N00236.000197
ALAMEDA POINT
SSIC NO. 5090.3

Harding Lawson Associates

A Report Prepared for

Commanding Officer
Western Division
Naval Facilities Engineering Command
P. O. Box 727
San Bruno, California 94066

CONFIRMATION STUDY
SANITARY LANDFILL
ALAMEDA NAVAL AIR STATION, CALIFORNIA

HLA Job No. 2176,059.01

by

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INTRODUCTION

This report presents the results of our confirmation studies performed in response to the recommendations presented in the final Initial Assessment Study (IAS) report on the Alameda Naval Air Station landfill. The purpose of this confirmation study is to determine if hazardous materials are present in the ground water at the landfill. The scope of our work is based upon our meetings of July 8, 1983, with Mr. Dong and Mr. Shanks of WESDIV, our meeting at the California Regional Water Quality Control Board (CRWQCB) on July 19, 1983, and our proposal dated July 21, 1983. A progress report dated September 20, 1983, was prepared to provide information to the CRWQCB in time for their September 21, 1983, board meeting.

The 19 existing monitoring wells in the landfill were installed by Harding Lawson Associates (HLA) during a site investigation in 1976. On March 16 and 17, 1983, ground water from or near Monitoring Wells 3, 6 9, 12, and 17 through 19 was sampled by HLA for an initial evaluati hazardous materials in response to the Draft IAS report which alleged t 400,000 tons or more of hazardous waste had been disposed of at the landfill. These test results were transmitted to you in our report dated April 13, 1983; the results also are attached at the end of this report.

NEW MONITORING WELL INSTALLATION

Six new monitoring wells (Nos. 20 through 25) were installed in late July 1983. The locations of the new monitoring wells and the old wells that

:ou. ı be located and sampled are shown on Plate 1. The new borings were ..cavated using a hollow-stem auger drill rig. Our hydrogeologist located ɜ monitoring wells at the site, logged the soils and refuse encountered, and obtained representative samples of the materials encountered for visual assification and possible laboratory analysis.

After drilling, 2-inch-diameter well casing was installed through the llow-auger stem. The casing was flush-jointed PVC with 0.02-inch factory ots, fastened together with stainless steel screws. The monitoring wells were screened from a few feet below the ground surface to at least a few :et below the refuse layer. Solid casing extended to the bottom of the boring. A 6-inch-thick bentonite seal was placed in the bottom of each ɔle. The annulus between the casing and the hole was then backfilled with ɜnd to within about 2 to 3 feet of the surface where a 1-foot-thick bento- ıite seal was installed. A cement bentonite grout was used to fill the nnulus above the bentonite to the surface. About 2 feet of casing was left protruding above the ground surface. A PVC cap then was placed on top of he casing. Data for the new and existing monitoring wells are shown in Tables 1 and 2, respectively.

Boring logs showing well construction details are presented on Plates 2 hrough 7. The soils have been classified in accordance with the Unified Soil Classification System which is explained on Plate 8. The boring logs ɔf the existing wells which were monitored are shown on Plate 8.

Table 1

New Monitoring Well Data

	Well Number					
	20	21	22	23	24	25
Top of Casing Elevation (ft)*	114.5	115.5	114.5	125.1	117.8	120.7
Water Level Elevation (ft)**	107.1	107.1	106.7	107.7	106.4	108.3
Total Depth of Hole (ft)	33	33	41.5	38.5	41.5	35
Depth to Bottom of Debris (ft)	23	22.5	21.5	22.5	20.+	19
Depth to Bottom of Casing (ft)	32.5	30.5	41.5	37.5	41.5	35
Screened Interval (ft)	2.5-27.5	3-28	5-38	3-27.5	6.5-26.5	2.5-32.5

Table 2

Existing Monitoring Well Data

	Well Number				
	3	8	9	18	19
op of Casing Elevation (ft)*	112.1	114.7	114.1	111.4	109.7
Water Level Elevations (ft)**	105.4	107.7	108.3	107.0	107.1
Total Depth of Hole (ft)	37	25	25	28	25
Depth to Bottom of Debris (ft)	N/A	15	20	12	12
Depth to Bottom of Casing (ft)	36	24	24	27	24
Screened Interval (ft)	3.36	2.24	3.22	2.26	3.23

* Alameda Naval Air Station Datum = Mean Sea Level + 104.2
** on 15 or 16 August, 1983

SAMPLING AND TESTING

The new and existing monitoring wells were developed using a centrifugal pump to evacuate a minimum of 10 well volumes of ground water. The following day, the six new wells plus existing Wells 3, 8, 9, and 19 were sampled.

ft ,ampling procedure consisted of evacuating a minimum of at least 3 well lumes using the centrifugal pump. Water levels and temperatures were ·ollected prior to sampling each monitoring well.

The water sample was collected using a clean, stainless steel bailer th a Teflon check valve. The water was carefully transferred into laboratory-supplied bottles. To avoid cross-contamination when sampling, e stainless steel bailer was washed with soapy water and rinsed thoroughly with clean water between sampling. Once collected, the samples were placed ·.. ice for delivery to the testing laboratories using chain of custody pro- dures. EAL Laboratories of Richmond, California, conducted the GC/MS analysis and Analytical Science Associates (ASA) of Emeryville, California, nducted the GC analysis. Initially, three of the monitoring wells were tested for the EPA priority pollutants using GC/MS testing procedures. The ,inder of the samples were tested using GC/EC testing procedures and juipment.

Two weeks later, on August 15 and 16, 1983, another set of water samples ıs collected; Monitoring Well 18 had been located and was added to this set. Sampling of the wells was performed as described previously. All ımples were taken to ASA for GC/EC testing. The laboratory test results ·ɔr both sampling periods are presented on the attached laboratory test reports. A report from ASA describing GC recovery rates is also attached.

During each round of sampling, a laboratory prepared blank sample was included along with the collected samples. The results of the tests run on ıe blank samples are included with the other results.

WATER LEVEL MONITORING AND GROUND-WATER GRADIENTS

Water level measurements were made on Monitoring Wells 3, 19, and 24, which are closest to the bay, to record water level fluctuations which might be the result of tidal influence. These level measurements were made using a weighted tape and are presented in Table 3.

Table 3

Water Level Data

	Monitoring Well Number		
Date and Time	3	19	24
15 August 1983			
1200	105.3	107.1	106.3
1318	105.3	106.7	106.4
1413	105.3	106.8	106.0
1500	105.5	106.9	106.2
High tides about 0645 and 1830	Low tide about 1145		
16 August 1983			
0930	105.5	106.9	106.2
1130	105.5	106.9	106.2
1215	105.6	106.9	106.3
1330	105.4	106.9	106.2
1410	105.4	106.9	106.3
1500	105.4	106.9	106.3
High tides about 0830 and 1930	Low tides about 0130 and 1300		

The ground-water gradients based on the latest water level readings were calculated and have been plotted on Plate 1.

MAGNETOMETER SURVEY

The Draft IAS report suggested that there might be large amounts of metal objects (possibly metal drums) buried in the southwest corner of the site. magnetometer survey was performed to determine if this was true. The magnetometer survey was performed on a 50- x 100-foot grid using a hand-held agnetometer. Only two anomalous areas were found. The characteristics of ach indicated that each anomaly probably was caused by a metal object buried at a depth of about 20 feet and weighing at least 1 ton.

CONCLUSIONS

We have reviewed the test data and compared it to the previous test data from the monitoring wells at the landfill plus published state and federal guidelines for hazardous materials in the ground water. We believe that the esults of the samples taken from the monitoring wells confirm our earlier test results and conclusion that:

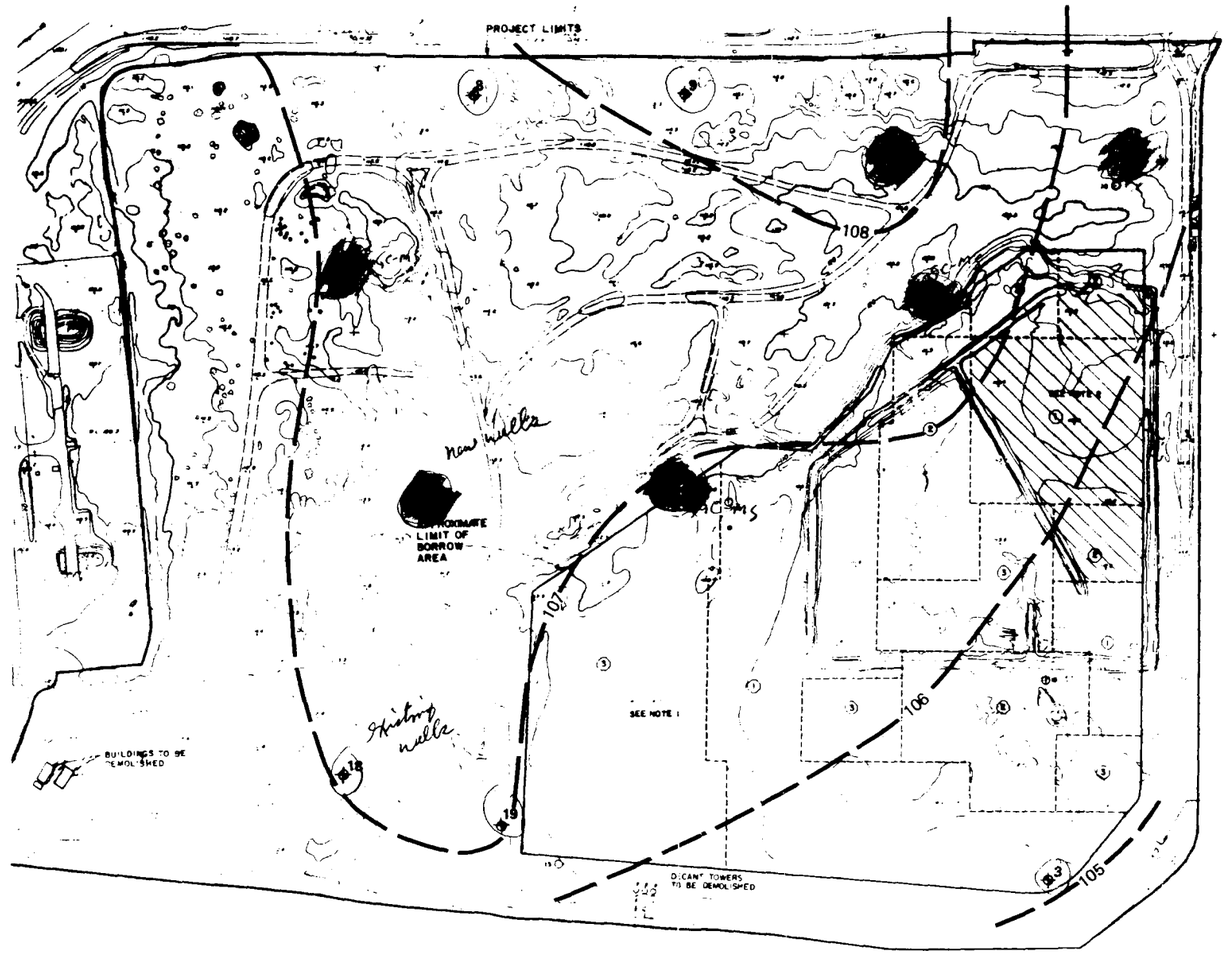
1. The heavy metal concentrations are about the same as they were in 1977 (all less than one part per million) and are not of significant concern.
2. Only a very small amount of volatile base neutral and acid fractions were detected and do not appear to be of significant concern.
3. The total identifiable chlorinated hydrocarbon (TICH) fraction indicated a slight trace of PCB.

Based on this analysis, it does not appear that significant amounts of materials are present in the landfill at hazardous levels and that the landfill should be closed as a Class II-2 landfill.

The plot of the ground-water gradients indicates that 1) the gradient is relatively flat in the vicinity of the north portion of the western perimeter; and 2) the gradients for the remainder of the site perimeter are steeper. This suggests that if seepage is occurring, it is most likely happening along the north portion of the western perimeter.

The ground-water levels near the bay which were monitored during parts of two days indicate little or no fluctuation. No clear-cut conclusions can be drawn from this water level data.

The magnetometer survey indicates that the metallic objects located are not buried drums. Rather, it appears that the metal is massive in size and buried at a depth of about 20 feet. This suggests that the metal probably was in place prior to the area being filled with hydraulic fill.



EXPLANATION

- Monitoring Well Location
- 106 Approximate Ground Water Elevation (NAS Datum)

0 200 400 600 feet

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Engineers, Geologists & Geophysicists

Location Plan
Sanitary Landfill Site
Alameda Naval Air Station
Alameda, California

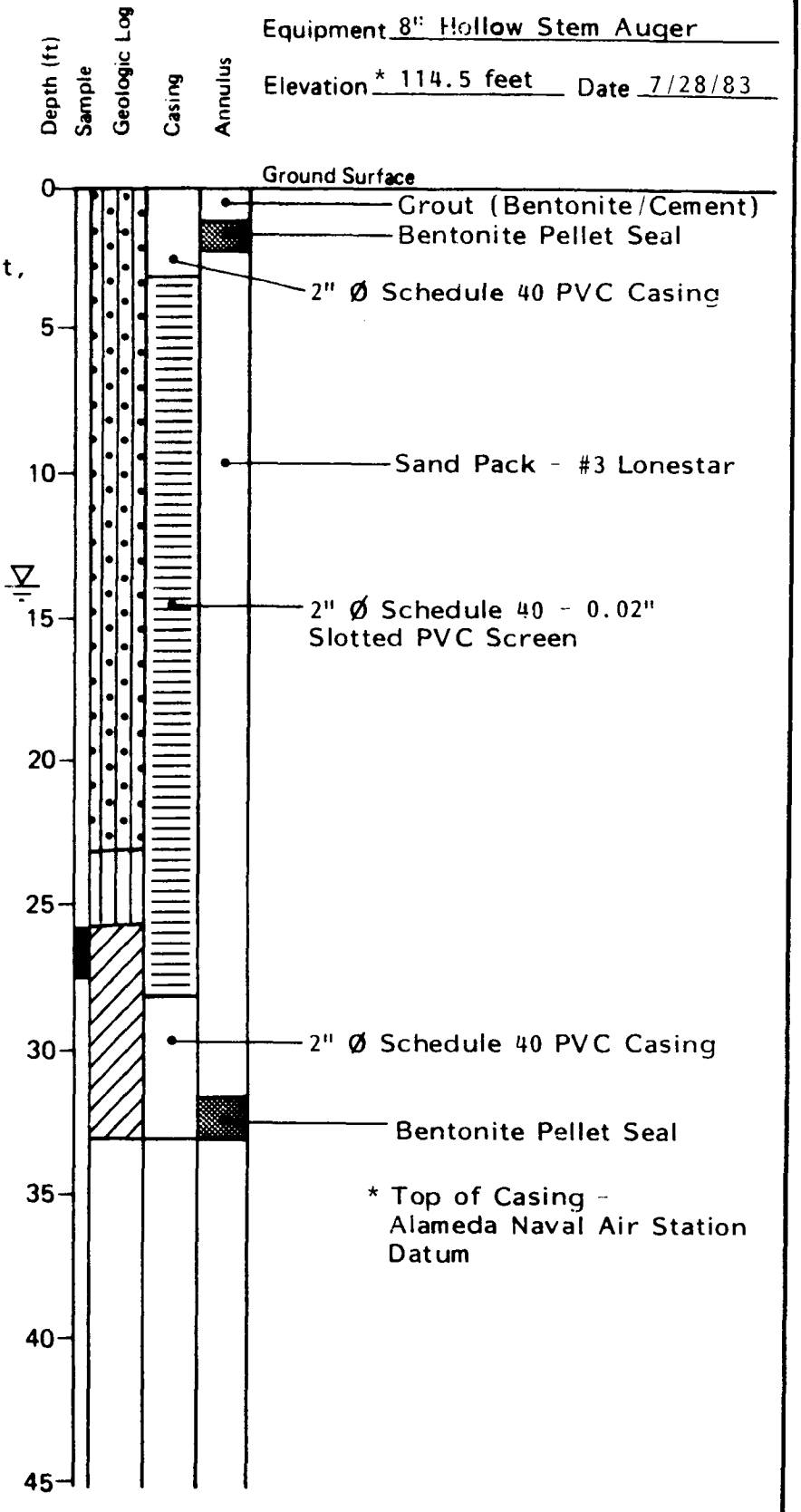
PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
MLQ	2176,059.01		10/83		

2176 059 0001

Equipment 8" Hollow Stem Auger

Elevation * 114.5 feet Date 7/28/83



BROWN SILTY SAND (SM)
loose to medium dense, moist, with debris beginning at 1.5 feet

DARK BROWN SANDY SILT (ML) - medium stiff, saturated

GRAY CLAY (CH)
soft, saturated

* Top of Casing - Alameda Naval Air Station Datum

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Log of Boring 20
Sanitary Landfill Site
Alameda Naval Air Station
Alameda, California

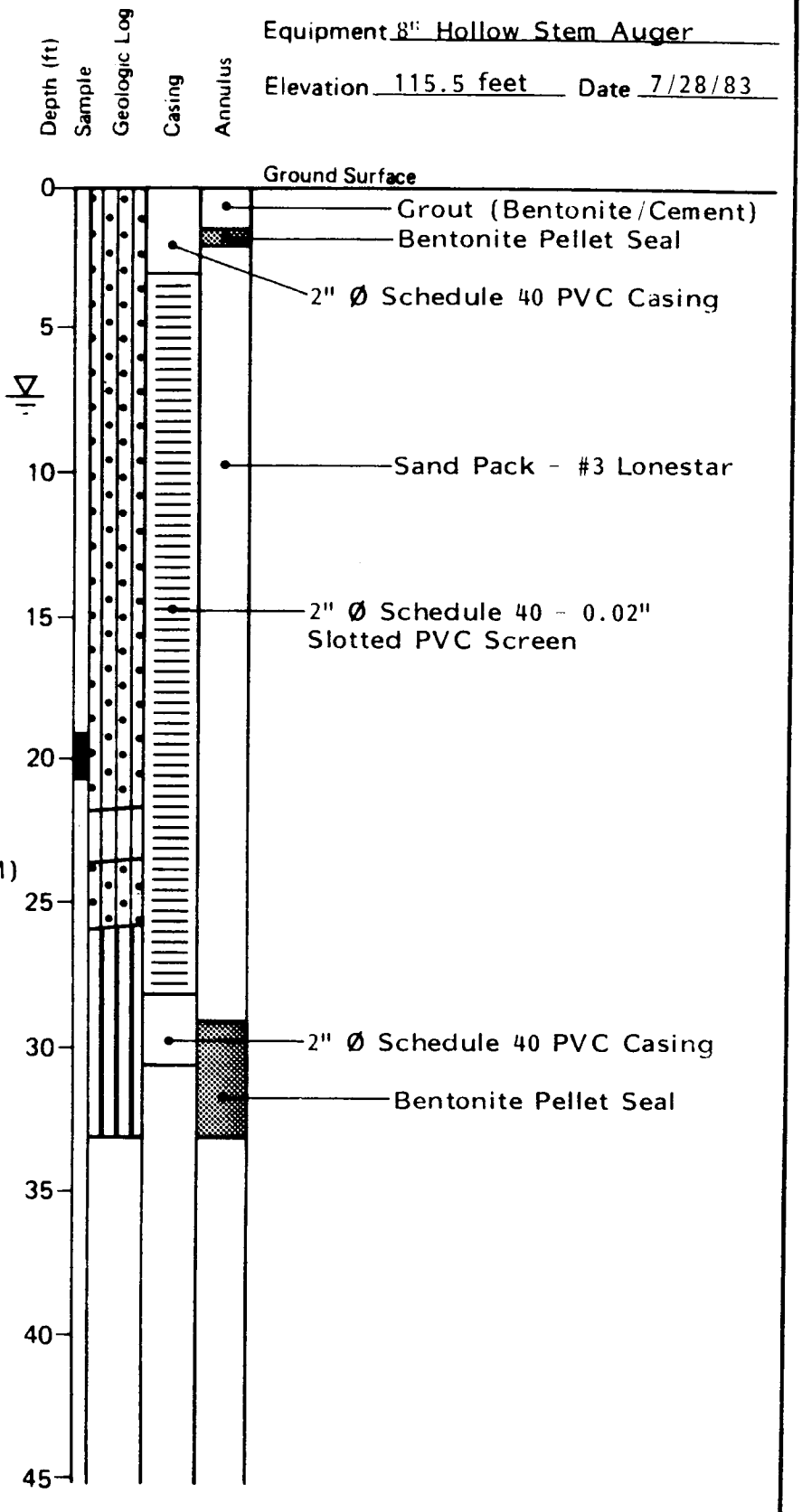
PLATE **2**

DRAWN	NUMBER	APPROVED	DATE	REVISED	DATE
MLQ	2176,059.01		10/83		

2176,059.0002

Equipment 8" Hollow Stem Auger

Elevation 115.5 feet Date 7/28/83



BROWN SILTY SAND (SM)
loose, dry,
moist with debris at 2 feet

DARK GRAY SILT (ML)
medium stiff, saturated

DARK GRAY SILTY SAND (SM)
loose, saturated

DARK GRAY SILT (MH)
medium stiff, saturated

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& Geophysicists

Log of Boring 21
Sanitary Landfill Site
Alameda Naval Air Station
Alameda, California

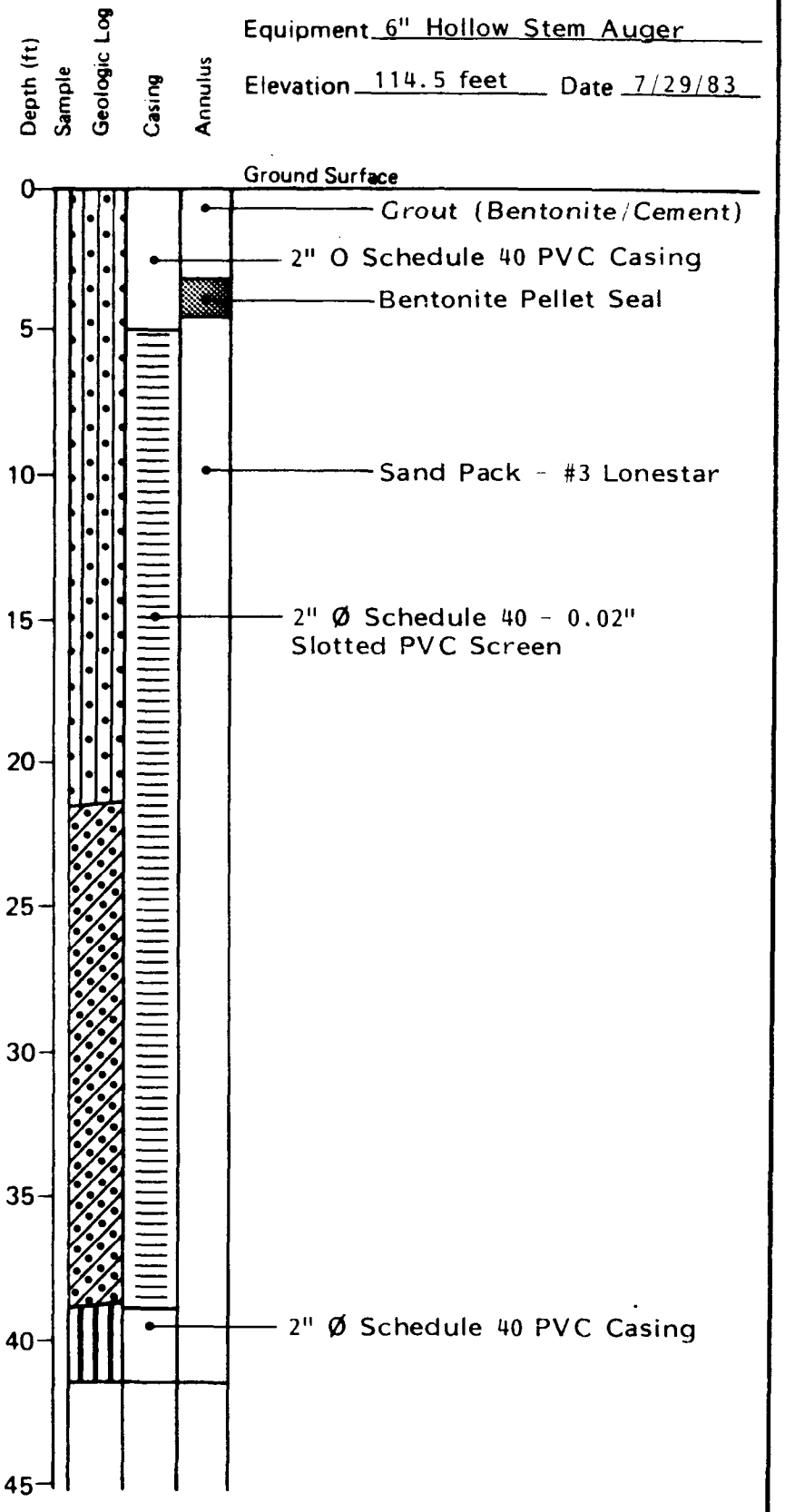
PLATE **3**

DRAWN	NUMBER	APPROVED	DATE	REVISED	DATE
MLQ	2176,059.01		10/83		

2176,059.0003

Equipment 6" Hollow Stem Auger

Elevation 114.5 feet Date 7/29/83



BROWN SILTY SAND (SM) loose, dry, with debris at 1.0 feet

change to gray in color at 6 feet

DARK GRAY CLAYEY SAND (SC) - loose, saturated

DARK GRAY SILT (MH) medium stiff, saturated

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Log of Boring 22
Sanitary Landfill Site
Alameda Naval Air Station
Alameda, California

PLATE **4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
MLQ	2176,059.01		10/83		

2176,059.0004

Equipment 8" Hollow Stem Auger

Elevation 125.1 feet Date 7/30/83

BROWN GRAVELLY SILTY SAND (SM) - medium dense, moist, with debris beginning at 1.0 feet

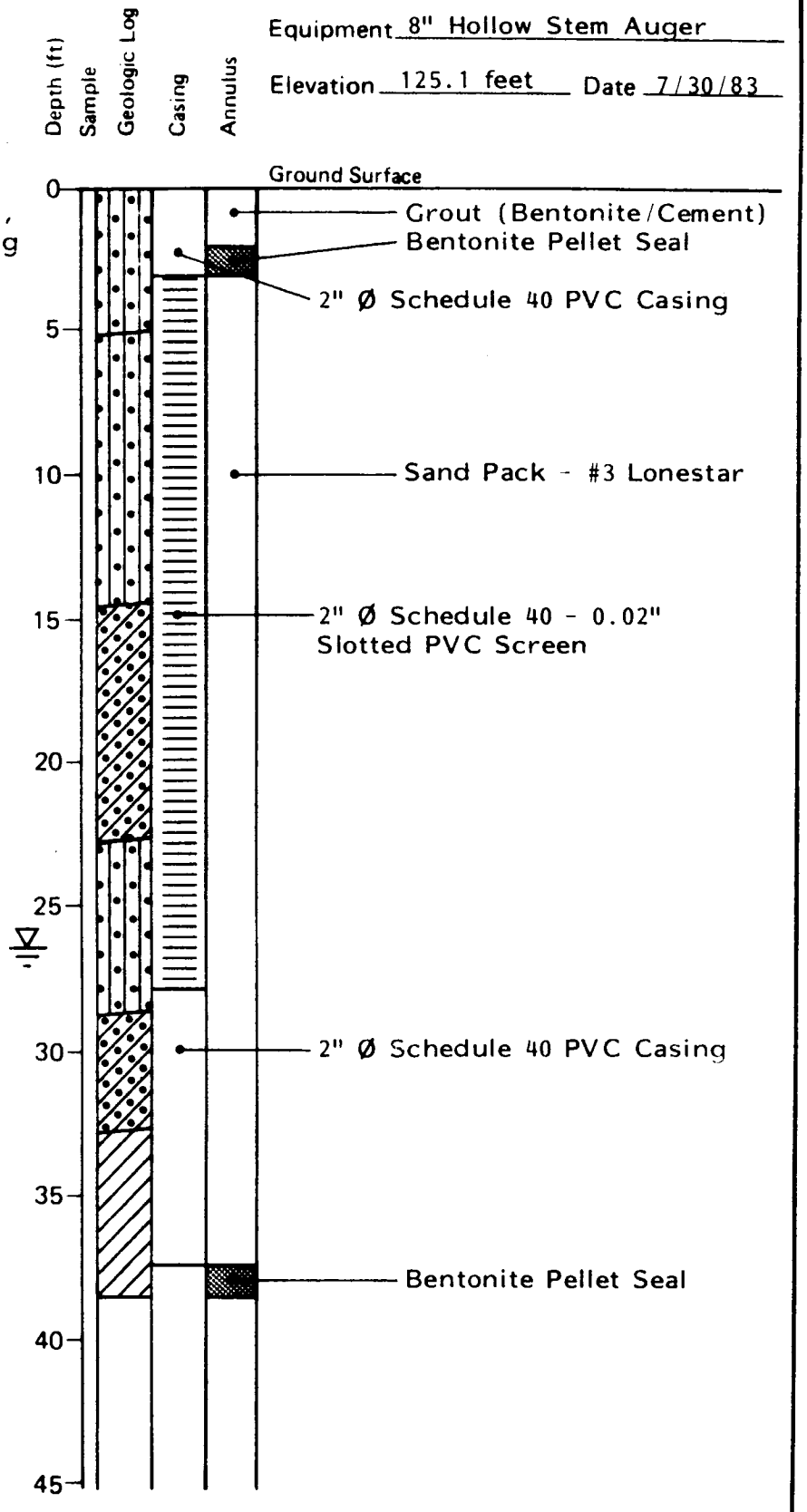
BROWN SILTY SAND (SM) loose, saturated, with debris

BROWN CLAYEY SAND (SC) medium dense, saturated, with small amount of debris

GRAY SILTY SAND (SM) medium dense, saturated

DARK GRAY CLAYEY SAND (SC) - medium dense, saturated

DARK GRAY SANDY CLAY (CH) - medium stiff, saturated



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Engineers Geologists & Geophysicists

Log of Boring 23
Sanitary Landfill Site
Alameda Naval Air Station
Alameda, California

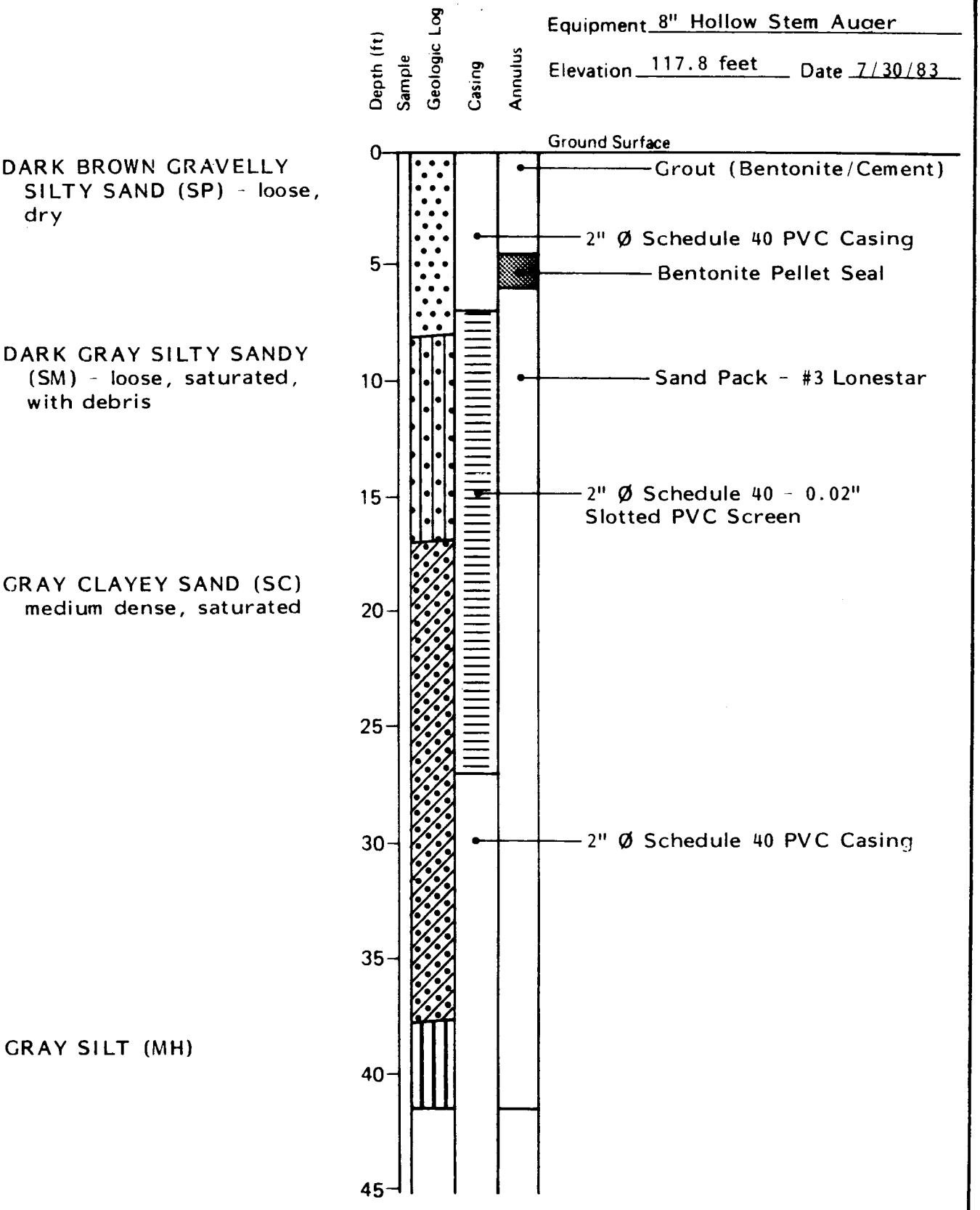
PLATE **5**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
MLQ	2176,059.01		10/83		

2176,059.0005

Equipment 8" Hollow Stem Auger

Elevation 117.8 feet Date 7/30/83



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Log of Boring 24
Sanitary Landfill Site
Alameda Naval Air Station
Alameda, California

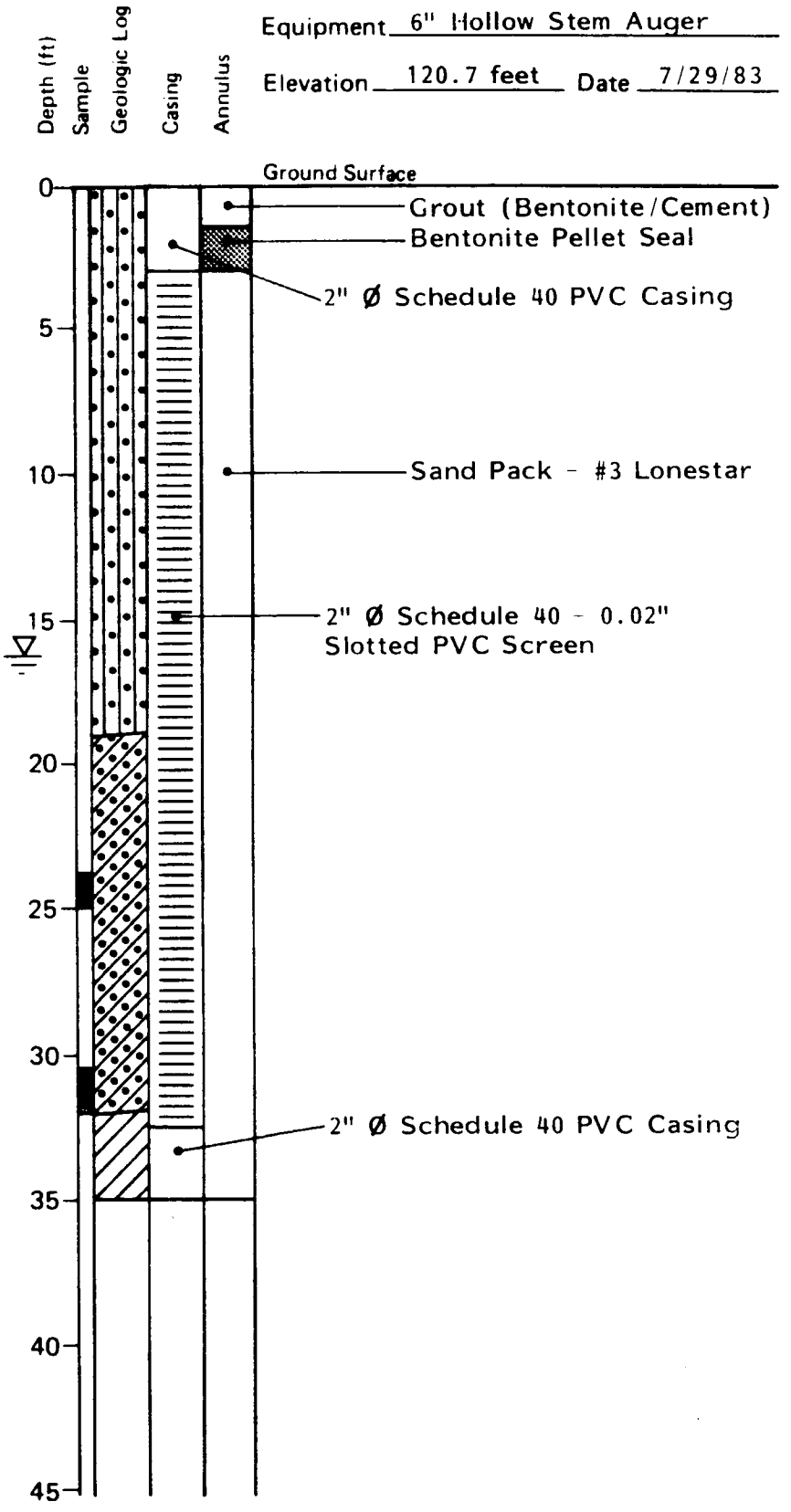
PLATE **6**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
MLQ	2176,059.01		10/83		

2176,059.0006

Equipment 6" Hollow Stem Auger

Elevation 120.7 feet Date 7/29/83



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Log of Boring 25
Sanitary Landfill Site
Alameda Naval Air Station
Alameda, California

PLATE **7**

DRAWN	BY NUMBER	APPROVED	DATE	REVISED	DATE
MLQ	2176,059.01		10/83		

2176,059.0007

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN HALF IS LARGER THAN NO. 200 SIEVE)	GRAVELS (MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND - SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL - SAND - CLAY MIXTURES
	SANDS (MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE)	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND - SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND - CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN HALF IS SMALLER THAN NO. 200 SIEVE)	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 CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (LIQUID LIMIT GREATER THAN 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION SYSTEM

Consol — Consolidation
LL — Liquid Limit (in %)
PL — Plastic Limit (in %)
G_S — Specific Gravity
SA — Sieve Analysis
■ — "Undisturbed" Sample
⊠ — Bulk Sample

Shear Strength, psf		Confining Pressure, psf		
*Tx	320	(2600)	—	Unconsolidated Undrained Triaxial
TxCU	320	(2600)	—	Consolidated Undrained Triaxial
DS	2750	(2000)	—	Consolidated Drained Direct Shear
FVS	470		—	Field Vane Shear
*UC	2000		—	Unconfined Compression
LVS	700		—	Laboratory Vane Shear

KEY TO TEST DATA

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Soil Classification Chart and Key to Test Data
Sanitary Landfill Site
Alameda Naval Air Station
Alameda, California

PLATE **8**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
MLQ	2176,059.01		10/83		

2176,059.0008

LOG OF BORING 3

Equipment 5" Rotary Wash

Elevation 111.4 feet Date 10/25/76

Shear Strength (lbs/sq ft)	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	Description
97% passing No. 200 sieve	64.7	59	0		BROWN-GRAY CLAY (CH) very soft, saturated
			5		LIGHT GRAY CLAYEY SAND (SC) medium dense, saturated water level 4/18/77
			10		LIGHT GRAY-BROWN CLAYEY SAND (SC) - very loose, saturated
			15		
			20		
			25		
	23.6	99			
			30		GRAY SILTY CLAY (CL) very soft, saturated, (bay mud)
			35		hole cased to 36 feet
			40		

Hydraulic Fill

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Job No 2176,030.01 Appr JCD Date 5/20/77

LOG OF BORING 3

Sanitary Landfill Site
Alameda Naval Air Station

PLATE 4

2176,059.0009

LOG OF BORING 8

Equipment 8" Hollow Auger

Elevation 114.0 feet Date 10/29/77

Shear Strength (lbs/sq ft)	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	Description
			0		BROWN SAND (SP) medium dense, moist, with debris
			5		water level 4/7/77
			10		
			15		
	19.2	104			DARK GRAY SILTY SAND (SM) loose, saturated
			20		
					hole cased to 24 feet
			25		
			30		
			35		
			40		

Refuse Fill

Hydraulic Fill

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Job No 2176,030.01 Appr JCD Date 5/20/77

LOG OF BORING 8

Sanitary Landfill Site
Alameda Naval Air Station

PLATE 9

2176,059.0010

LOG OF BORING 9

Equipment 6" Flight Auger

Elevation 113.8 feet Date 10/29/76

Shear Strength (lbs/sq ft)	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	Description
			0		BROWN SILTY SAND (SM) loose to medium dense, moist, with debris
			5		water level 4/7/77
			10		Refuse Fill
			15		
			20		DARK GRAY CLAYEY SILT (MH) soft to medium stiff, saturated, (bay mud) hole cased to 24 feet
			25		
			30		
			35		
			40		

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LOG OF BORING 9

Sanitary Landfill Site
Alameda Naval Air Station

PLATE 10

2176,059.0011

LOG OF BORING 18

Equipment 9" Hollow Auger

Elevation 110 feet Date 3/16/77

Shear Strength (lbs/sq ft)	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	Description
			0		BROWN SANDY CLAY (CL) medium stiff, wet, with debris
					DEBRIS FILL loose
					water level 4/18/77
			5		
			10		
15.0% passing No. 200 sieve	20.9	107			BLACK SILTY SAND (SM) loose, saturated
			15		
			20		
			25		DARK GRAY CLAYEY SILT (MH) soft, saturated, (bay mud)
					hole cased to 27 feet
			30		
			35		
			40		

Refuse Fill

Hydraulic Fill

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Job No 2176,030.01 Appr JCD Date 5/20/77

LOG OF BORING 18

Sanitary Landfill Site
Alameda Naval Air Station

PLATE 17

2176,059.0012

LOG OF BORING 19

Equipment: 9" Hollow Auger

Elevation: 109.8 feet Date: 3/16/77

Shear Strength (lbs/sq ft)	Moisture Content (%)	Dry Density (pcf)	Depth (ft)	Sample	Description
			0		BROWN SANDY CLAY (CL) medium stiff, wet
					DEBRIS FILL loose, saturated
					water level 4/18/77
			5		
			10		BLACK SILTY SAND (SM) loose, saturated, with layers of sandy silt
	44.6	75	15		
			20		hole cased to 24 feet
			25		
			30		
			35		
			40		

Refuse Fill

Hydraulic Fill

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Consulting Engineers and Geologists

Job No 2176,030.01 Appr JCD Date 5/20/77

LOG OF BORING 19

Sanitary Landfill Site
Alameda Naval Air Station

PLATE 18

2176.059.0012

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APR 11 1983

ANALYTICAL SCIENCE ASSOCIATES, Inc.
4560 HORTON ST. • EMERYVILLE, CA 94608 • (415) 547-6390

GC screen

HLA Project No. 2176,059.01
April 1, 1983

ABSTRACT

Samples were received from the Alameda Naval Air Station on March 16 and 17 for the screening of Priority Pollutants. No contaminants were detected in the volatile or Base-Neutral fraction. The acid and pesticide fractions contained traces of phenol and polychlorinated biphenyls. No metals were detected above 1 ppm.

METHODS

I Volatile Fraction

Samples were analyzed by gas-chromatography[1,2] for the volatile priority pollutants using GCFID and GCHSD under the following analytical conditions:

Instrument	:	Perkin Elmer 3B
Column	:	SP 1000/Carbopack B
Program	:	50°-200° @ 8°/minute

II Base Neutral/Acid Fraction

Samples were analyzed by GCFID under the following analytical conditions:

Instrument	:	Perkin Elmer 3920
Column	:	1% SP2150 DB; Tenax 60/80
Program	:	50°-270° @ 8°/minute; 180°-300°

RECEIVED
APR 1 ...
HARDING ... ASSOC.

III Pesticide Fraction

The 6, 15 and 50 percent Florisil fractions were analyzed[3] by GCHSD under the following conditions:

Instrument	:	Perkin Elmer 3B
Column	:	3% OV1
Temperature	:	180°C

IV Metals

Samples were filtered (0.45 um) and analyzed by Atomic Absorption spectroscopy.

RESULTS

Data are presented in Table I. Only the actual organic components found have been reported.

---

1. 40 CFR, part 141 app. C
2. Sampling and Analysis Procedures for the Screening of Industrial Effluents. EPA 1979
3. Methods for the Organic Analysis of Water and Wastes. EPA 1980.

F 3
21/6,059.01

TABLE I

LANDFILL WELL NO.	17	18	3	19	9	8	near 6	near 12
Sample ID	9001	9002	9003	9004	9005	9006	9007	9008
Cadmium	0.053	0.03	0.024	0.024	0.018	0.011	0.012	0.009
Copper	0.72	0.06	0.06	0.04	0.04	0.03	0.06	0.08
Lead	0.17	0.09	0.07	0.05	0.06	0.06	0.07	0.06
Selenium	0.08	0.04	0.03	0.04	0.04	0.04	0.03	0.04
Silver	k0.05	k0.05	k0.05	k0.05	k0.05	k0.05	k0.05	k0.05
Zinc	0.48	0.13	0.038	0.032	0.16	0.013	0.044	0.076
Oil & Grease	30	20	15	50	80	40	20	15
Phenol (ppb)	26	11	k10	k10	11	10	11	10
TICH (ppb, as arochlor 1248)	0.52	0.08	0.05	0.60	0.40	k0.05	0.20	0.10
Arsenic	0.09	0.06	0.05	0.06	0.04	0.04	0.05	0.05
Beryllium	0.012	k0.01	k0.01	k0.01	k0.01	k0.01	k0.01	k0.01
pH	7.4	7.0	7.3	7.1	7.2	7.2	7.5	7.7
Conductivity	6400	19,000	13,000	16,000	2700	3500	1500	1300
Nickel	0.11	0.11	0.10	0.13	0.12	0.07	0.06	0.07

All values in ppm unless otherwise noted.

ADDENDUM

LANDFILL WELL NO.	17	18	3	19	9	8	near 6	near 12
Sample ID	9001	9002	9003	9004	9005	9006	9007	9008
Chromium	k0.05	k0.05	k0.05	k0.05	k0.05	k0.05	k0.05	k0.05
Mercury	0.0008	k0.0001	k0.0001	k0.0001	0.0002	k0.0001	k0.0001	k0.0001
Magnesium	120	420	420	420	57	68	33	35

All values in ppm unless otherwise noted.

k = less than value

EAL Corporation

2030 Wright Avenue
Richmond, California 94804
(415) 235-2633
(TWX) 910-382-8132

GC-MS

Thermo Electron CORPORATION

ANALYSIS REPORT

HARDING LAWSON ASSOCIATES
P O BOX 578
NOVATO CA 94947
Attention: Lyle Lewis

DATE: 9-7-83
Samples Received: 8-8-83
EAL W.O. No. 45-5300
Harding Lawson Job #: 2176.059.01
Samples Collected: 8-2-83 1st sampling

Well No.		23	21
		ANLW-16	ANLW-31
Analysis	Units	255-84-7	255-84-8
Antimony	MG/L	0.70	<0.01
Arsenic	MG/L	0.044	0.006
Beryllium	MG/L	<0.01	<0.01
Cadmium	MG/L	0.057	0.005
Chromium	MG/L	0.057	<0.01
Copper	MG/L	0.09	0.020
Lead	MG/L	0.33	0.04
Mercury	MG/L	<0.0005	<0.0005
Nickel	MG/L	0.40	0.08
Selenium	MG/L	0.06	<0.006
Silver	MG/L	0.053	<0.01
Thallium	MG/L	0.2	<0.01
Zinc	MG/L	0.087	0.043

EAL Corporation

Thermo Electron CORPORATION

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Richmond, California 94804
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(TWX) 910-382-8132

Report to HARDING LAWSON ASSOCIATES

Well No.		22	23	21	22
Analysis	Units	ANLW-35 255-84-9	ANLW-16 255-84-10	ANLW-31 255-84-11	ANLW-35 255-84-12
Antimony	MG/L	0.62	---	---	---
Arsenic	MG/L	0.056	---	---	---
Beryllium	MG/L	<0.01	---	---	---
Cadmium	MG/L	0.055	---	---	---
Chromium	MG/L	0.057	---	---	---
Copper	MG/L	0.06	---	---	---
Lead	MG/L	0.28	---	---	---
Mercury	MG/L	<0.001	---	---	---
Nickel	MG/L	0.41	---	---	---
Selenium	MG/L	0.04	---	---	---
Silver	MG/L	0.052	---	---	---
Thallium	MG/L	0.2	---	---	---
Zinc	MG/L	0.036	---	---	---
Cyanide	MG/L	---	<0.02	<0.02	<0.02

EAL Corporation

Thermo Electron CORPORATION

2030 Wright Avenue
Richmond, California 94804
(415) 235-2633
(TWX) 910-382-8132

Report to HARDING LAWSON ASSOCIATES

Well No.		23	21	22
		ANLW-16	ANLW-31	ANLW-35
Analysis	Units	255-84-13	255-84-14	255-84-15
Phenol, Total	MG/L	<0.1	<0.1	<0.1

Results for pesticides, volatile organics, and acid & base/neutrals attached.

Laurence E. Penfold
Program Manager
Environmental Science Dept.

Harding Lawson

Date: September 7, 1983
EAL Lab No.: 255-84-1
Client I.D.: ANLW-15 8-2-83
Well No. 23

PRIORITY POLLUTANT DATA SHEET

ACID COMPOUNDS	ug/L(ppb)
2,4,6-trichlorophenol	< 10
p-chloro-m-cresol	< 10
2-chlorophenol	< 10
2,4-dichlorophenol	< 10
2,4-dimethylphenol	38
2-nitrophenol	< 10
4-nitrophenol	< 10
2,4-dinitrophenol	< 10
4,6-dinitro-2-methylphenol	< 10
pentachlorophenol	< 10
phenol	< 10

BASE/NEUTRAL COMPOUNDS	ug/L(ppb)
acenaphthene	< 2
benzidine	<10
1,2,4-trichlorobenzene	< 2
hexachlorobenzene	< 2
hexachloroethane	< 2
bis(2-chloroethyl)ether	< 2
2-chloronaphthalene	< 2
1,2-dichlorobenzene	< 2
1,3-dichlorobenzene	< 2
1,4-dichlorobenzene	< 2
3,3'-dichlorobenzidine	<10
2,4-dinitrotoluene	< 2
2,6-dinitrotoluene	< 2
2,2-diphenylhydrazine	< 2
(as azobenzene)	< 2
fluoroanthene	< 2
4-chlorophenyl phenyl ether	< 2

BASE/NEUTRAL COMPOUNDS	ug/L(ppb)
4-bromophenyl phenyl ether	< 2
bis(2-chloroisopropyl) ether	< 2
bis(2-chlorethoxy)methane	< 2
hexachlorobutadiene	< 2
hexachlorocyclopentadiene	< 2
isophorone	< 2
napthalene	80
nitrobenzene	< 2
N-nitrosodimethylamine	< 2
N-nitrosodiphenylamine	< 2
N-nitrosodi-n-propylamine	< 2
bis(2-ethylhexyl)phthalate	6
butyl benzyl phthalate	< 2
di-n-butyl phthalate	< 2
di-n-octyl phthalate	< 2
diethyl phthalate	< 2
dimethyl phthalate	< 2
benzo(a)anthracene	< 2
benzo(a)pyrene	< 2
benzo(b)fluoranthene	< 2
benzo(k)fluoranthene	< 2
chrysene	< 2
acenaphthylene	< 2
anthracene	< 2
benzo(ghi)perylene	< 2
fluorene	< 2
phenanthrene	< 2
dibenzo(a,h)anthracene	< 2
indeno(1,2,3-cd)pyrene	< 2
pyrene	< 2

Harding Lawson

Date: September 7, 1983

EAL Lab No.: 255-84-2

Client I.D.: ANLW-30 8-2-83
Well No. 21

PRIORITY POLLUTANT DATA SHEET

ACID COMPOUNDS	ug/L(ppb)	BASE/NEUTRAL COMPOUNDS	ug/L(ppb)
2,4,6-trichlorophenol	< 10	4-bromophenyl phenyl ether	< 2
p-chloro-m-cresol	< 10	bis(2-chloroisopropyl) ether	< 2
2-chlorophenol	< 10	bis(2-chlorethoxy)methane	< 2
2,4-dichlorophenol	< 10	hexachlorobutadiene	< 2
2,4-dimethylphenol	< 10	hexachlorocyclopentadiene	< 2
2-nitrophenol	< 10	isophorone	< 2
4-nitrophenol	< 10	napthalene	104
2,4-dinitrophenol	< 10	nitrobenzene	< 2
4,6-dinitro-2-methylphenol	< 10	N-nitrosodimethylamine	< 2
pentachlorophenol	< 10	N-nitrosodiphenylamine	< 2
phenol	< 10	N-nitrosodi-n-propylamine	< 2
BASE/NEUTRAL COMPOUNDS	**ug/L(ppb)**	bis(2-ethylhexyl)phthalate	10
acenaphthene	< 2	butyl benzyl phthalate	< 2
benzidine	<10	di-n-butyl phthalate	< 2
1,2,4-trichlorobenzene	< 2	di-n-octyl phthalate	< 2
hexachlorobenzene	< 2	diethyl phthalate	< 2
hexachloroethane	< 2	dimethyl phthalate	< 2
bis(2-chloroethyl)ether	< 2	benzo(a)anthracene	< 2
2-chloronaphthalene	< 2	benzo(a)pyrene	< 2
1,2-dichlorobenzene	< 2	benzo(b)fluoranthene	< 2
1,3-dichlorobenzene	< 2	benzo(k)fluoranthene	< 2
1,4-dichlorobenzene	< 2	chrysene	< 2
3,3'-dichlorobenzidine	<10	acenaphthylene	< 2
2,4-dinitrotoluene	< 2	anthracene	< 2
2,6-dinitrotoluene	< 2	benzo(ghi)perylene	< 2
2,2-diphenylhydrazine	< 2	fluorene	< 2
(as azobenzene)	< 2	phenanthrene	< 2
fluoroanthene	< 2	dibenzo(a,h)anthracene	< 2
4-chlorophenyl phenyl ether	< 2	indeno(1,2,3-cd)pyrene	< 2
2-methylnaphthalene	16	pyrene	< 2

Harding Lawson

Date: September 7, 1983
EAL Lab No.: 255-84-3
Client I.D.: ANLW-34 8-2-83
Well No. 22

PRIORITY POLLUTANT DATA SHEET

ACID COMPOUNDS	ug/L(ppb)	BASE/NEUTRAL COMPOUNDS	ug/L(ppb)
2,4,6-trichlorophenol	< 10	4-bromophenyl phenyl ether	< 2
p-chloro-m-cresol	< 10	bis(2-chloroisopropyl) ether	< 2
2-chlorophenol	< 10	bis(2-chlorethoxy)methane	< 2
2,4-dichlorophenol	< 10	hexachlorobutadiene	< 2
2,4-dimethylphenol	< 10	hexachlorocyclopentadiene	< 2
2-nitrophenol	< 10	isophorone	< 2
4-nitrophenol	< 10	napthalene	< 2
2,4-dinitrophenol	< 10	nitrobenzene	< 2
4,6-dinitro-2-methylphenol	< 10	N-nitrosodimethylamine	< 2
pentachlorophenol	< 10	N-nitrosodiphenylamine	< 2
phenol	< 10	N-nitrosodi-n-propylamine	< 2
BASE/NEUTRAL COMPOUNDS	**ug/L(ppb)**	bis(2-ethylhexyl)phthalate	< 2
acenaphthene	< 2	butyl benzyl phthalate	< 2
benzidine	< 10	di-n-butyl phthalate	< 2
1,2,4-trichlorobenzene	< 2	di-n-octyl phthalate	< 2
hexachlorobenzene	< 2	diethyl phthalate	< 2
hexachloroethane	< 2	dimethyl phthalate	< 2
bis(2-chloroethyl)ether	< 2	benzo(a)anthracene	< 2
2-chloronaphthalene	< 2	benzo(a)pyrene	< 2
1,2-dichlorobenzene	< 2	benzo(b)fluoranthene	< 2
1,3-dichlorobenzene	< 2	benzo(k)fluoranthene	< 2
1,4-dichlorobenzene	< 2	chrysene	< 2
3,3'-dichlorobenzidine	< 10	acenaphthylene	< 2
2,4-dinitrotoluene	< 2	anthracene	< 2
2,6-dinitrotoluene	< 2	benzo(ghi)perylene	< 2
2,2-diphenylhydrazine	< 2	fluorene	< 2
(as azobenzene)	< 2	phenanthrene	< 2
fluoroanthene	< 2	dibenzo(a,h)anthracene	< 2
4-chlorophenyl phenyl ether	< 2	indeno(1,2,3-cd)pyrene	< 2
		pyrene	< 2

Harding Lawson

Date: September 7, 1983
EAL Lab No.: 255-84-4
Client I.D.: ANLW 13 & 14 8-2-83
Well No. 23

PRIORITY POLLUTANT DATA SHEET

VOLATILES	ng/mL(ppb)	VOLATILES	ng/mL(ppb)
acrolein	<25	trans-1,3-dichloropropene	< 5
acrylonitrile	<25	cis-1,3-dichloropropene	< 5
benzene	< 5	ethylbenzene	< 5
carbon tetrachloride	< 5	methylene chloride	<50
chlorobenzene	< 5	chloromethane	< 5
1,2-dichloroethane	< 5	bromomethane	< 5
1,1,1-trichloroethane	< 5	bromoform	< 5
1,1-dichloroethane	< 5	bromodichloromethane	< 5
1,1,2-trichloroethane	< 5	fluorotrichloromethane	< 5
1,1,2,2-tetrachloroethane	< 5	dichlorodifluoromethane	< 5
chloroethane	< 5	chlorodibromomethane	< 5
2-chloroethylvinyl ether	< 5	tetrachloroethene	< 5
chloroform	< 5	toluene	235
1,1-dichloroethene	< 5	trichloroethene	< 5
trans-1,2-dichloroethene	< 5	vinyl chloride	< 5
1,2-dichloropropane	< 5		

NON-PRIORITY POLLUTANTS

tetrahydrofuran	25	diethylether	25
diethylacetate	25	1-ethyl-4-methylbenzene	22
ozulene	22		

Harding Lawson

Date: September 7, 1983
EAL Lab No.: 255-84-5
Client I.D.: ANLW 28 & 29
Well No. 21

PRIORITY POLLUTANT DATA SHEET

VOLATILES	ng/mL(ppb)	VOLATILES	ng/mL(ppb)
acrolein	< 5	trans-1,3-dichloropropene	< 1
acrylonitrile	< 5	cis-1,3-dichloropropene	< 1
benzene	6	ethylbenzene	5
carbon tetrachloride	< 1	methylene chloride	<10
chlorobenzene	31	chloromethane	< 1
1,2-dichloroethane	< 1	bromomethane	< 1
1,1,1-trichloroethane	< 1	bromoform	< 1
1,1-dichloroethane	< 1	bromodichloromethane	< 1
1,1,2-trichloroethane	< 1	fluorotrichloromethane	< 1
1,1,2,2-tetrachloroethane	< 1	dichlorodifluoromethane	< 1
chloroethane	< 1	chlorodibromomethane	< 1
2-chloroethylvinyl ether	< 1	tetrachloroethene	< 1
chloroform	< 1	toluene	7
1,1-dichloroethene	< 1	trichloroethene	< 1
trans-1,2-dichloroethene	< 1	vinyl chloride	< 1
1,2-dichloropropane	< 1	acetone	620
		o-xylene	11

Harding Lawson

Date: September 7, 1983

EAL Lab No.: 255-84-6

Client I.D.: ANLW 32 & 33 8-2-83
Well No. 22

PRIORITY POLLUTANT DATA SHEET

VOLATILES	ng/mL(ppb)	VOLATILES	ng/mL(ppb)
acrolein	< 5	trans-1,3-dichloropropene	< 1
acrylonitrile	< 5	cis-1,3-dichloropropene	< 1
benzene	< 1	ethylbenzene	< 1
carbon tetrachloride	< 1	methylene chloride	<10
chlorobenzene	< 1	chloromethane	< 1
1,2-dichloroethane	< 1	bromomethane	< 1
1,1,1-trichloroethane	< 1	bromoform	< 1
1,1-dichloroethane	< 1	bromodichloromethane	< 1
1,1,2-trichloroethane	< 1	fluorotrichloromethane	< 1
1,1,2,2-tetrachloroethane	< 1	dichlorodifluoromethane	< 1
chloroethane	< 1	chlorodibromomethane	< 1
2-chloroethylvinyl ether	< 1	tetrachloroethene	< 1
chloroform	< 1	toluene	< 1
1,1-dichloroethene	< 1	trichloroethene	< 1
trans-1,2-dichloroethene	< 1	vinyl chloride	< 1
1,2-dichloropropane	< 1		

Harding Lawson

Date: September 7, 1983
EAL Lab No.: 255-84-1
Client I.D.: ANLW-15
Well No. 23

PRIORITY POLLUTANT DATA SHEET

PESTICIDES	ug/L (ppb)	PESTICIDES	ug/L (ppb)
a-BHC	<0.1	pp-DDT (4,4')	0.7
g-BHC (lindane)	<0.1	Endrin Aldehyde	0.1
B-BHC	<0.1	Endosulfan Sulfate	0.5
Heptachlor	<0.1	Chlordane	<0.1
D-BHC	0.2	Toxaphene	<3
Aldrin	<0.1	PCB's	
Heptachlor Epoxide	<0.1	PCB-1016	<0.2
a-Endosulfan	<0.1	PCB-1221	<0.2
p,p-DDE (4,4')	<0.1	PCB-1232	<0.2
Dieldrin	<0.1	PCB-1242	<0.2
Endrin	<0.1	PCB-1254	<0.2
p,p-DDD (4,4')	<0.1	PCB-1260	<0.2
B-Endosulfan	<0.1	PCB-1262	<0.2
1,2,3,4-TCDD	<0.1		

Harding Lawson

Date: September 7, 1983

EAL Lab No.: 255-84-2

Client I.D.: ANLW-31
Well No. 21

PRIORITY POLLUTANT DATA SHEET

PESTICIDES	ug/L (ppb)	PESTICIDES	ug/L (ppb)
a-BHC	0.2	pp-DDT (4,4')	<0.1
g-BHC (lindane)	<0.1	Endrin Aldehyde	<0.1
B-BHC	<0.1	Endosulfan Sulfate	0.1
Heptachlor	0.4	Chlordane	<0.1
D-BHC	<0.1	Toxaphene	<3
Aldrin	<0.1	PCB's	
Heptachlor Epoxide	<0.1	PCB-1016	<0.2
a-Endosulfan	<0.1	PCB-1221	<0.2
p,p-DDE (4,4')	<0.1	PCB-1232	<0.2
Dieldrin	<0.1	PCB-1242	<0.2
Endrin	<0.1	PCB-1254	<0.2
p,p-DDD (4,4')	<0.1	PCB-1260	<0.2
B-Endosulfan	<0.1	PCB-1262	<0.2
1,2,3,4-TCDD	<0.1		

Harding Lawson

Date: September 7, 1983

EAL Lab No.: 255-84-3

Client I.D.: ANLW-34
Well No. 22

PRIORITY POLLUTANT DATA SHEET

PESTICIDES	ug/L (ppb)	PESTICIDES	ug/L (ppb)
a-BHC	<0.1	pp-DDT (4,4')	<0.1
g-BHC (lindane)	0.3	Endrin Aldehyde	<0.1
B-BHC	<0.1	Endosulfan Sulfate	<0.1
Heptachlor	0.2	Chlordane	<0.1
D-BHC	<0.1	Toxaphene	<0.6
Aldrin	0.1	PCB's	
Heptachlor Epoxide	<0.1	PCB-1016	<0.1
a-Endosulfan	<0.1	PCB-1221	<0.1
p,p-DDE (4,4')	<0.1	PCB-1232	<0.1
Dieldrin	<0.1	PCB-1242	<0.1
Endrin	<0.1	PCB-1254	<0.1
p,p-DDD (4,4')	<0.1	PCB-1260	<0.1
B-Endosulfan	<0.1	PCB-1262	<0.1
1,2,3,4-TCDD	<0.1		

ANALYTICAL SCIENCE ASSOCIATES, Inc.
4560 HORTON ST. • EMERYVILLE, CA 94608 • (415) 547-6390

GC analysis

7 September 1983

Lyle Lewis
HARDING LAWSON ASSOCIATES
P. O. Box 578
Novato, CA 94948

Dear Lyle:

Enclosed is the Alameda Naval Air Station Analytical Report. If you have any questions please call.

Sincerely,

Bill

William Prater

WP:la

Enclosure

Carole Site

ABSTRACT

Samples from Alameda Naval Air Station were screened for Priority Pollutants and pesticides using EPA 608/624/625 GCFID/EC methodology. The only parameters found were low-level (<10 ppb) PCB ontamination in two wells.

METHODS

(A) Volatile Fraction

Samples were analyzed for volatile components by GCEC/FID[1] using the following analytical conditions:

Instrument	:	Perkin-Elmer Sigma 3
Detector	:	EC/FID
Column	:	SP1000/Graphitized Carbon Black
Temperature	:	50° - 210° C.

(B) Base-Neutral/Acid Fraction

Samples were analyzed[2] under the following analytical conditions:

Instrument	:	Perkin-Elmer Sigma 3B
Detector	:	FID
Column	:	SP2100 DB; SP1240 DA
Temperature	:	50° - 270°; 50° - 200°
Internal Standard	:	D_{10}Anthracene; 2 Nitrophenol

(C) Pesticides/PCB's

Samples were analyzed[2] under the following analytical conditions:

Instrument	:	Perkin-Elmer 3B
Detector	:	EC
Column	:	3% OV1
Temperature	:	180°C
Internal Standard	:	Aldrin

1. 40 CFR Part III, App. C.
2. 40 CFR Vol 44, #233.

method

GC FID

TABLE I

All values in ppb

SAMPLE ID	Well No.	VOLATILE	ACID, B-N	PESTICIDES/PCB's(3)
W01	19	<1	<20	-
W04	3	<1	<20	-
W07	24	<1	<20	-
W10	Blank	<1	<20	-
W17	25	<1	<20	-
W20	9	<1	<20	-
W23	20	<1	<20	-
W36	8	<1	<20	-
W201	19	<1	<20	ND
W203	20	<1	<20	8
W205	9	<1	<20	ND
W207	Blank	<1	<20	ND
W209	3	<1	<20	ND
W211	24	<1	<20	ND
W213	23	<1	<20	ND
W215	8	<1	<20	ND
W217	18	<1	<20	ND
W219	25	<1	<20	ND
W221	21	<1	<20	4
W223	22	<1	<20	ND

(3) Detection Limit 1 ppb.

GC FID and GS-MS give similar results (i.e. pring pollutant screen)

GC FID gives a better result quantitatively

GC-MS gives a better result in quality but inferior result in quantity

∴ normally do GC FID first; if many pollutants are detectable, do GC-MS to confirm.

TABLE II

PERCENT RECOVERY
OF INTERNAL STANDARDS

SAMPLE ID.	VOLATILE(1)	ACID(2)	B-N(3)	PESTICIDES(4) & PCBs
W01 19	95	79	98	
W04 3	97	85	100	
W07	93	85	100	
W10 -B	95	90	96	
W17	95	88	95	
W20	96	89	100	
W23	98	79	95	
W36	99	75	92	
W201	93	80	100	85
W203	95	82	100	85
W205	99	80	100	90
W207-B	95	85	95	100
W209	96	80	96	85
W211	94	90	97	88
W213	95	85	95	89
W215	95	85	100	90
W217	100	90	95	89
W219	100	88	95	90
W221	95	90	96	88
W223	96	85	99	90

1. Bromodichloromethane
2. 2 Nitrophenol
3. D_{10}Anthracene
4. Aldrin

DISTRIBUTION

CONFIRMATION STUDY
SANITARY LANDFILL
ALAMEDA NAVAL AIR STATION
CALIFORNIA
October 14, 1983

COPY NO. 4

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JCD/LEL/bt

QUALITY CONTROL REVIEWER

James H. Tinto

James H. Tinto,
Civil Engineer - 32588