy currents in subsurface materials, which give rise to a secondary EM field. The EM-31 measures the components of the secondary EM field both in-phase and 90-degrees out-of-phase with the primary EM field. The out-of-phase component is converted to apparent conductivity in millisiemens per meter (mS/m) and the in-phase component is measured as parts per thousand of the primary EM field. A negative EM-31 response with positive shoulders is generally observed over shallow, buried metallic objects. The EM-31 can locate both ferrous and nonferrous metallic objects and can locate a metallic object the size of a 55-gallon drum to a maximum depth of about 5 feet. The EM-31 must pass directly over or immediately adjacent to a buried metallic object to detect it. Because of the 12-foot separation between the transmitter and receiver coils, the EM-31 cannot detect very small, buried metallic objects. The EM-31 can also map changes in the electrical conductivity of subsurface soils caused by certain types of conductive contaminants (i.e. brines, drilling muds, chloride, metals, etc.) or simply a change in soil type (i.e. low conductivity sand to high conductivity clay).

Applications of EM Induction methods include:

- Locating buried tanks

- Locating pipes and utilities
- Locating pits and trenches containing metallic and/or nonmetallic debris
- Delineating landfill boundaries
- Delineating oil production sumps and mud pits
- Mapping conductive soil and groundwater contamination
- Mapping soil salinity in agricultural areas
- Characterizing shallow subsurface geology
- Mapping buried channel deposits
- Locating sand and gravel deposits
- Mapping conductive fault and fracture zones
- Mapping lateral variation in subsurface soil type

Strengths of EM Induction Methods include:

- Rapid – data can be acquired at a slow walking pace
- Locate both metallic and some nonmetallic targets
- Better resolution than magnetometer
- Not as sensitive to very small surface debris as other methods
- Can locate electrical and telephone cables which often cannot be located by other methods
- Anomalies of buried objects have simple shape facilitating identification and positioning of the source

Limitations of EM Induction Methods include:

- Metallic structures such as buildings, fences, reinforced concrete, and light posts interfere with the measurements
- High voltage powerlines can often strongly interfere with the measurements
- Depth of investigation not as great as that of a magnetometer for detection of buried ferrous metallic objects
- Highly variable soil conductivity can complicate quadrature component interpretation

3 FIELD PROCEDURES

This section describes the field procedures used during the investigation, including site preparation, and magnetic and EM-31 survey procedures.

3.1 Site Preparation

Before conducting the geophysical investigation, 4-foot survey lathe were placed at 20-foot intervals along the NE and SW edges and the middle of the survey area to provide control for the geophysical survey.

A Sokkia GIR1000 single-frequency global positioning system (GPS) was coupled to the geophysical instruments to provide horizontal control for the geophysical data. Differential corrections were applied to the GPS data using GPS base station data recorded at the Sokkia office in Orange, California. GPS data were collected in geodetic coordinates based on the WGS84 system and transformed to California State Plane Coordinates, Zone 6, North American Datum of 1983 (NAD83) after applying differential corrections. Ellipsoid heights measured using the GPS system were converted to NAVD 88 elevations using the Geoid Model of 1996. Maximum horizontal errors in the corrected GPS data are estimated to be about 3 feet, with average errors being about 1 to 2 feet.

The GPS system was also used to map pertinent surficial features at the site, including roads, fences, soil piles, monitoring wells, brush lines, etc. A site map showing the location of the geophysical survey area, State Plane Coordinate System, and surficial features is presented as Figure 1.

3.2 Magnetic Survey

Magnetic data were acquired on February 9 to 11, 2000. Prior to data acquisition, the base station magnetometer was set up SW of the survey area at a location free of surface debris. The internal clock of the base station and G858 were synchronized to GPS time and the base station was programmed to record the magnetic field intensity of the earth at 5-second intervals throughout the day. The G858 and GPS units were then programmed with the appropriate settings. The magnetometer was operated with the sensor about 3 feet above ground surface. Measurements of the earth's total magnetic field intensity were made at 0.5-second intervals as the operator walked along SW-NE survey lines nominally spaced 10 feet apart. The 0.5-second sampling interval resulted in an average station spacing of about 2 feet. The stakes placed at the ends and middle of the survey area allowed the instrument operator to walk a relatively straight line, thereby ensuring uniform site coverage. The magnetic data were stored in the internal memory of the magnetometer, along with line number, and time of measurement. If an error was made on a survey line the line was deleted from the magnetometer's internal memory and reacquired. GPS, base station and field magnetic data were downloaded to a laptop computer at the end of the magnetic survey.

3.3 Geonics EM-31 Survey

EM-31 data were acquired on February 10 to 11, 2000. Prior to data acquisition, the EM-31 was assembled and battery levels were checked and found to be within acceptable levels. The in-phase component was then set to zero in a portion of the site with no buried metallic objects. The EM-31 digital data logger was synchronized to GPS time and programmed with the appropriate file name, line number, measurement increment, and direction. Changes in these parameters were made as necessary throughout the survey. The EM-31 was operated in vertical dipole mode with an approximate 3-foot instrument height and the instrument boom parallel to the survey lines. EM-31 measurements of conductivity and in-phase component were made at 0.5-second intervals as the operator walked along SW-NE survey lines nominally spaced 10 feet apart. The 0.5-second sampling interval resulted in an average station spacing of about 2 feet. The EM-31 data were stored in a digital data logger along with line and station number. If an error was made acquiring a line, a note was made in the field log and the line repeated. EM-31 and GPS data were downloaded to a laptop computer at the end of each field day.

4 DATA PROCESSING AND INTERPRETATION

This section presents the data processing procedures and interpretation of the geophysical data.

4.1 Data Processing

Color-enhanced contour maps of magnetic and EM-31 data were generated using the GEOSOFT® geophysical mapping system. Prior to contour map generation, a number of preprocessing steps were completed. These preprocessing steps consisted of the following:

- Backup of all original field data files to floppy disk.
- Downloading GPS base station data from Sokkia bulletin board.
- Applying differential corrections to GPS data and outputting an ASCII file containing State Plane Coordinates, elevation, and time.
- Correcting of all data acquisition errors (typically only deleting the first portion of a reacquired line, renaming lines incorrectly labeled, deleting additional readings outside the grid, etc.)
- Reformatting field data files to free format XYZ files containing at a minimum GPS time and field measurements.
- Merging GPS position data and geophysical data using in-house software.
- Removing diurnal variation from total magnetic field measurements using the base station data file and in-house software, if necessary.
- Merging of multiple data files into a single file and sorting, if necessary.

These data adjustments were made using a combination of commercial and in-house software. All adjustments made to data files and resulting file names were documented and are retained in project files.

The outputs of the data preprocessing were data files containing California State Plane, Zone 6, NAD83 Easting and Northing, and the various data measurements. The magnetic data file contained total magnetic field intensity. The EM-31 data file contained conductivity and in-phase response.

These data files were imported into the GEOSOFT® mapping system and the following data processing steps applied:

- Reformatting of data files to GEOSOFT® format.
- Generating final map scale.
- Gridding data using minimum curvature and a 5-foot cell size.
- Masking grid in areas where data not acquired (i.e. around obstructions).
- Applying a single pass Hanning filter to smooth the data.
- Generating color zone file describing color for different data ranges.
- Contouring the data.
- Generating map surrounds (title block, legend, scale, color bar, north arrow, etc.)
- Annotating anomalies.
- Merging various plot files and plotting final map.

The names of the files generated and the processing parameters used were recorded on data processing forms. All completed data processing forms are retained in project files. All files generated during the processing sequence were archived on CD-ROM.

4.2 Interpretation

Color-enhanced contour maps of total magnetic field intensity, EM-31 conductivity and EM-31 in-phase response are presented as Figures 2 to 4, respectively. The coordinates shown in these figures reference the California State Plane Coordinate System, Zone 6, NAD83. The color bar indicates the amplitude of the measured quantity with the magenta and cyan colors indicating high- and low-amplitudes, respectively. The light orange, yellow and light green colors in the contour maps of total magnetic field intensity and EM-31 in-phase response indicate average "background" values of the measured quantity.

Significant anomalies in the magnetic and EM-31 data were field checked to determine if a source of metal at the surface caused the anomaly. A number of surface metallic features, primarily the fence along the SW and NW edges of the survey area, caused anomalies in the geophysical data. These anomalies are labeled as "SM" on the contour maps. Numerous potentially significant geophysical anomalies were identified during this investigation. For the purpose of discussion, these anomalies were identified as A-1 to A-6 on the contour maps of magnetic and EM-31 data (Figures 2 to 4). A combined interpretation of the geophysical data is presented in Figure 1 and discussed below.

Anomaly A-1, located in the SW portion of the survey area, is a 440-foot-long SW-NE trending magnetic anomaly with amplitude of about 500 to 1,000 nT. The source of this anomaly is interpreted as a large trench containing buried metallic/construction debris. The absence of an associated EM-31 anomaly indicates that the metallic debris is much greater than 5 feet deep.

Anomaly A-2 depicts two large areas in the NE portion of the survey area with numerous high-amplitude magnetic anomalies. The source of this anomaly is interpreted as a large disposal area containing significant amounts of buried metallic/construction debris. The absence of a strong associated EM-31 response indicates that the debris is typically greater than 5 feet deep. The presence of several, low amplitude EM-31 in-phase response anomalies in this area indicate that some small accumulations of metallic debris may be located at a depth of slightly over 5 feet. Because the magnetic anomalies associated with A-2 have much higher amplitude than those associated with A-1, the metallic debris in the A-2 area is either shallower or more concentrated than that in the A-1 area.

Anomaly A-3 identifies a large area immediately between the two anomaly A-2 areas and several areas SW of A-2 with numerous low-amplitude magnetic anomalies. The amplitudes of these anomalies are much smaller than those associated with A-2. This indicates that there is less metallic debris in these areas; however, there may still be high concentrations of nonmetallic construction debris. There is a large EM-31 anomaly associated with the anomaly A-3 area located in the vicinity of 2194975N, 6117425E. This small portion of anomaly A-3, which extends outside the SE boundary of the survey area, probably contains some shallow, scattered, metallic debris.

Anomaly A-4, located along the NE edge of the survey area, identifies an area containing several high amplitude magnetic and EM-31 anomalies. These anomalies are indicative of shallow, buried, metallic debris that have probably accumulated at the base of the slope.

Anomaly A-5 represents several, discrete magnetic anomalies located primarily on the NW side of anomaly A-1. These anomalies appear to represent isolated, buried metallic objects or small accumulations of debris with dimensions on the order of 5- by 5-feet. One of these anomalies, located at 2195050N, 6116820E, has an associated EM-31 anomaly and may be associated with the drain inlet of the other side of the fence. Additionally, there are numerous very small magnetic anomalies, mostly on the SE side of anomaly A-1, interpreted as being caused by very small buried metallic objects or debris. These anomalies are labeled as "B" on the contour maps and are probably caused by very small pieces of metallic debris at shallow depth.

The bulk electrical conductivity of shallow soils at the site ranges from about 18 to 82 mS/m, with low conductivities around the perimeter and high conductivities in the central portion of the survey area. The low and high conductivities are consistent with those expected for sandy and clayey soils, respectively. The relatively low conductivities appear to be associated with native soils, whereas the high conductivity zone in the center of the site (anomaly A-6 in Figure 3) appears to be associated with imported fill soils. The boundary of the fill/native soils is not well defined in the NE portion of the survey area and is, thereby, queried on the interpretation map (Figure 1). It is possible that subsurface soils native to the site may have variable composition and, therefore, variable conductivities. This may make it difficult to accurately distinguish native and fill soil in some parts of the site. Most of the magnetic anomalies at this site fall within the zone of elevated conductivity interpreted as fill soil; however, some anomalies appear to extend outside this zone.

5 CONCLUSIONS

A magnetic and Geonics EM-31 (EM-31) survey was conducted in the approximate 9-acre Aerial Photographic Anomaly Area 3 (MSC R1) at MCAS EL Toro, California to screen the site for buried metallic debris and fill soils. Interpretation of the geophysical data is presented in Figure 1. Contour maps of total magnetic field intensity and EM-31 conductivity and in-phase response are presented as Figures 2 to 4, respectively.

The magnetic data (Figure 2) revealed the presence of several large areas containing buried metallic debris, including a large trench in the SW portion of the survey area (anomaly A-1) and a large disposal area in the northeast portion of the survey area (anomalies A-2 and A-3). Buried debris also appears to have accumulated at the base of the slope along the northeastern edge of the survey area (anomaly A-4). Additionally, there are several buried metallic objects or small accumulations of debris (anomaly A-5) northwest of and numerous very small pieces of metallic debris southeast of the trench referred to as anomaly A-1. The absence of large EM-31 anomalies associated with most of the magnetic anomalies indicates that the metallic debris is deeper than 5 feet in much of the site.

The EM-31 conductivity data (Figure 3) revealed the presence of a large area of elevated electrical conductivity in the central portion of the survey area (anomaly A-6). This area is interpreted as containing fine-grained, clayey soils in the near surface. Because much of the native soil at the site appears to consist of low conductivity, clean sands deposited by the Agua Chinon Wash, it is likely that the conductive soils in the middle of the site are imported fill material.

The geophysical survey was designed to map large accumulations of buried metallic debris in the subsurface and variations in near-surface soil type that could be indicative of fill soils. It was assumed that any construction debris buried at the site would contain enough metallic debris (i.e. rebar, pipe segments, steel plates, etc.) to be mappable using the magnetic method. Areas containing only nonmetallic debris at depth (i.e. concrete without rebar and wood) would not have been located by this geophysical survey.

6 CERTIFICATION

All geophysical data, analysis, interpretations, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by a **GEO*Vision*** California Registered Geophysicist.

REGISTERED GEOPHYSICIST
ANTONY JEFFREY MARTIN
GP 989
Exp. 3/21/01
STATE OF CALIFORNIA

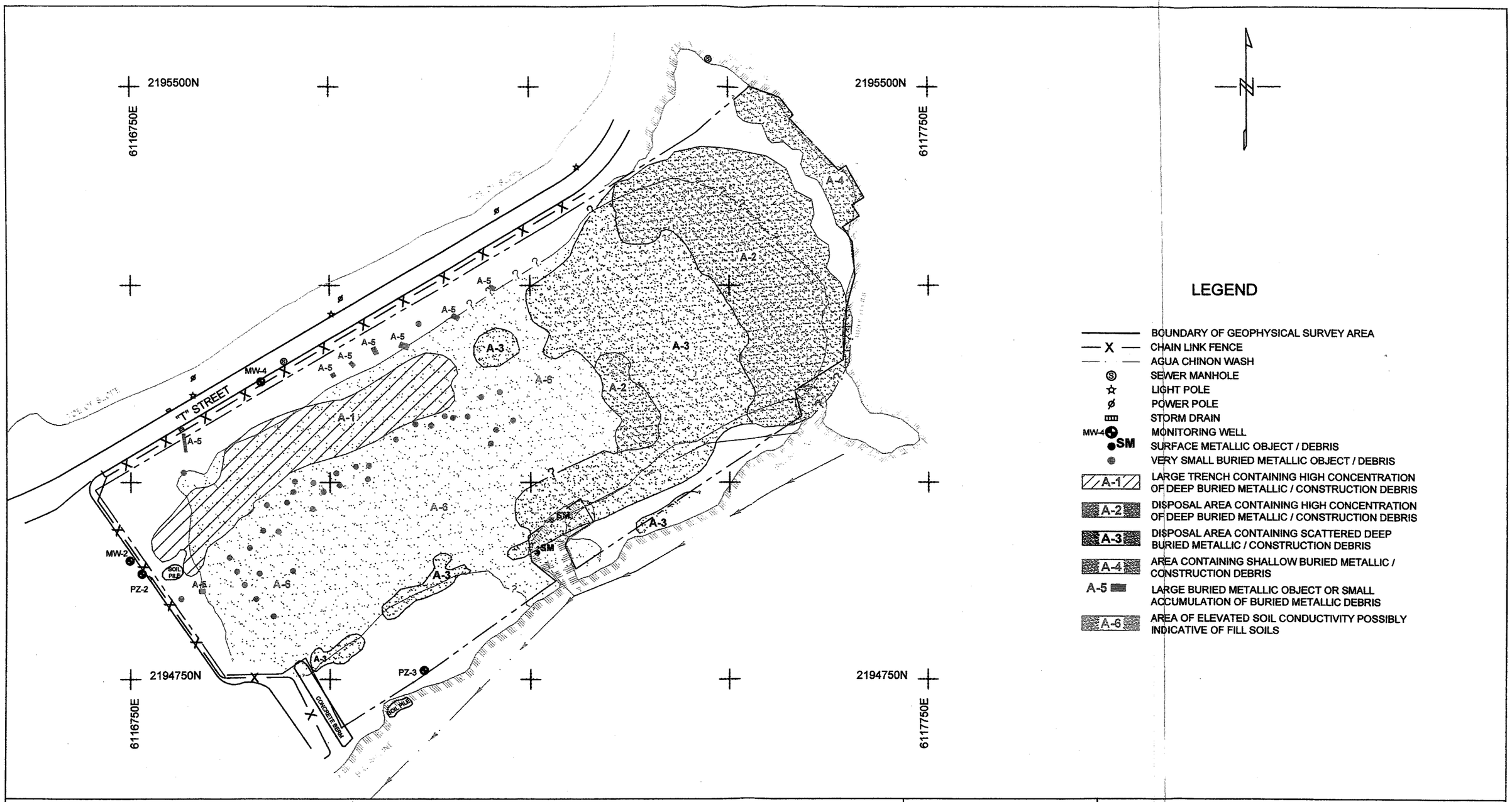
Antony J. Martin
California Registered Geophysicist GP989
GEO*Vision* Geophysical Services

3/13/00
Date

* This geophysical investigation was conducted under the supervision of a California Registered Geophysicist using industry standard methods and equipment. A high degree of professionalism was maintained during all aspects of the project from the field investigation and data acquisition, through data processing interpretation and reporting. All original field data files, field notes and observations, and other pertinent information are maintained in the project files and are available for the client to review for a period of at least one year.

  A registered geophysicist's certification of interpreted geophysical conditions comprises a declaration of his/her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations or ordinances.

FIGURES



NOTE:
1. COORDINATES ARE IN CALIFORNIA STATE PLANE COORDINATE SYSTEM, NAD83, ZONE 6

0 60 120 240
(feet)

GEOVision geophysical services

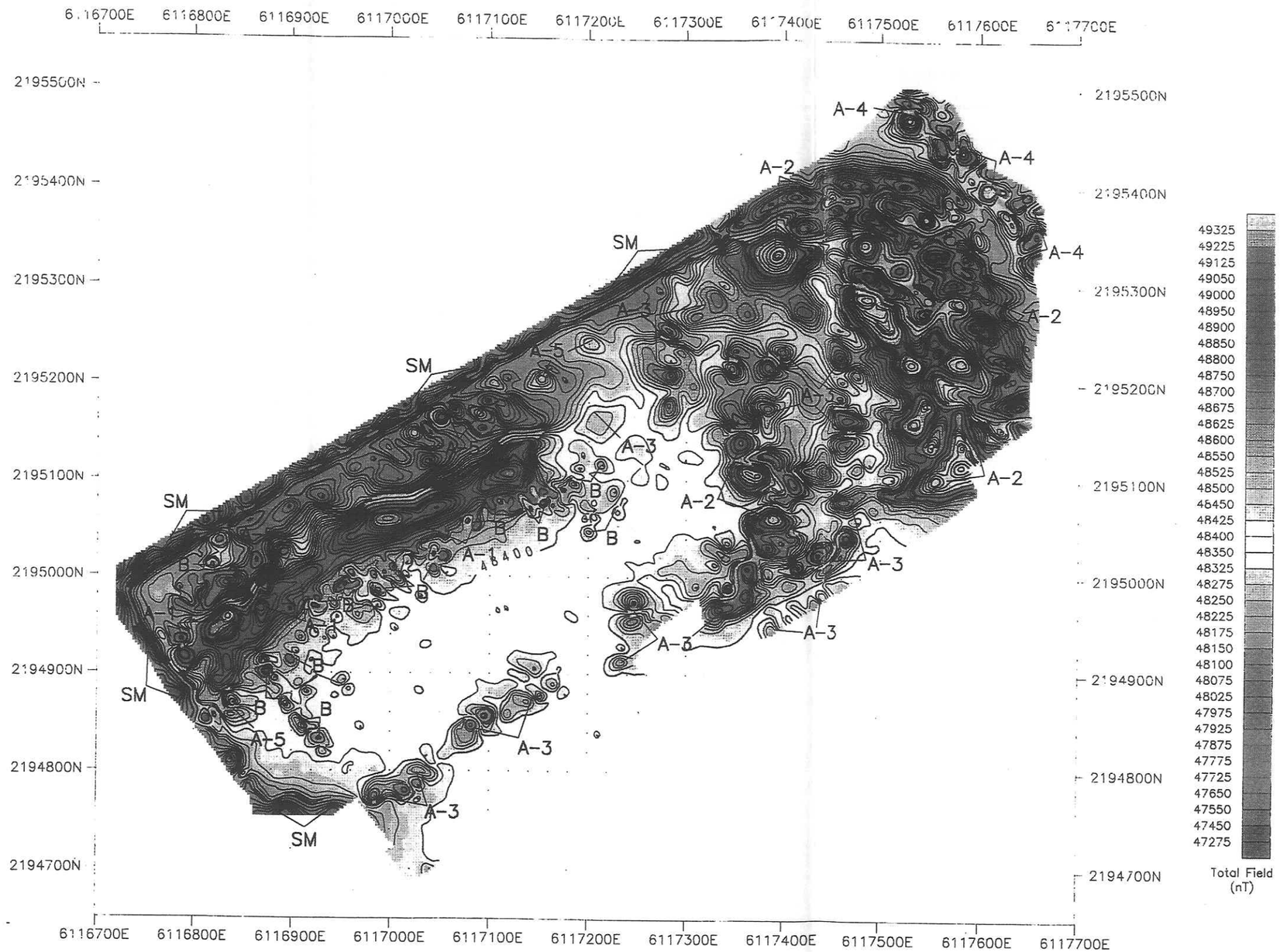
Project No. 0240	Date 03-13-00
Developed by	A MARTIN
Drawn by	T RODRIGUEZ
Approved by	
File	0240/0240.DWG

FIGURE - 1
SITE MAP WITH GEOPHYSICAL INTERPRETATION

AERIAL PHOTOGRAPHIC ANOMALY AREA 3 (MSC R1)

MCAS EL TORO, CALIFORNIA

PREPARED FOR
THE IT GROUP



CONTOUR INTERVAL = 50 NANOTESLAS

LEGEND

A-1	GEOPHYSICAL ANOMALY DISCUSSED IN REPORT
B	ANOMALY CAUSED BY SMALL BURIED METALLIC OBJECT OR DEBRIS
SM	ANOMALY CAUSED BY SURFACE METALLIC OBJECT OR DEBRIS

60 0 60 120 180
(feet)

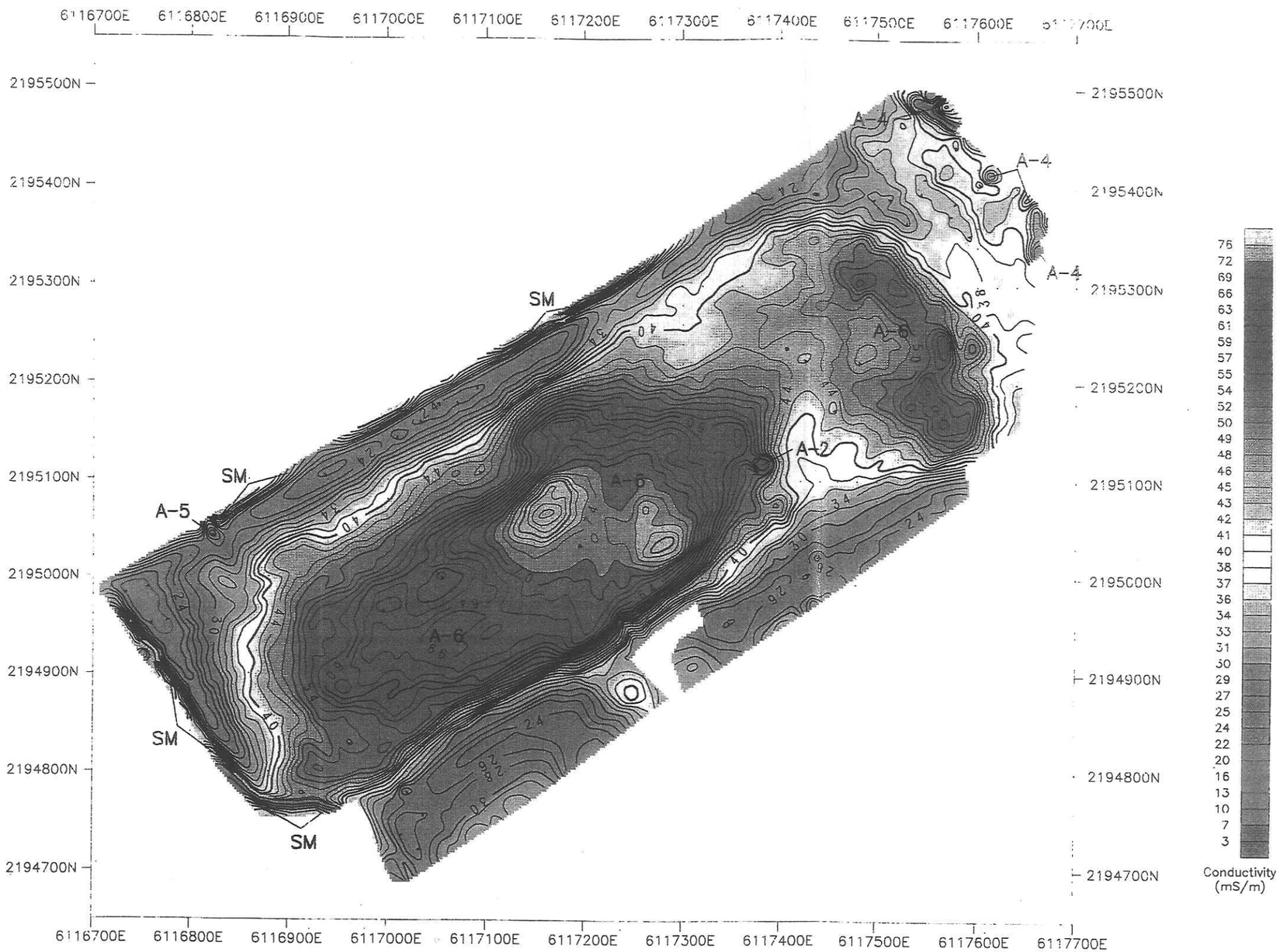
Note: Coordinates are in the California State Plane Coordinate System, Zone 6, NAD83

FIGURE 2
CONTOUR MAP OF TOTAL MAGNETIC FIELD INTENSITY

AERIAL PHOTOGRAPHIC ANOMALY AREA 3 (MSC R1)
MCAS EL TORO, CALIFORNIA

PREPARED FOR
THE IT GROUP

GEOVISION GEOPHYSICAL SERVICES



CONTOUR INTERVAL = 2 MILLISIEMENS PER METER

LEGEND

A-6 GEOPHYSICAL ANOMALY DISCUSSED IN REPORT

SM ANOMALY CAUSED BY SURFACE METALLIC OBJECT OR DEBRIS

60 0 60 120 180
(feet)

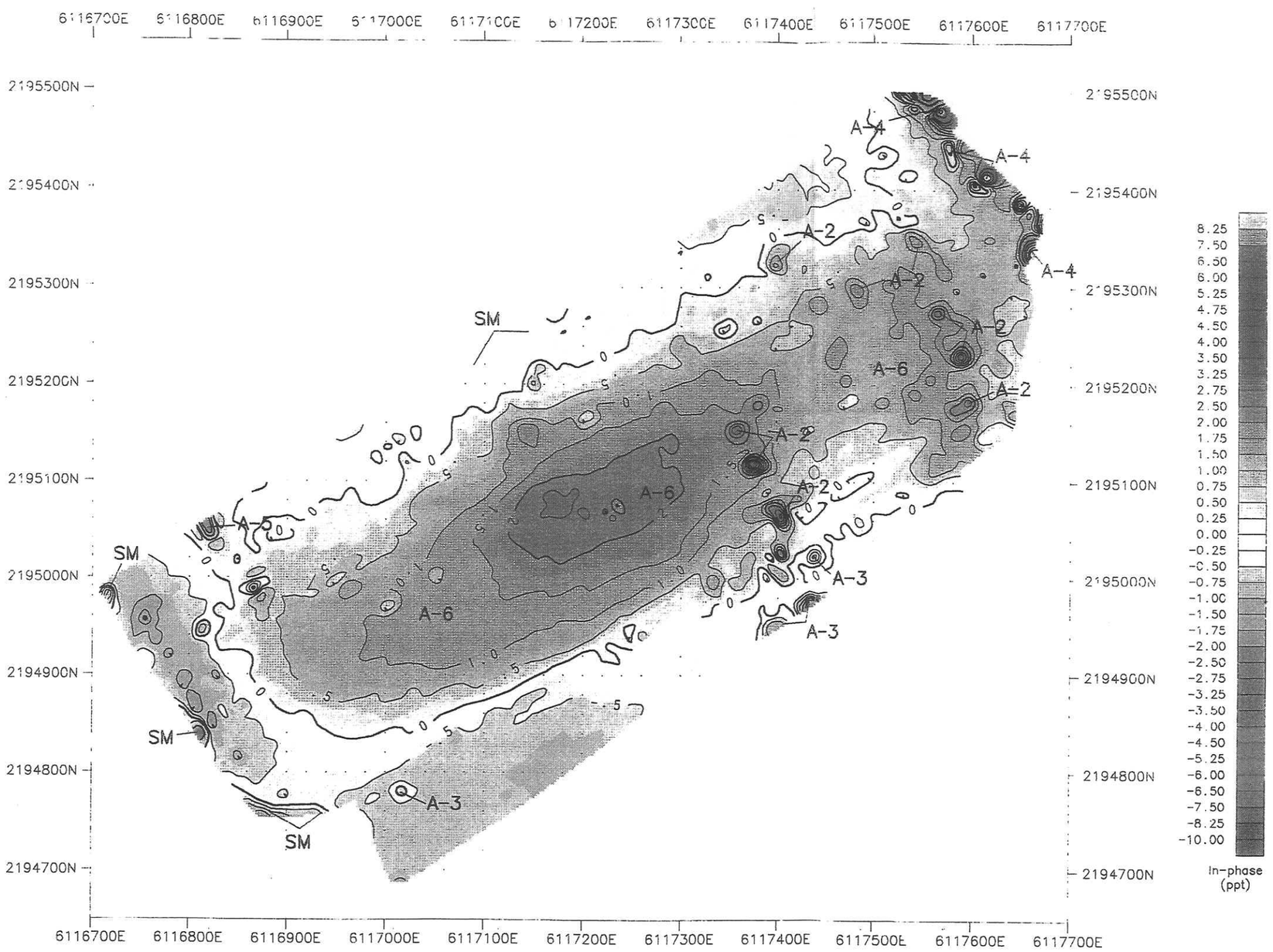
Note: Coordinates are in the California State Plane Coordinate System, Zone 6, NAD83

FIGURE 3
CONTOUR MAP OF GEONICS EM-31 CONDUCTIVITY RESPONSE

AERIAL PHOTOGRAPHIC ANOMALY AREA 3 (MSC R1)
MCAS EL TORO, CALIFORNIA

PREPARED FOR
THE IT GROUP

GEOVISION GEOPHYSICAL SERVICES



LEGEND

A-6 GEOPHYSICAL ANOMALY DISCUSSED IN REPORT

SM ANOMALY CAUSED BY SURFACE METALLIC OBJECT OR DEBRIS

60 0 60 120 180
(feet)

CONTOUR INTERVAL = 0.5 PARTS PER THOUSAND

Note: Coordinates are in the California State Plane Coordinate System, Zone 6, NAD83

FIGURE 4
CONTOUR MAP OF GEONICS EM-31 IN-PHASE RESPONSE

AERIAL PHOTOGRAPHIC ANOMALY AREA 3 (MSC R1)
MCAS EL TORO, CALIFORNIA

PREPARED FOR
THE IT GROUP

GEOVISION GEOPHYSICAL SERVICES

APPENDIX A
GEOPHYSICAL TECHNIQUES FOR SHALLOW ENVIRONMENTAL INVESTIGATIONS

GEOPHYSICAL TECHNIQUES FOR SHALLOW ENVIRONMENTAL INVESTIGATIONS

GEOVision
geophysical services
a division of Blackhawk Geometrics

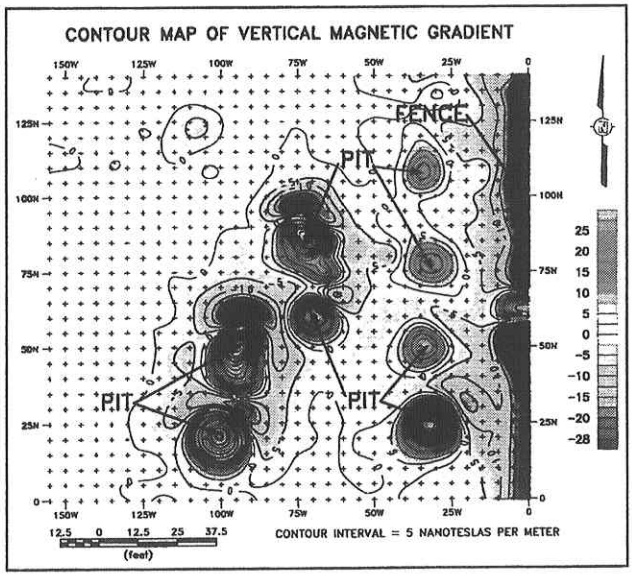
MAGNETIC METHOD

The magnetic method generally involves the measurement of the earth's magnetic field intensity or vertical gradient of the earth's magnetic field. Anomalies in the earth's magnetic field are caused by induced or remanent magnetism. Induced magnetic anomalies are the result of secondary magnetization induced in a ferrous body by the earth's magnetic field. The shape and amplitude of an induced magnetic anomaly is a function of the orientation, geometry, size, depth, and magnetic susceptibility of the body as well as the intensity and inclination of the earth's magnetic field in the survey area. The magnetic method is an effective way to search for small metallic objects, such as buried ordnance and drums, because magnetic anomalies have spatial dimensions much larger than those of the objects themselves. Typically, a single buried drum can be detected to a depth of about 10 feet.

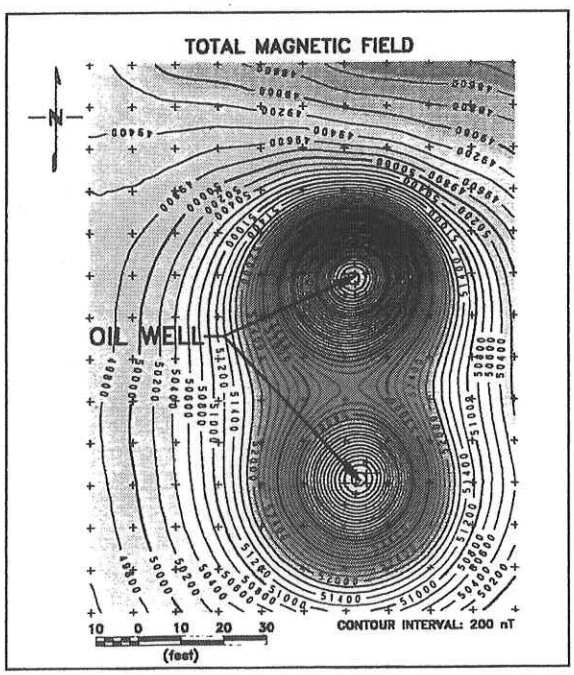
Larger metallic objects can often be located to greater depths. Induced magnetic anomalies over buried objects such as drums, pipes, tanks, and buried metallic debris generally exhibit an asymmetrical, south up/north down signature (positive response south of the object and negative response to the north).

Magnetic data is typically acquired along a grid with results being presented as color-enhanced contour maps generated by the Geosoft™ Mapping System or OASIS montaj. The approximate location and depth of magnetic objects can be calculated using the Geosoft™ UXO System.

Geometrics G858 Cesium Magnetic Gradiometer



Magnetic Survey to Locate Pits Containing Buried Metallic Containers



Magnetic Survey to Locate Abandoned Oil Wells

Magnetic surveys are typically conducted to:

- Locate abandoned steel well casings
- Locate buried tanks and pipes
- Locate pits and trenches containing buried metallic debris
- Detect buried unexploded ordnance (UXO)
- Map old waste sites and landfill boundaries
- Clear drilling locations
- Map basement faults and geology
- Investigate archaeological sites

ELECTROMAGNETIC METHODS

Electromagnetic (EM) methods typically applied to shallow environmental investigations include frequency domain EM methods, such as EM induction and EM utility location methods, time domain electromagnetic (TDEM) metal detection methods, and ground penetrating radar (GPR) methods.

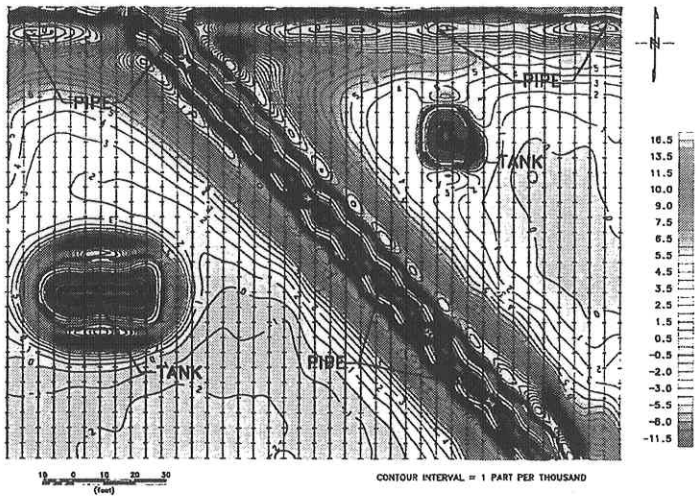
EM Induction Method

EM induction surveys are often conducted using the Geonics EM-31 terrain conductivity meter (EM-31). The EM-31 consists of a transmitter coil mounted at one end and a receiver coil mounted at the other end of a 3.7-meter long plastic boom. Electrical conductivity and in-phase component field strength are measured and stored along with line and station numbers in a digital data logger. In-phase component measurements generally only respond to buried metallic objects; whereas conductivity measurements also respond to conductivity variations caused by changes in soil type, moisture or salinity and the presence of nonmetallic bulk wastes. The EM-31 must pass over or immediately adjacent to a buried metallic object to detect it. Typical EM-31 anomalies over small, buried metallic objects consist of a negative response centered over the object and a lower amplitude positive response to the sides of the object. When the instrument boom is oriented parallel to long, linear conductors such as pipelines a strong positive response is observed. The EM-31 can explore to depths of about 6 meters, but is most sensitive to materials about 1 meter below ground surface. Single buried drums can typically be detected to depths of about 5 feet.

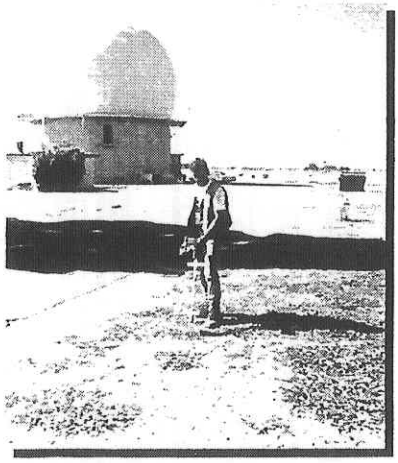
Geonics EM-31 Terrain Conductivity Meter

EM-31 surveys are typically conducted to:

- Locate buried tanks and pipes
- Locate pits and trenches containing metallic and/or nonmetallic debris
- Delineate landfill boundaries
- Delineate oil production sumps and mud pits
- Map conductive soil and groundwater contamination
- Map soil salinity in agricultural areas
- Characterize shallow subsurface hydrogeology
  - Map buried channel deposits
  - Locate sand and gravel deposits
  - Locate conductive fault and fracture zones



Geonics EM-31 Survey to Locate Underground Storage Tanks



EM Utility Location Methods

EM utility locators; such as the Metrotech 810, Metrotech 9890 and Radiodetection RD400, are designed to accurately trace metallic pipes and utility cables and clear drilling/excavation locations. These utility locators consist of a separate transmitter and a receiver. The transmitter emits a radio frequency EM field that induces secondary fields in nearby metallic pipes and cables. The receiver detects these fields and is used to accurately locate and trace the pipes, often to distances over 200 feet from the transmitter. Many of the utility locators have a passive 60Hz mode to locate live electrical lines. Modern utility locators are also capable of providing rough depth estimates of the pipes.

Metrotech EM Utility Locator

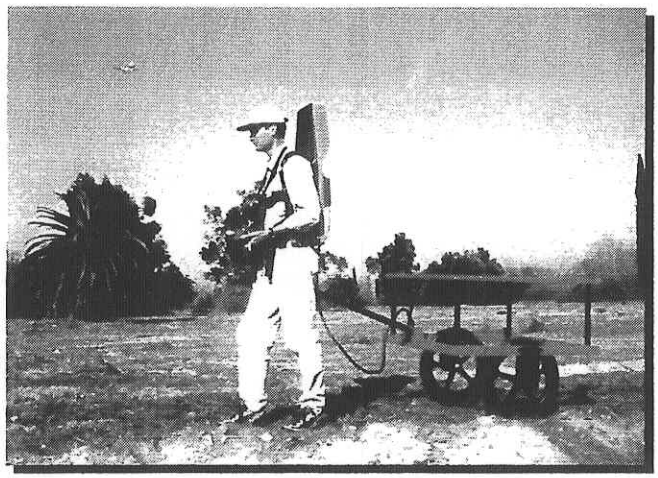
TDEM Metal Detection Methods

A Geonics EM-61 (EM-61) is a high sensitivity, time-domain, digital metal detector which is often used to detect both ferrous and non-ferrous metallic objects. It is designed specifically to locate buried metallic objects such as drums, tanks, pipes, UXO, and metallic debris and to be relatively insensitive to above ground structures such as fences, buildings, and vehicles.

The EM-61 consists of two square, 1-meter coils, one mounted over the other and arranged on a hand-towed cart. The bottom coil acts as both a transmitter and receiver while the top coil is a receiver only. While transmitting the bottom coil generates a pulsed primary magnetic field, which induces eddy currents into nearby metallic objects. When the transmitter is in its off cycle both coils measure the decay of these eddy currents in millivolts (mV) with the results being stored in a digital data logger along with position information.

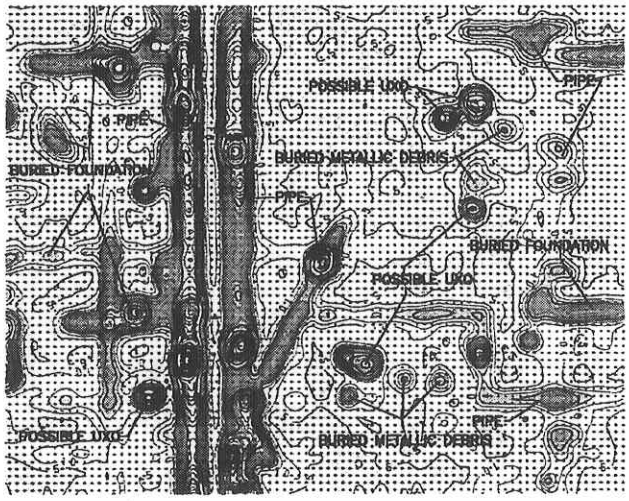
The decay of the eddy currents is proportional to the size and depth of the metallic target. A symmetrical positive anomaly is recorded over metallic objects with the peak centered over the object. The signal from the top coil is amplified in such a way that both coils record effectively the same response for a metallic object on the surface and the top coil records a larger response for buried metallic objects. The response of near surface objects can, therefore, be suppressed by subtracting the lower coil response from the upper coil response (differential response).

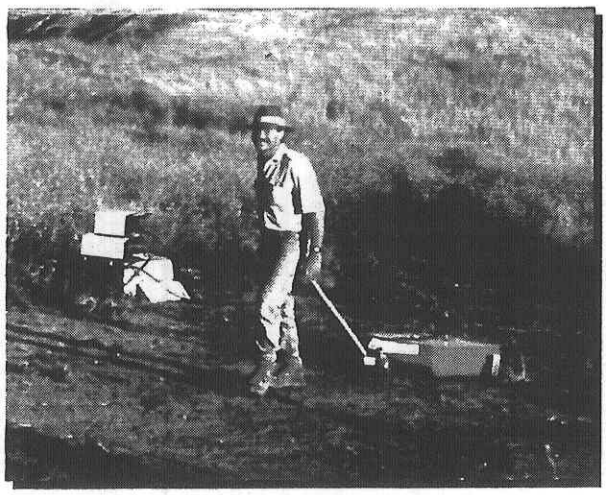
In practice, the usable depth of investigation of the EM-61 depends on the size and shape of the object and the amount of above ground interference encountered at the site. A single buried drum can often be detected at a depth of about 10 feet.



Geonics EM-61 Digital Metal Detector

Geonics EM-61 Survey to Map Subsurface Infrastructure and Potential UXO ⇨





GSSI SIR-10A GPR Unit

GPR Methods

Ground-penetrating radar (GPR) is a high-frequency electro-magnetic method commonly applied to a number of engineering and environmental problems.

A GPR system radiates short pulses of high-frequency EM energy into the ground from a transmitting antenna. This EM wave propagates into the ground at a velocity that is primarily a function of the relative dielectric permittivity of subsurface materials. When this wave encounters the interface of two materials having different dielectric properties, a portion of the energy is reflected back to the surface, where it is detected by a receiver antenna and transmitted to a control unit for processing and display.

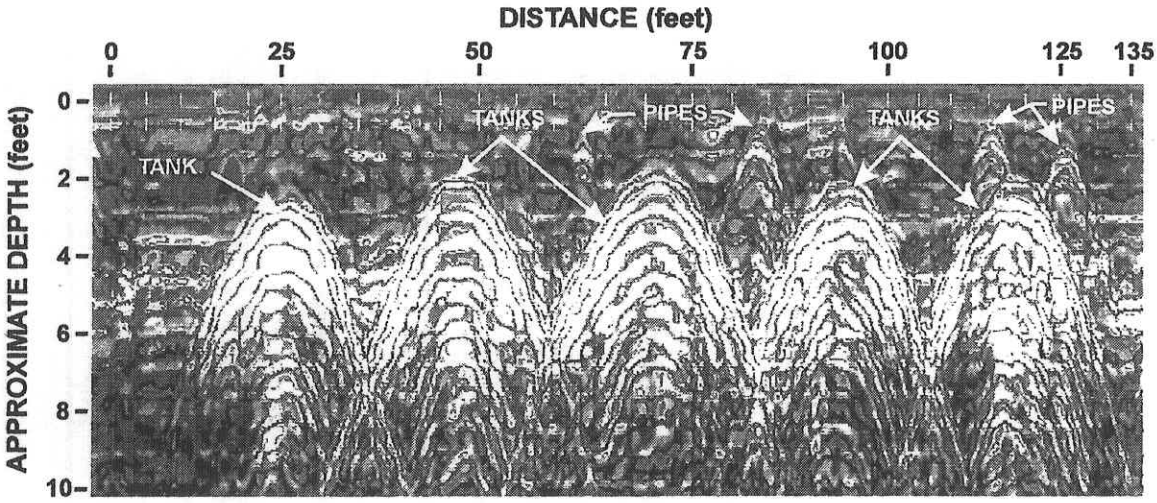
Depth penetration is a function of antenna frequency and the electrical conductivity of the soils in the survey area. Lower frequency antennas achieve greater depth penetration than higher frequency antennas, but have poorer spatial resolution. Conductive soils, such as clays, attenuate the radar waves much more rapidly than resistive dry sand and rock. In many environments in California, depth penetration of 500 and 300 MHz

antennas is limited to 3 to 5 feet. Depth penetration may be greater if shallow soils consist of clean sands and less if shallow soils consist of clay.

GPR surveys are typically conducted to:

- Locate and delineate underground storage tanks (metallic and non-metallic)
- Locate metallic and nonmetallic pipes and utility cables
- Map rebar in concrete structures
- Map landfill boundaries
- Delineate pits and trenches containing metallic and nonmetallic debris
- Delineate leach fields and industrial cribs
- Delineate previously excavated and backfilled areas
- Map shallow groundwater tables
- Map shallow soil stratigraphy
- Map shallow bedrock topography
- Map shallow subsurface voids and cavities
- Characterize archaeological sites

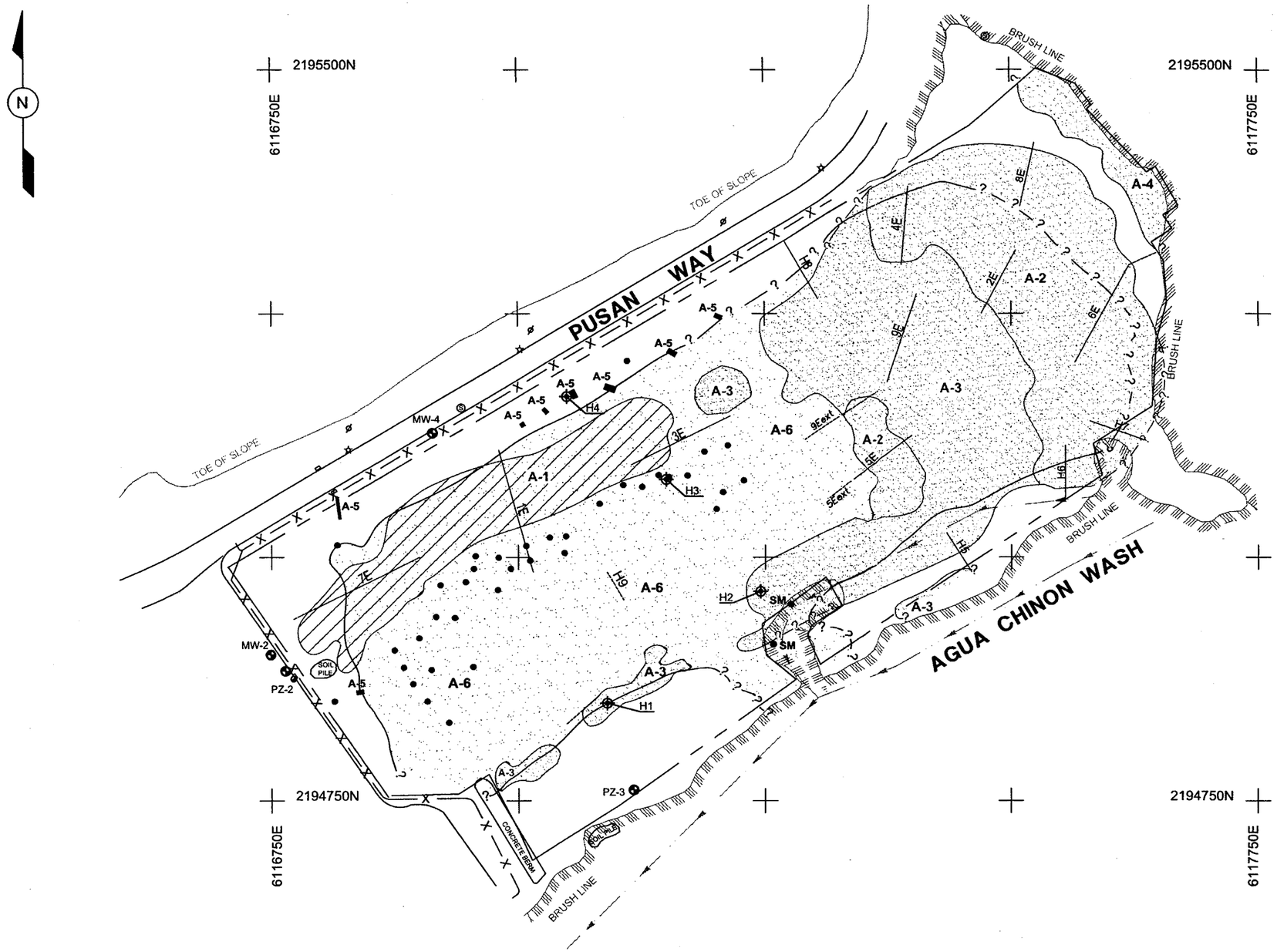
Geophysical Survey Systems Inc. (GSSI) SIR-2 or SIR-10 GPR systems with antennas in the frequency range of 50 to 1,000 MHz are often used during GPR investigations. Mala Geoscience and Sensors and Software, Ltd also manufacture GPR systems. GPR data is processed using a variety of software including the RADAN™ or GRADIX software packages by GSSI and Interpex Ltd., respectively.



GPR Survey to Locate Underground Storage Tanks

B-2 FIGURES

Figure B-1 Trench Location with Geophysical Survey
Figure B-2 Trench Sample Location Map



LEGEND

- BOUNDARY OF GEOPHYSICAL SURVEY AREA
- CHAIN LINK FENCE
- AGUA CHINON WASH
- SEWER MANHOLE
- LIGHT POLE
- POWER POLE
- STORM DRAIN
- MW-4 MONITORING WELL
- SM SURFACE METALLIC OBJECT / DEBRIS
- VERY SMALL BURIED METALLIC OBJECT / DEBRIS
- A-1 LARGE TRENCH CONTAINING HIGH CONCENTRATION OF DEEP BURIED METALLIC / CONSTRUCTION DEBRIS
- A-2 DISPOSAL AREA CONTAINING HIGH CONCENTRATION OF DEEP BURIED METALLIC / CONSTRUCTION DEBRIS
- A-3 DISPOSAL AREA CONTAINING SCATTERED DEEP BURIED METALLIC / CONSTRUCTION DEBRIS
- A-4 AREA CONTAINING SHALLOW BURIED METALLIC / CONSTRUCTION DEBRIS
- A-5 LARGE BURIED METALLIC OBJECT OR SMALL ACCUMULATION OF BURIED METALLIC DEBRIS
- A-6
- 5E TRENCH LOCATIONS

GRAPHIC SCALE

0 60 120 240

(IN FEET)

NOTE:
1. COORDINATES ARE IN CALIFORNIA STATE PLANE COORDINATE SYSTEM, NAD83, ZONE 6
2. INTERPRETED BOUNDARIES ARE APPROXIMATE, QUERIED WHERE INFERRED OR UNCERTAIN

REVISIONS			
REV. No.	DESCRIPTION	DATE	APPROVED

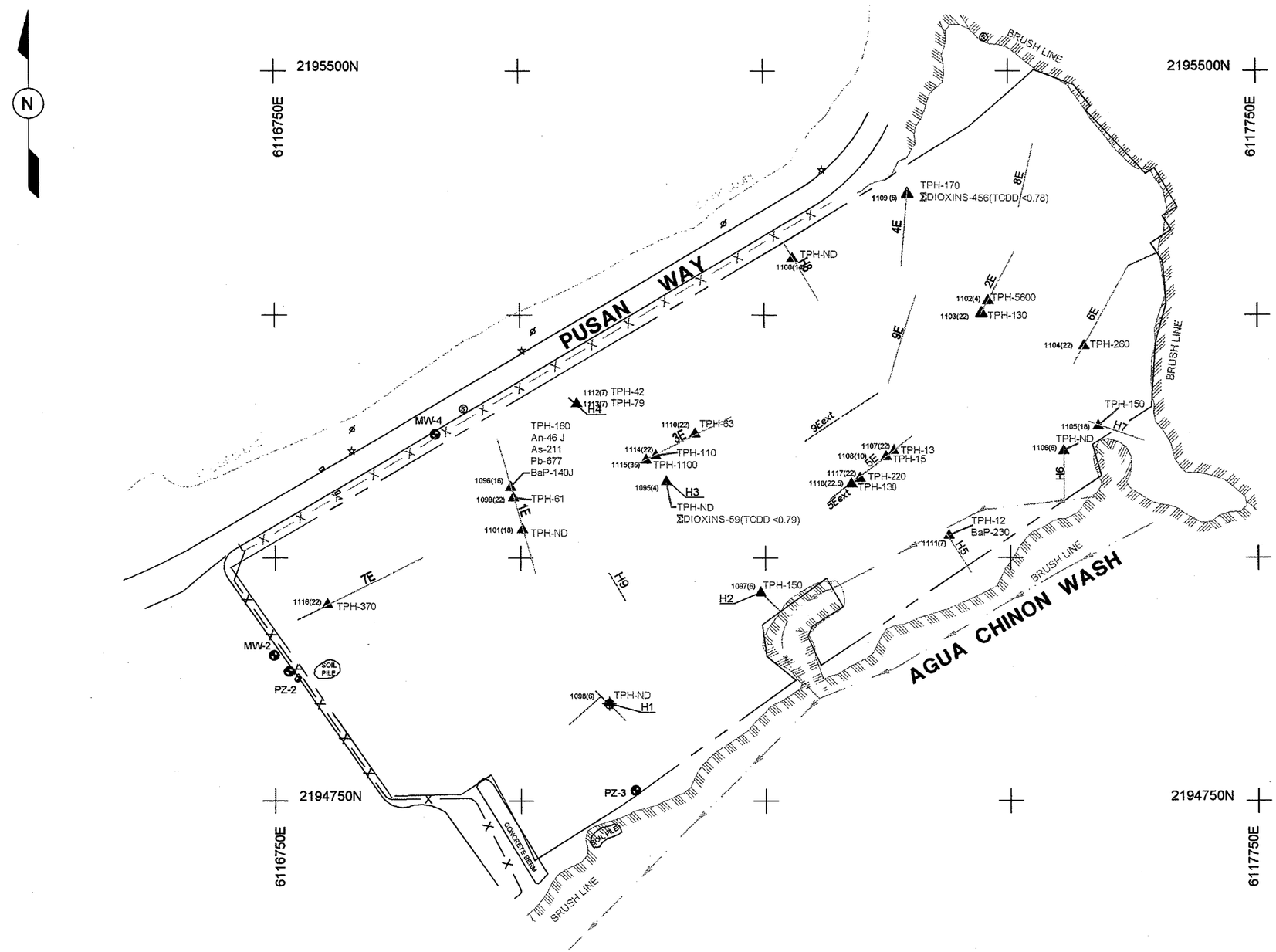
CONTRACT NAME	SWDIV
DRAWN BY R. PIRMORADIAN	DATE 11-9-00
CHECKED BY	DATE 11-15-00
APPROVED BY	DATE 11-15-00
PROJECT MANAGER DR	DATE 11/15/00
AUTOCAD FILE No. 20242177.DWG	

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation
IRVINE, CA

SITE MAP
TRENCH LOCATIONS WITH
GEOPHYSICAL INTERPERTATION AERIAL
ANOMALY AREA 3 (MSC R1)
MARINE CORPS AIR STATION
EL TORO CALIFORNIA

SCALE	SHEET	OF	DOCUMENT CONTROL No.	OHM PROJECT No.	DRAWING No.
AS NOTED	1	1	SW9312	920242	FIG B-1

Nov 09, 2000 58:21 I:\OHM_CORP\PROJECTS\20242\20242177.dwg



LEGEND

— — — —	BOUNDARY OF GEOPHYSICAL SURVEY AREA
—X—X—X—	CHAIN LINK FENCE
—<·—·—	AGUA CHINON WASH
Ⓢ	SEWER MANHOLE
☆	LIGHT POLE
ø	POWER POLE
▥	STORM DRAIN
1095 ▲ (6)	APPROXIMATE SAMPLE LOCATION (SAMPLE DEPTH IN FEET)
MW-4	MONITORING WELL
PZ-3	PIEZOMETER
TPH-42	ANALYTE CONCENTRATIONS
1095(4)	SAMPLE NUMBER (FEET BELOW GROUND SURFACE)
- - - - - -	TRENCH LOCATIONS, DASHED WHERE EXTENDED
TPH	TOTAL PETROLEUM HYDROCARBONS (mg/kg)
An	ANTIMONY (mg/kg)
Pb	LEAD (mg/kg)
As	ARSENIC (mg/kg)
BaP	BENZO(a)PYRENE (mg/kg)
ΣDIOXINS	TOTAL DIOXINS (mg/kg)
TCDD	2, 3, 7, 8-TCDD
5 E	SOIL REMOVE WITH EXCAVATOR
H2	SOIL REMOVED WITH BACK HOE

GRAPHIC SCALE

0 60 120 240

(IN FEET)

NOTE:
1. COORDINATES ARE IN CALIFORNIA STATE PLANE COORDINATE SYSTEM, NAD83, ZONE 6
2. INTERPRETED BOUNDARIES ARE APPROXIMATE, QUERIED WHERE INFERRED OR UNCERTAIN
3. ONLY ANALYTE CONCENTRATIONS ABOVE PRG ARE SHOWN, EXCEPT FOR TPH WHERE ALL CONCENTRATIONS ARE SHOWN.

REVISIONS

REV. No.	DESCRIPTION	DATE	APPROVED

CONTRACT NAME: SWDIV

OHM Remediation Services Corp.
A Subsidiary of OHM Corporation
IRVINE, CA

DRAWN BY: R. PIRMORADIAN — DATE: 11-9-00
CHECKED BY — DATE: 11-15-00
APPROVED BY — DATE: 11-15-00
PROJECT MANAGER — DATE: 11/15/00
AUTOCAD FILE No.: 20242178.DWG

SITE MAP
ANALYTICAL RESULTS IN SOIL
ANOMALY AREA 3
(MSC R1)
MARINE CORPS AIR STATION
EL TORO CALIFORNIA

SCALE	SHEET	OF	DOCUMENT CONTROL No.	OHM PROJECT No.	DRAWING No.
AS NOTED	1	1	SW9312	920242	FIG B-2

Nov 09, 2000 — 15:42:35 I:\OHM CORP\PROJECTS\20242\20242178.dwg

B-3 TRENCH LOGS

El Toro, Aerial Photograph Anomaly Area 3
Trench Excavation Log

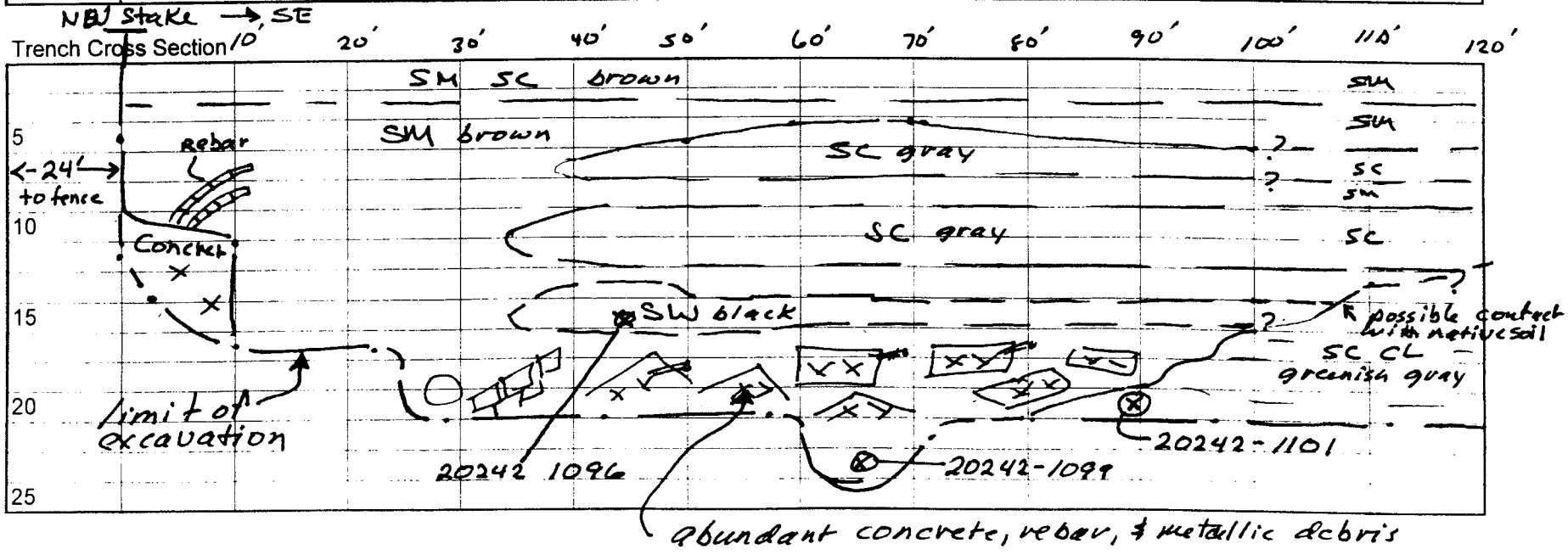
Project Nu. 920242
wbs 08001001

Trench Number 1E Date of Excavation 3-7-00 Page 1 of 2

General Description: Excavation of 1E - Started 0745 - complete 1445. This trench bisects the trench Anomaly A-1. Determine trench edges & characterize materials

Stratigraphic Description:		**Sample:**	
SCS	Lithic Description	Number	Analyses
SM SC	0-2.5' clayey to silty SAND (SM SC): brown 10YR4/3; 60-70% fine to med. sand; 30-40% silt and clay		
SM	2.5 - 8 silty gravelly SAND (SM): brown 10YR4/3; 70% fine to med. sand; 15% silt, 15% gravel; Mixed with debris	20242-1099	Priority Pollutants
SC	8'-10' clayey SAND (SC): gray ↙12'-15'		
SW	gravelly SAND (SW): black with asphalt particles - no odor no PID - Debris - concrete & metallic	20242 1096	
SC/CL	14'-20' sandy Clay (SC CL): greenish gray 5G5/1; 50% Sand & silt; 50% Clay mod. plastic - CL - possible native material?	20242-1101	Prior. Polls.

Trench Cross Section

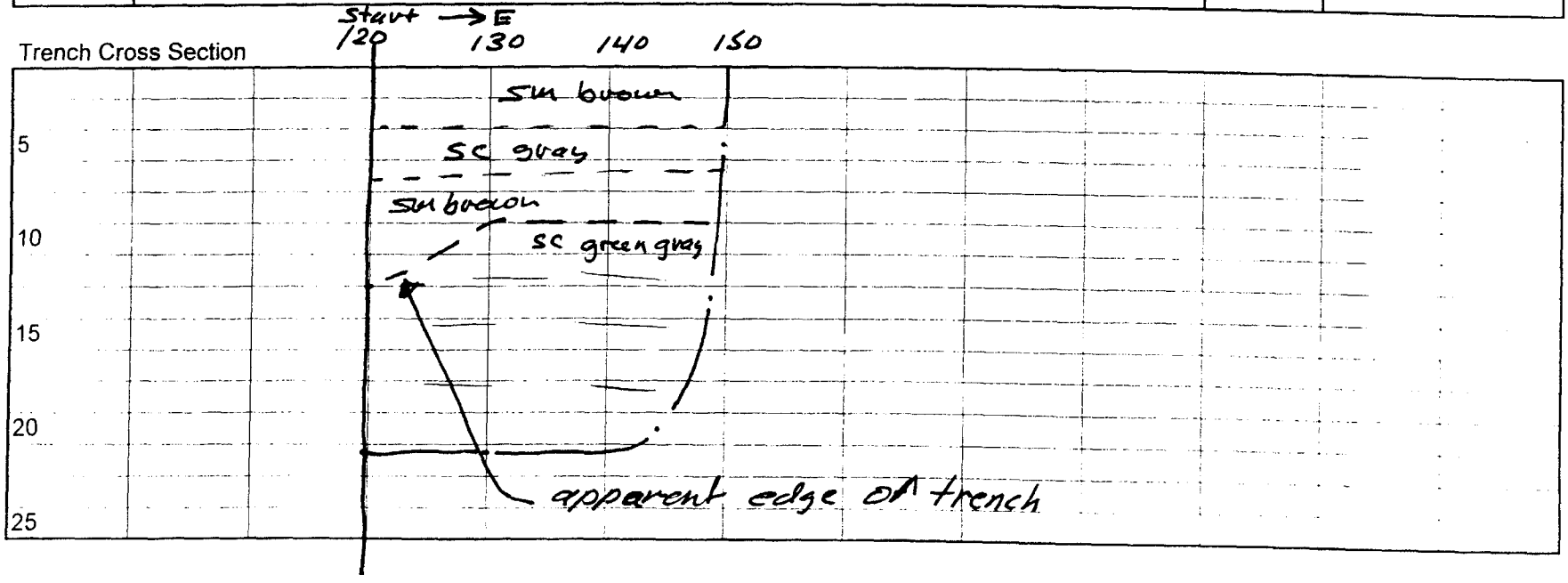


Trench Number 1E (cont) Date of Excavation 3-7-00 Page 2 of 2

General Description: eastward continuation of trench 1E

Stratigraphic Description:		**Sample:**	
SCS	Lithic Description	Number	Analyses
SM	Silty SAND (SM): brown 10YR 4/3 to ?		
SC	Clayey SAND (SC): gray		
SC CL	Sandy Clay (SC-CL):- Claystone? greenish gray 5GY5/1 hard fractured micaceous.		

Trench Cross Section



MC. El Toro, Aerial Photograph Anomaly Area 3
Trench Excavation Log

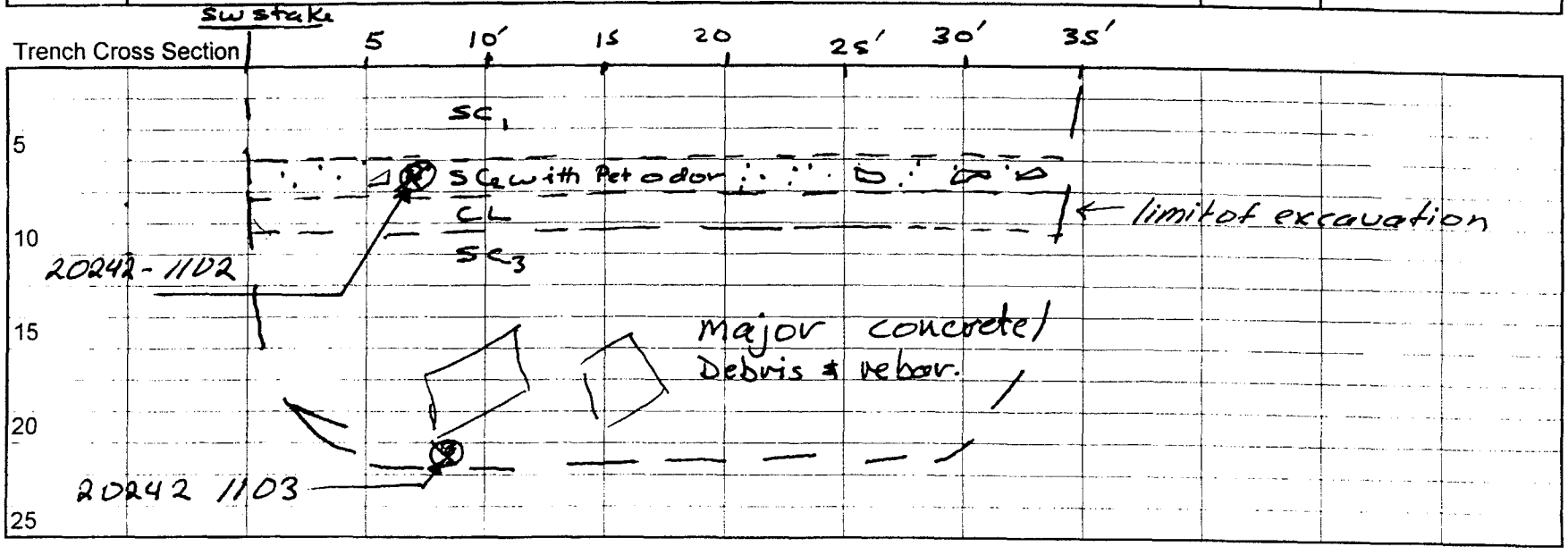
Project Num. 920242
wbs 08001001

Trench Number 2E Date of Excavation 3-9-2000

General Description: Trench started at SW stake & advanced toward site NE.

	Stratigraphic Description:		**Sample:**	
	SCS	Lithic Description	Number	Analyses
0-5' -	SC_1	clayey SAND (SC): brown 10YR 4/2		
5-7' -	SC_2	sandy CLAY/clayey SAND (SC) - black - with rubble (concrete, brick & asphalt, & metal. Strong petroleum odor - NO PID	20242 1102	Priority Pols.
7-9'	CL	silty CLAY (CL): olive gray 5Y 4/2; stiff Clay		
9-22'	SC_3	clayey SAND (SC): olive gray? mixed with rubble & maj concrete debris & rebar.	20242 1103	Priority Pols

Trench Cross Section



MC El Toro, Aerial Photograph Anomaly Area 3
Trench Excavation Log

Project Num. 920242
wbs 08001001

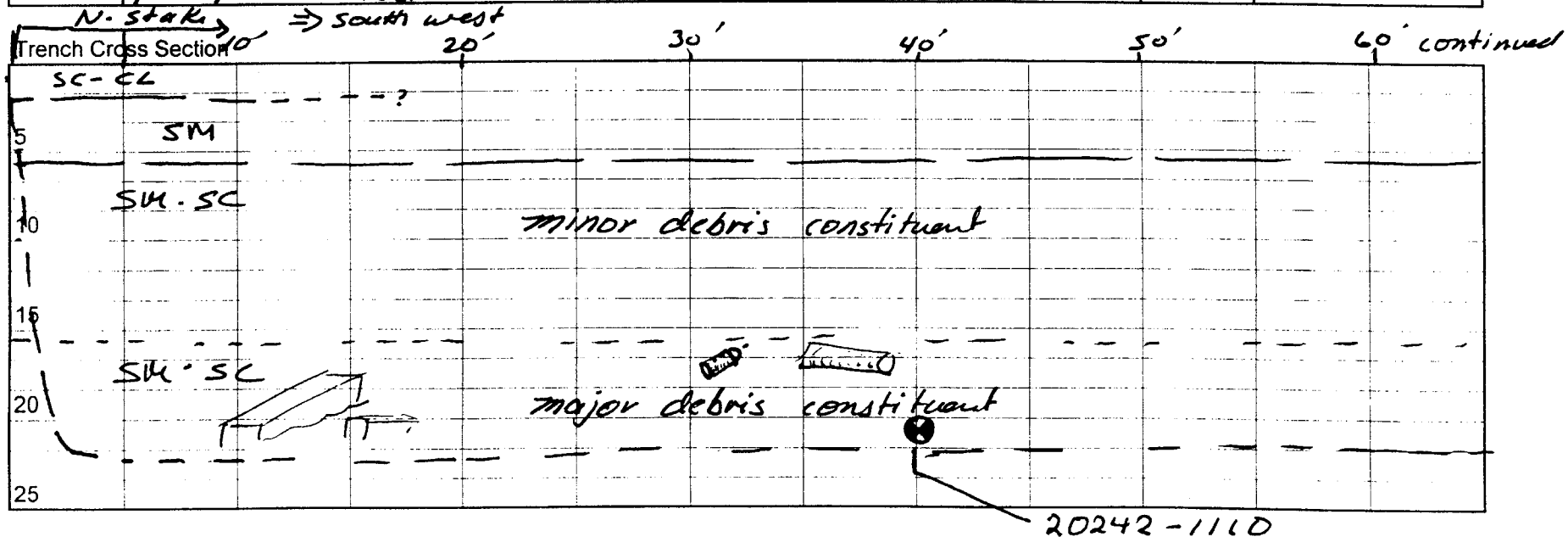
Trench Number 3E

Date of Excavation 3-9-2000

General Description: Trench started from NE stake, advanced south west.

Stratigraphic Description:		Sample:	
SCS	Lithic Description	Number	Analyses
SC-CL (0-1')	Clayey SAND (SC+CL): dark brown 10YR 4/2; 50-60% fine to med. sand, 40-50% silt & clay. moist.		
SM (1-6')	Silty SAND (SM): dark brown 10YR 4/3; 80% fine to med sand some coarse grains, 15% silt, 5% small gravel. DRY Loose — Sharp contact		
SM-SC (6-to TD)	Silty SAND (SM-SC): olive gray 5Y5/2; 90% fine sand 10% silt with trace clay. Moist. with Debris: concrete with rebar, re-bar, bricks, fabric, wood, PVC, can of tive sealant, asphalt pipe & metal debris.	20242-1110	Priority Pollutants 40' offset 22' deep

Trench Cross Section



MC(:l Toro, Aerial Photograph Anomaly Area 3
Trench Excavation Log

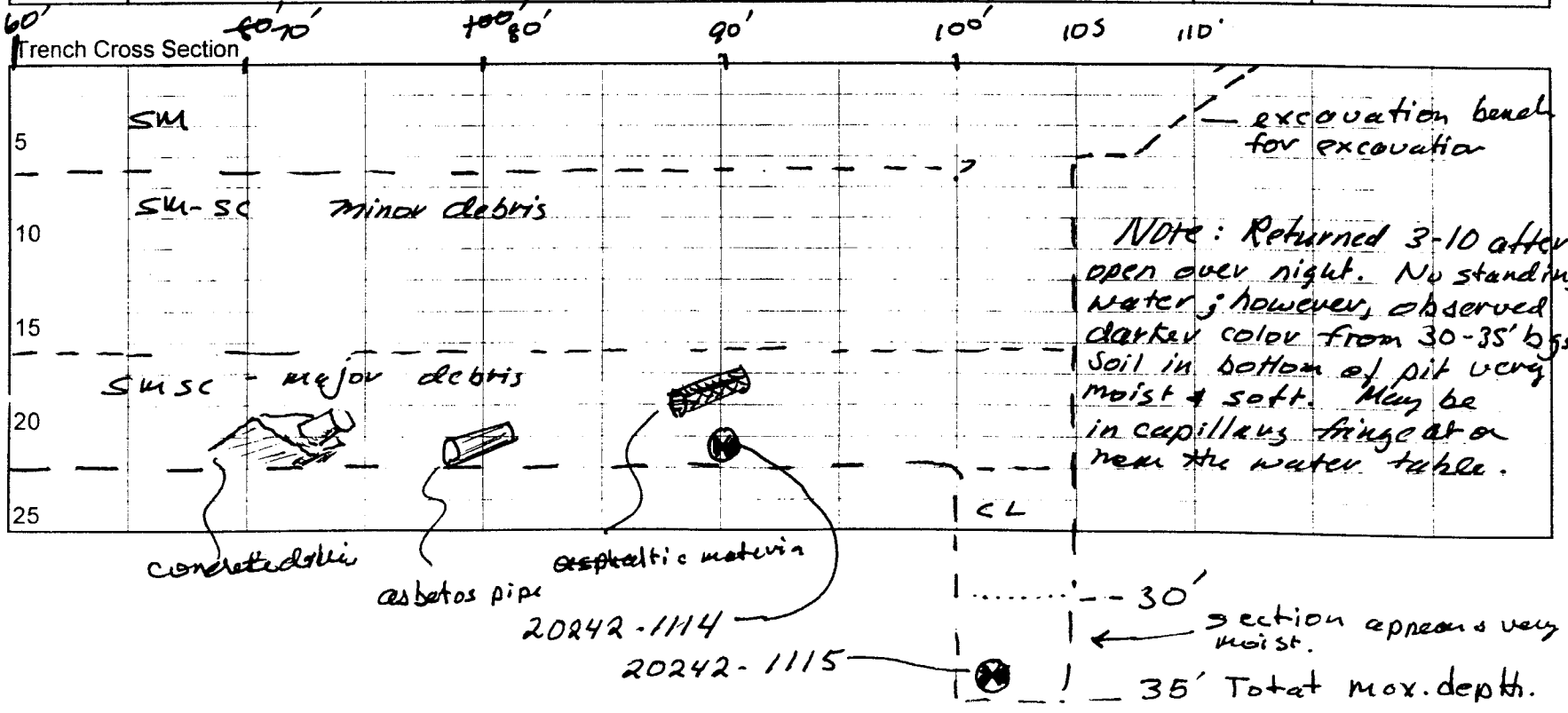
Project Num. (20242
wbs 08001001

Trench Number 3E (cont.) Date of Excavation 3-9-00

General Description: Continuation of 3E toward the south.

Stratigraphic Description:		Sample:	
SCS	Lithic Description	Number	Analyses
	overlying units continue through this part of the trench	20242 1114	
2.5'—to TD CL	Silty CLAY (CL): dark greenish gray 5GY4/1; 80% silt and clay, moist, moderat to low plasticity, some debris. sample is very moist.		

Trench Cross Section



MCAS El Toro, Aerial Photograph Anomaly Area 3
Trench Excavation Log

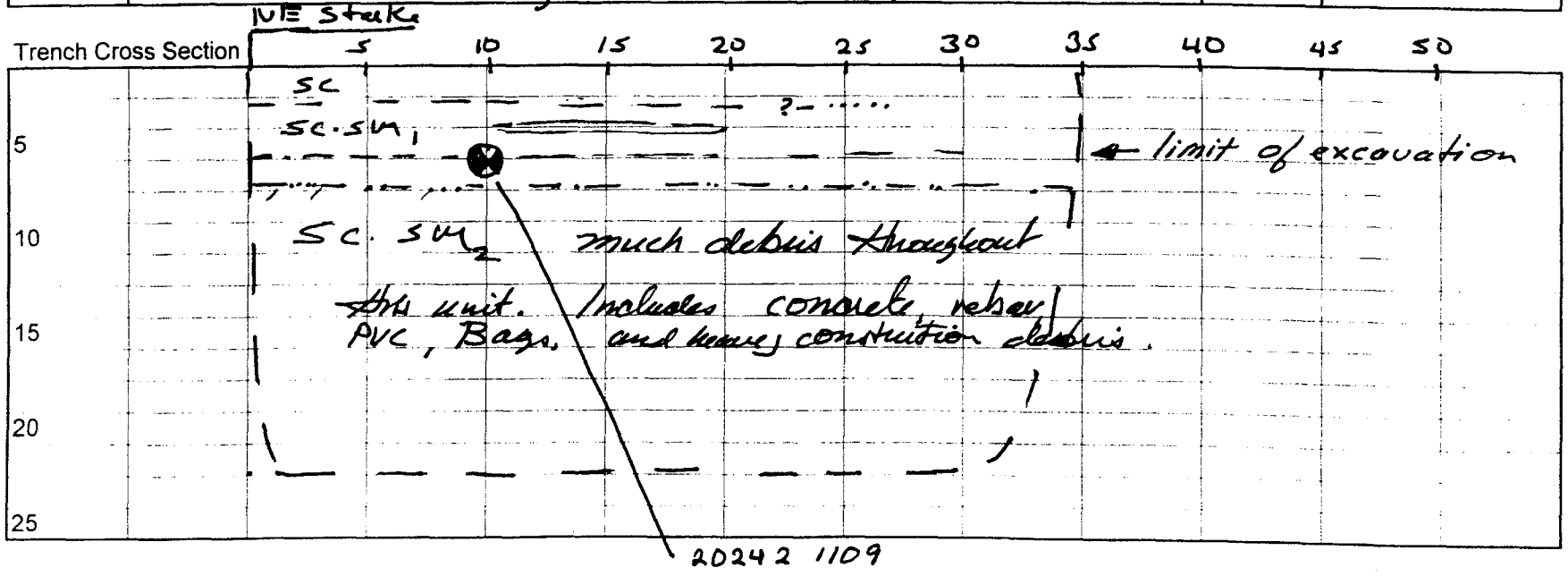
Project Num. 20242
wbs 08001001

Trench Number 4E Date of Excavation 3-8-00

General Description: Trench advanced from NE stake toward South.

Stratigraphic Description:		Sample:	
SCS	Lithic Description	Number	Analyses
SC 0-1'	Clayey SAND (SC): dark brown 10YR 4/2; 50% SAND fine to med 50% Silt & Clay		
SC-SM 1	Clayey silty SAND (SC SM): brown 10YR 4/3; 80% fine to med sand 20% silt and clay. layered appearance - strong sweet chemical odor - sample collected!	20242 1109	Priority Pol.
SC-SM 2	Clayey SAND (SC SM): Olive gray 5GY 4/1; 80% SAND (fine to med) 20% silt and clay; much large construction debris disseminated throughout this unit.		

Trench Cross Section



MCAS El Toro, Aerial Photograph Anomaly Area 3
Trench Excavation Log

Project Num. 20242
wbs 08001001

Trench Number 5E

Date of Excavation 3-8-00 and extension 3-10-00

Page 1 of 2

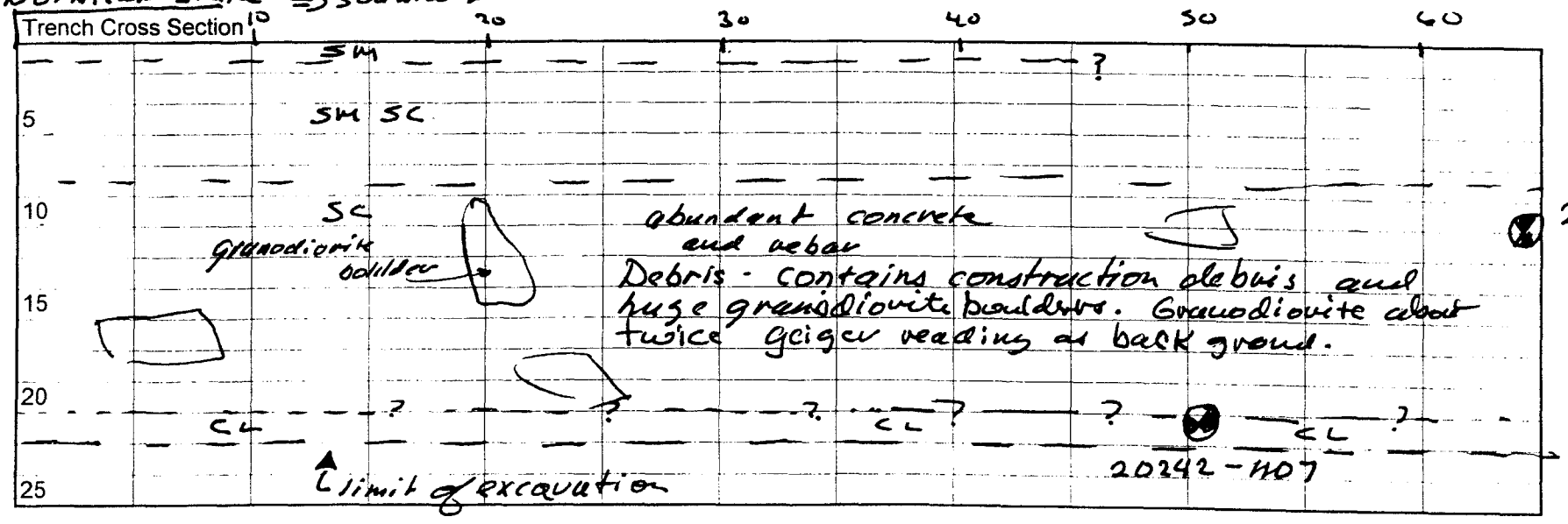
extended trench

General Description: Began trench on 3-8-00 from N stake toward south, on 3-10-00 ~~started~~ approximately 105' south of North stake & excavated toward the south.

Stratigraphic Description:		Sample:	
SCS	Lithic Description	Number	Analyses
0-1' SM	silty SAND (SM): brown 10YR 4/3; 90% fine to med. SAND, 10% silt. — Sharp lower contact —		
1-7 SC SM	clayey SAND (~~SC~~ SM): Dark brown 10YR 3/3; 60% fine sand; 40% silt ~~& clay~~ interlayered with clayey SAND (SC): olive gray 5Y 4/2		
7-20' SC	clayey SAND (SC): olive gray ~~to~~ brown 10YR 3/1; 60% sand 40% silt and clay - debris - see notes below.	20242 1108	
20-22	silty CLAY (CL): olive gray 5Y 4/1; stiff - blocky fracture.	20242 1107	

Northeast stake ⇒ southwest

Trench Cross Section

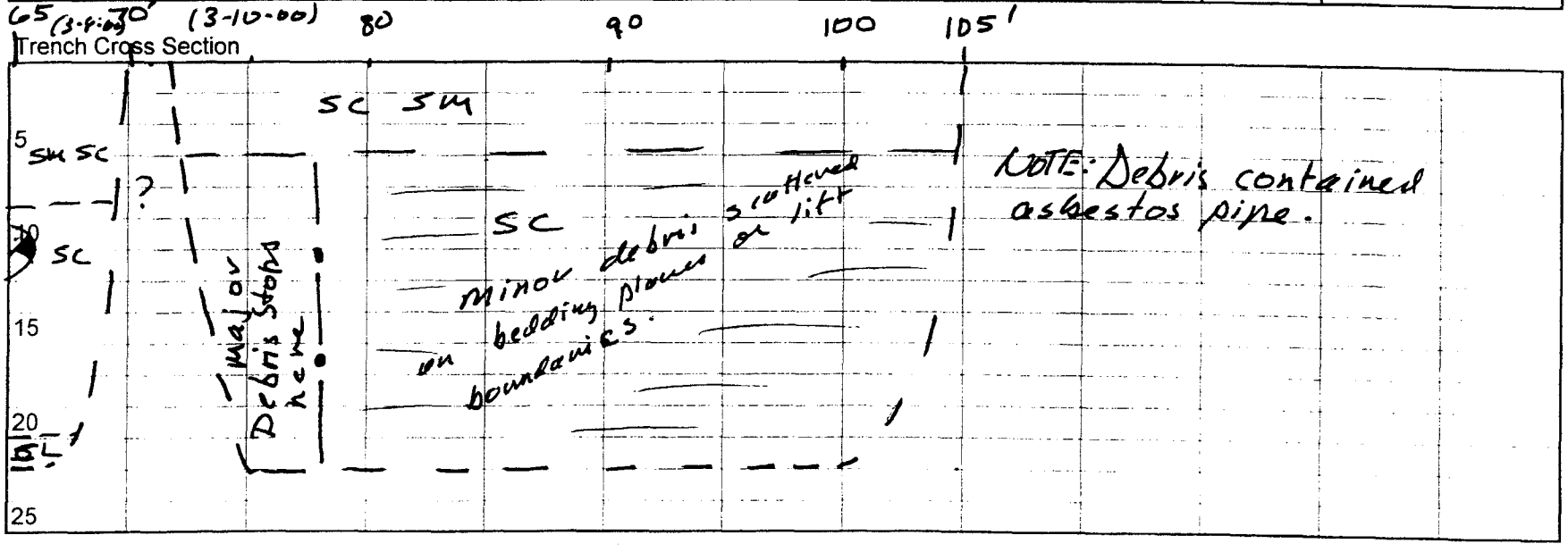


Trench Number 5E (cont.) Date of Excavation 3-8 & 10-00

General Description: This was the south extension of 5E - to locate the southern extent of the debris.

Stratigraphic Description:		Sample:	
SCS	Lithic Description	Number	Analyses
0'-5' SC-SM	extension on 3-10-00 interlayered: Clayey SAND (SC): Dark brown 10YR 3/2; 60% SAND 40% Silt & Clay Silty SAND (SM): brown 10YR 4/2; 80% sand; 20% silt — sharp contact —		
5'-TD SC/CL	Clayey SAND to SANDY CLAY (SC CL): Stiff hand clay 50% silt and fine sand; moist - med to low plasticity. NOTE Major debris in this unit stops 45' south of ~~stake~~ Start Point		

Trench Cross Section



MCAS El Toro, Aerial Photograph Anomaly Area 3
Trench Excavation Log

Project Number 20242
wbs 08001001

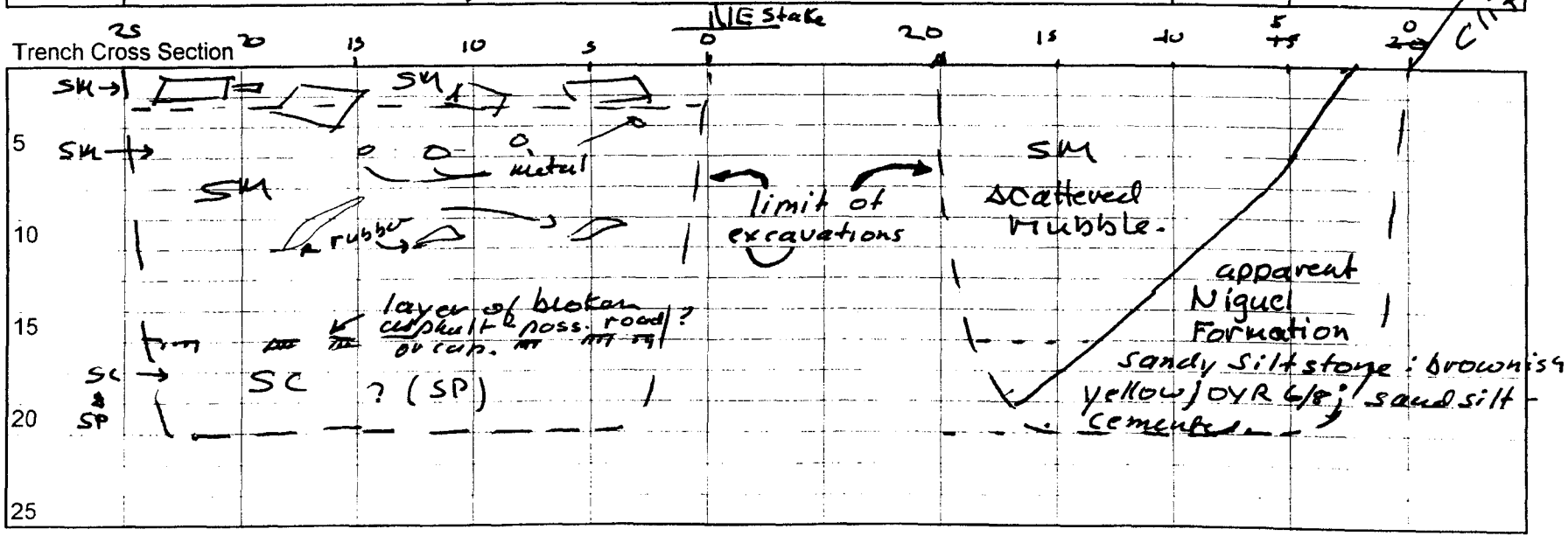
Trench Number 6E

Date of Excavation 3-8-00

General Description: Excavate from NE stake toward ~~so~~ SW. then extended 6E trench from cliff back toward the stake inorder to locate trench or backfill boundaries.

Stratigraphic Description:		Sample:	
SCS	Lithic Description	Number	Analyses
0-2 SM	silty SAND (SM): brown 10YR 4/3 with construction debris including concrete rebar conduits & pieces.		
2-15' SM	silty SAND (SM): brown 10YR 4/3 with rubble construction debris with apparent ~~asphalt~~ pipe. metal debris & rubber?		
15-20 SC	Clayey SAND (SC): very dark brown 10YR 3/2; 80% fine to coarse sand, 20% silt & clay - ROCK Fragments	20242 1104	
20? SP	silty SAND (SM-SP?): brown 10YR5/3; 90% fine sand 10% silt Dry.		

Trench Cross Section

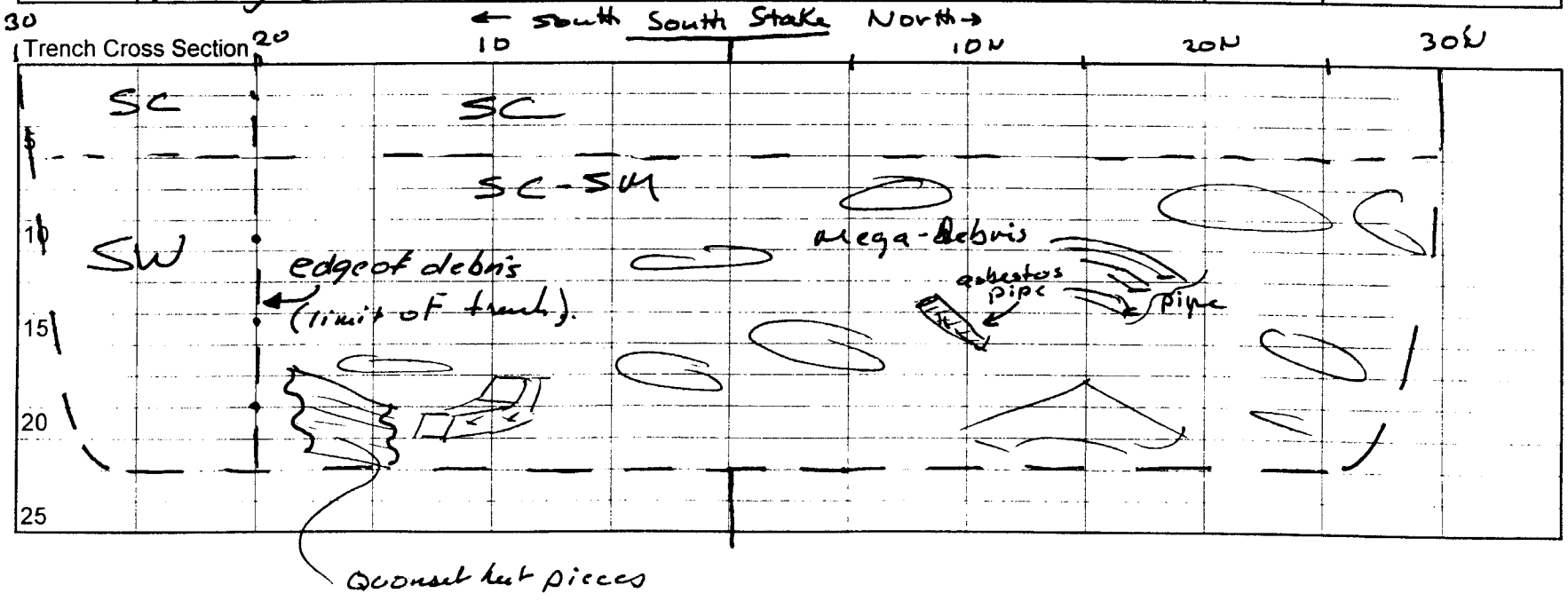


MC(El Toro, Aerial Photograph Anomaly Area 3
Trench Excavation Log

Project Num(020242
wbs 08001001

Trench Number 7E Date of Excavation 3-9-00

General Description: Started at southwest stake & excavated N. stopped because all the material was the same. Started at stake and excavated toward the south & found the trench boundary.

Stratigraphic Description:		Sample:	
SCS	Lithic Description	Number	Analyses
0-4' SC	Clayey SAND (SC): dark grayish brown 10YR 3/2; 50-60% fine sand, 40-50% silt and clay. moist no odor.		
4-22' SC SM	Silty Clayey SAND (SC SM): brown 10YR 5/3; 60% fine sand, 40% silt trace of clay. Contains abundant debris. (brick, concrete, rebar, plastic pipe, metal pipe, asbestos pipe, wire, quonset hut (crushed),	20242 11	Priority Pollutant
4-22 SW	gravelly SAND (SW): brown 10YR 3/2; 90% fine to coarse sand 10% gravel (1/4" to 2" diameter).		

Trench Cross Section