

EXCESS SOIL TREATMENT PILOT STUDY
AND
SOILS ABATEMENT ACTION ALTERNATIVES
FOR THE
BAY CENTER CONSTRUCTION SITE
IN
EMERYVILLE, CALIFORNIA

Prepared for:

ALAMEDA COUNTY
HAZARDOUS MATERIALS UNIT

February 17, 1987

Prepared by:

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1. INTRODUCTION

This report addresses the results of an excess soil treatment pilot study and recommended abatement action for the Bay Center construction site in Emeryville, California (see Figure 1). The construction site is the subject of previous August 20, 1986 Contaminant Characterization and Worker Hygiene and Safety Reports, which were prepared under the supervision of Alameda County, Department of Health Services, Hazardous Materials Unit. This current report specifically addresses excess indigenous materials which have been created by excavation and grading activities and which currently are stockpiled within site boundaries.

The soil treatment consists of mechanically mixing indigenous material with added materials, in prescribed proportions, for a relatively short time. Details of the treatment process are provided in Section 2. The test results presented herein are intended for the use of Alameda County, California DOHS, and/or Regional Water Quality Control Board. Said agencies have ultimate jurisdictional responsibility for the determination of the hazard class of wastes and appropriateness of the disposition of stockpiled wastes. Hazard identification is the subject of California Administrative Code Title 22, Article 11.

This report presents test results of a soil treatment pilot study. The report preliminarily addresses the technical and economical feasibility of treating excess indigenous material at Bay Center. The subject of the pilot study is the potential for classification of the treated soil as Special Waste, pursuant to Title 22, Article 11, Section 66742. The report and its author, however, do not make the determination of hazard class, a determination which, as described above, is the responsibility of public agencies.

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-  TRUCKING AND TRUCK STORAGE
-  MIXED USE
-  WHOLESALE
-  MANUFACTURE
-  RESIDENTIAL
-  PUBLIC FAC.
-  UTILITY
-  VACANT
-  STORAGE YARD



SCALE: 1" = 177'

FIGURE 1. BAY CENTER PROJECT SITE AND SURROUNDING LAND USE

2. DESCRIPTION OF STOCKPILED MATERIAL AND SOIL TREATMENT PILOT PROCESS

2.1 STOCKPILED SOIL CHARACTERIZATION. Figure 2 illustrates the existing stockpiles. In excess of 4,000 cubic yards have been kept in discreet stockpiles, sorted by place of origin within the construction site. There are: stockpiles of clean foundation fill from a now demolished truck terminal, stockpile of the Christie Street (extended) grade cut, stockpiles of utility lateral and new foundation footing trenches, and assorted other stockpiles. Generally, the excavated material is dark gray or black in color and contains fragments of brick, wood, scrap metal, and slag.

The site is the subject of a previous contaminant characterization study. The current study provides additional results of laboratory analysis of metals in the soil stockpiles. Table 1 presents the characterization of the soil stockpiles.

Inspection of Table 1 shows consistently high bulk lead levels above the Soluble Threshold Limit Concentration (STLC) and Total Threshold Limit Concentration (TTLIC). Copper and cadmium bulk levels also exceed the respective STLCs. Chromium (not hexavalent) bulk levels are below the STLC. Analysis of metals other than lead, copper, cadmium, and chromium is provided in Table 3. But, based upon the previous Contaminant Characterization Report, inorganic lead is a principal concern.

2.2 EXCESS SOIL TREATMENT PROCESS

The soil treatment process consists of mixing indigenous material with calcium carbonate, silica ore (SiO₂), and water. Mixture occurs in a paddle wheel mixer capable of mixing approximately 30 pounds in three to five minutes (3 to 4 cubic yards per hour). Addition of the added ingredients was manually performed. Weighing was performed with a common scale.

It was reported that a similar process has been used to treat sand from foundry castings. Given the known lead and other metals in the indigenous site soil, the objective was to the efficacy of the foundry sand treatment technology in a new situation.

Proportions and weights used in the current application to excess stockpiled soils on the Bay Center construction site are listed below:

	<u>15-15-15 (%)</u>	<u>20-20-20 (%)</u>
Calcium	4.5 pounds	6 pounds
SiO ₂	4.5 pounds	6 pounds
Water	4.5 pounds	6 pounds
Indigenous Soil	16.5 pounds	12 pounds
	<hr/>	<hr/>
Mixture	30 pounds	30 pounds



TABLE 1. CHARACTERIZATION OF INORGANIC METALS IN STOCKPILED EXCESS SOIL AT BAY CENTER, EMERYVILLE

SAMPLE I.D.	TOTAL CONCENTRATION (mg/kg)			
	Lead	Copper	Chromium	Cadmium
TTLIC	1,000	2,500	2,500	500
STLC	5	25	560	1.0
A	3,624 *	1,914 **	36	11 **
B	2,390 *	740 **	73	9 **
C	1,604 *	421 **	54	11 **
D	1,236 *	643 **	78	4 **
E	2,644 *	487 **	50	7 **
F	1,557 *	682 **	59	11 **
G	2,543 *	205 **	41	2 **
H	61 **	22	33	0.5
I	2,393 *	650 **	37	8 **
J	2,797 *	1,763 **	71	10 **
K	967 **	177 **	100	4 **
L	2,206 *	485 **	108	19 **
M	419 **	166 **	34	3 **
N	564 **	123 **	49	3 **
O	998 **	360 **	40	8 **
P	289 **	17	42	1 **
Q	1,448 *	612 **	64	8 **
R	1,479 *	151 **	31	1 **
S	50 **	48 **	34	0.4
T	1,047 *	749 **	35	4 **
U	360 **	122 **	33	2 **
V	1,548 *	98 **	31	4 **
W	391 **	105 **	57	2 **
X	147 **	65 **	33	0.9
Y	660 **	758 **	38	4 **
Z	143 **	805 **	29	1 **
AA	92 **	66 **	32	0.6
BB	213 **	854 **	54	2 **
CC	1,574 *	808 **	82	6 **
DD	18 **	14	16	0.2

* Exceeds California Title 22 TTLIC.
 ** Exceeds California Title 22 STLC.

Source: Earth Metrics Incorporated; Brown & Caldwell, 1987.

(copy) March 88

3. PILOT SOIL TREATMENT SAMPLING AND TEST RESULTS

3.1 SAMPLING PROTOCOL

Pilot soil treatment and sampling occurred on Friday, January 9, 1987. The pilot soil treatment and sampling were attended by DOHS (Mr. Chein Kao, Alternative Technology), The Martin Company (Mr. Allan McKay, Project Manager), Earth Metrics Incorporated, and other observers. Alameda County (Mr. Lowell Miller, Hazardous Materials Unit) attended a part of the pilot soil treatment.

Before and after soil samples were collected by Earth Metrics Incorporated, from the mixer, in glass sample containers with screwcaps provided by Brown & Caldwell Analytical Laboratory, Emeryville. The Chain of Custody was completed and submitted with soil samples to Brown & Caldwell. A total of thirty one (31) samples were collected, and a subset of these were randomly selected for metals analysis by Brown & Caldwell. All thirty one samples are being archived for one month, or until approximately March 4, 1987.

All soil samples were taken from the mixer. Before treatment samples were taken after brief (1 minute) mixing of screened indigenous material. Note that each sample of indigenous material was collected from an individual stockpile and screened to remove large objects, prior to loading into the mixer.

3.2 LABORATORY ANALYSIS PROTOCOL

Twenty (20) soil samples, consisting of ten pairs of before treatment and after treatment samples, were selected at random for metals analysis. Sixteen (16) soil samples were tested for total solids, total lead, and soluble lead by the California Wet Extraction Test (WET). Four (4) soil samples were tested for all metals listed in Title 22, except for hexavalent chromium, in addition to lead.

All procedures of California Title 22 were followed. The over drying procedure, following preweighing of soil samples, was coordinated with the Alameda County Environmental Health Laboratory.

3.3 BEFORE AND AFTER TREATMENT TEST RESULTS

Table 2 summarizes before and after lead levels for the ten pairs of soil samples. Typically, the total and soluble lead concentrations in the ontreated soil were greater than the TTLC and STLC, for all ten untreated soil samples. Overall, the results for treated soil show a general downward reduction in the soluble lead concentration, relative to the soluble lead concentration in the untreated soil.

The reductions in total solids before treatment after treatment are caused by the addition of 15 to 20 percent water in the process. Significant increases in total lead concentrations after treatment (refer to samples FT9 and FT16) are anomalous. These above analytical results are being rechecked by Brown & Caldwell.

TABLE 2. BEFORE AND AFTER LEAD CONCENTRATIONS IN PILOT SOIL TREATMENT AT BAY CENTER, EMERYVILLE

SAMPLE I.D. (PAIRS OF SAMPLES)	BEFORE			AFTER		
	TOTAL SOLIDS (a) (%)	TOTAL LEAD (b) (mg/kg)	EXTRACTABLE LEAD (c) (mg/l)	TOTAL SOLIDS (a) (%)	TOTAL LEAD (b) (mg/kg)	EXTRACTABLE LEAD (c) (mg/l)
FT 2,3	84	2,900	2,100	73	1,400	4.3
FT 4,5	83	2,700	160	72	1,900	1.4
FT 8,9	86	1,600	93	73	7,800	66.0
FT 11,12	84	2,400	230	71	1,200	1.4
FT 13,14	80	720	72	66	740	0.3
FT 15,16	77	750	34	68	960	1.7
FT 17,18	82	4,600	330	72	1,400	2.8
FT 19,20	83	1,800	140	73	1,400	2.0
FT 25,26	82	1,800	270	66	1,600	0.7
FT 27,28	84	2,300	190	64	2,000	0.2

* Exceeds California Title 22 TTLC. ** Exceeds California Title 22 STLC.

(a) Dry weight over wet weight, expressed as a percentage.

(b) Total or bulk concentration of the specified metal, expressed in milligrams per kilogram.

(c) Extractable concentration of the specified metal, as determined by WET and expressed in milligrams per liter.

Source: Earth Metrics Incorporated; Brown & Caldwell, 1987.

Table 3 presents before and after metals concentrations for seventeen metals listed in Title 22. Soluble metals concentrations in soil samples after treatment are less than their respective STLCs.

3.4 EFFICACY

The available results are encouraging with respect to the efficacy of the soil treatment process. The STLC for lead is currently 5 mg/l, and in the majority

TABLE 3. BEFORE AND AFTER METALS CONCENTRATIONS IN PILOT SOIL TREATMENT AT BAY CENTER, EMERYVILLE

SAMPLE I.D. (PAIRS OF SAMPLES)	METAL	BEFORE			AFTER		
		TOTAL SOLIDS(a) (%)	TOTAL LEVEL(b) (mg/kg)	EXTRACT-ABLE LEVEL(c) (mg/l)	TOTAL SOLIDS(a) (%)	TOTAL LEVEL(b) (mg/kg)	EXTRACT-ABLE LEVEL (c) (mg/l)
FT 19,20	Sb	83	<10	1.5	73	<10	<0.1
	As		10 **	0.2		7 **	0.2
	Ba		330 **	3.3		500 **	2.5
	Be		0.3	<0.01		0.3	<0.01
	Cd		7.1**	0.5		4.9**	<0.01
	Cr		35	0.6		27	0.4
	Co		17	0.5		39	0.1
	Cu		910 **	35 **		460 **	7.9
	Pb		1,800 *	150 **		1,400 **	2.0
	Hg		0.9**	<0.001		0.4**	<0.001
	Mo		8.1	0.2		6.8	0.2
	Ni		58 **	1.7		63 **	0.4
	Se		0.8	<0.01		<0.2	<0.01
	Ag		1.9	0.03		<1	<0.01
	Tl		12 **	0.6		18 **	0.5
	V		32 **	0.6		35 **	0.6
	Zn		2,300 **	150		2,000 **	0.5

* Exceeds California Title 22 TTLC. ** Exceeds California Title 22 STLC.
 (a) Dry weight over wet weight, expressed as a percentage.
 (b) Total or bulk concentration of the specified metal, expressed in milligrams per kilogram.
 (c) Extractable concentration of the specified metal, as determined by WET and expressed in milligrams per liter.

Source: Earth Metrics Incorporated; Brown & Caldwell, 1987.

TABLE 3 (CONTINUED). BEFORE AND AFTER METALS CONCENTRATIONS IN PILOT SOIL TREATMENT AT BAY CENTER, EMERYVILLE

SAMPLE I.D. (PAIRS OF SAMPLES)	METAL	BEFORE			AFTER		
		TOTAL SOLIDS(a) (%)	TOTAL LEVEL(b) (mg/kg)	EXTRACT-ABLE LEVEL(c) (mg/l)	TOTAL SOLIDS(a) (%)	TOTAL LEVEL(b) (mg/kg)	EXTRACT-ABLE LEVEL(c) (mg/l)
FT 13,14	Sb	80	<10	<0.1	66	<10	<0.1
	As		8.2**	0.3		11 **	0.2
	Ba		320 **	3.9		360 **	2.1
	Be		0.3	0.02		0.3	<0.01
	Cd		3.8**	0.3		2.3**	0.5
	Cr		38	0.9		13	0.4
	Co		13	0.4		13	<0.05
	Cu		700 **	39 **		540 **	12
	Pb		720 **	72 **		740 **	0.3
	Hg		0.5**	<0.001		0.6**	<0.001
	Mo		3.4	0.1		4.4	<0.1
	Ni		51 **	2.2		51 **	0.5
	Se		0.8	<0.01		<0.2	<0.01
	Ag		<1	<0.01		<1	0.03
	Tl		8.9**	0.4		13 **	0.6
	V		35 **	1.5		37 **	0.5
	Zn		1,100 **	100		1,200 **	0.02

* Exceeds California Title 22 TTLC. ** Exceeds California Title 22 STLC.
 (a) Dry weight over wet weight, expressed as a percentage.
 (b) Total or bulk concentration of the specified metal, expressed in milligrams per kilogram.
 (c) Extractable concentration of the specified metal, as determined by WET and expressed in milligrams per liter.

Source: Earth Metrics Incorporated; Brown & Caldwell, 1987.

of treated soil samples the soluble lead is less than the STLC. In the one instance where it is not, the analytical laboratory is rechecking the result.

For the soil treatment process to be considered as technically feasible (as opposed to economically feasible), the soil after treatment must meet certain criteria established in California Title 22. These criteria encompass the metals criteria and additional criteria of reactivity, corrosivity, and Section 66723. Subject to conformance with the applicable Title 22 criteria, the treated soil may be classified as a "Special Waste".

Special Waste is a separate category or classification of waste. Special Waste can be disposed in a variety of manners, including potential disposal off site in qualifying landfills or disposal on site with suitable encapsulating material. Special waste is distinguishable from Class I waste, for example, which typically would be disposable at a Class I landfill.

4. TECHNOLOGICAL AND ECONOMIC FEASIBILITY OF STOCKPILE TREATMENT

The scale of the screening and mixing equipment could be upsized to make technologically and economically feasible the treatment of 3,000 to 5,000 cubic yards. Since the worst case alternative to treatment appears to be off site disposal in a Class I landfill, one economical feasibility criterion is the relative cost of off site disposal in a Class I landfill. The latter cost would be approximately \$200 per cubic yard. In contrast, a full scale treatment process could be implemented for percent of that latter cost, including the costs of hauling and disposing in the nearest Class III landfill site.

Whether one assumes encapsulate on site or disposal off site treatment of excess soils appears to be economically feasible relative to the \$200 per cubic yard criterion. This feasibility evaluation assumes that screenings would be disposable without treatment in a Class III landfill or in another approved site. Screenings are assumed to account for 33 percent of the total volume of excess soils.

5. SOILS ABATEMENT ACTION ALTERNATIVES

Alameda County and/or the Regional Water Quality Control Board can decide the appropriate disposition of excess soils on the Bay Center Construction site. The abatement action alternatives and No Action alternative are explained below.

A. No Action. The No Action alternative is not feasible because the construction site is in the process of development.

B. Off Haul and Disposal at a Class I Landfill Without Treatment. Cost would be extreme if not prohibitive at \$200 per cubic yard. This alternative abatement action is the least conservative of Class I landfill capacity.

C. Treatment followed by Off Haul and Disposal at an Alternate Landfill. Treatment would be economically feasible, although not inexpensive. The estimated cost of \$58 per cubic yard, excluding off haul and disposal costs, assumes that the screenings are disposable without treatment and without other unforeseen costs. This alternative is subject to agency approval and qualification of treated soil as special waste.

D. Treatment followed by On Site Encapsulation. This alternative is a variation of Alternative C. Treated soil would be encapsulated with imported clean loam in earthen berms.

E. On Site Encapsulation Without Treatment. Similar to Alternative D, Alternative E would not treat the excess soil prior to encapsulation. Alternative E could potentially maintain the site at approximately the same risk level as existed before construction. Above ground earthen berms with impermeable barriers could potentially minimize leaching to groundwater and surface storm water runoff. The relative cost of impermeable barriers compared to the cost of treatment has not been evaluated.

Based upon the above alternatives, and subject to agency approval and qualification of treated soil as special waste, Alternative C or Alternative D are preferred. Alternative C and Alternative D are relatively economical, minimize potential environmental harm and conserve Class I landfill capacity.



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REPORT OF ANALYTICAL RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED				
01-357-1	BC1UT FT2	09 JAN 87				
01-357-2	BC1T FT3	09 JAN 87				
01-357-3	CHR1UT FT4	09 JAN 87				
01-357-4	CHR1T FT5	09 JAN 87				
01-357-5	BC3UT FT8	09 JAN 87				
PARAMETER	01-357-1	01-357-2	01-357-3	01-357-4	01-357-5	
Total Solids, Percent	84.3	73.0	82.8	71.6	85.5	
Lead, mg/kg	2900	1400	2700	1900	1600	
Nitric Acid Digestion, Date	01.21.87	01.21.87	01.21.87	01.21.87	01.21.87	



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LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED				
01-357-6	BC3T FT9	09 JAN 87				
01-357-7	BC4UT FT11	09 JAN 87				
01-357-8	BC4T FT12	09 JAN 87				
01-357-9	BC6UT FT15	09 JAN 87				
01-357-10	BC6T FT16	09 JAN 87				
PARAMETER	01-357-6	01-357-7	01-357-8	01-357-9	01-357-10	
Total Solids, Percent	73.3	83.9	71.3	76.7	68.4	
Lead, mg/kg	7800	2400	1200	750	960	
Nitric Acid Digestion, Date	01.21.87	01.21.87	01.21.87	01.21.87	01.21.87	



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LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED				
01-357-11	BC7UT FT17	09 JAN 87				
01-357-12	BC7T FT18	09 JAN 87				
01-357-13	BC3UT FT25	09 JAN 87				
01-357-14	BC3T FT26	09 JAN 87				
01-357-15	CHR1UT FT27	09 JAN 87				
PARAMETER		01-357-11	01-357-12	01-357-13	01-357-14	01-357-15
Total Solids, Percent		82.5	71.6	81.7	65.6	83.6
Lead, mg/kg		4600	1400	1800	1600	2300
Nitric Acid Digestion, Date		01.21.87	01.21.87	01.21.87	01.21.87	01.21.87



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LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED				
01-357-16	CHR1T FT28	09 JAN 87				
01-357-17	BC5UT FT13	09 JAN 87				
01-357-18	BC5T FT14	09 JAN 87				
01-357-19	CHR2UT FT19	09 JAN 87				
01-357-20	CHR2T FT20	09 JAN 87				
PARAMETER	01-357-16	01-357-17	01-357-18	01-357-19	01-357-20	
Antimony, mg/kg	---	<10	<10	<10	<10	
Arsenic, mg/kg	---	8.2	11	10	7.0	
Barium, mg/kg	---	320	360	330	500	
Beryllium, mg/kg	---	0.3	0.3	0.3	0.3	
Cadmium, mg/kg	---	3.8	2.3	7.1	4.9	
Chromium, mg/kg	---	38	13	35	27	
Cobalt, mg/kg	---	13	13	17	39	
Copper, mg/kg	---	700	540	910	460	
Mercury, mg/kg	---	0.53	0.59	0.87	0.45	
Molybdenum, mg/kg	---	3.4	4.4	8.1	6.8	
Nickel, mg/kg	---	51	51	58	63	
Selenium, mg/kg	---	0.8	<0.2	0.8	<0.2	
Silver, mg/kg	---	<1.0	<1.0	1.9	<1.0	
Thallium, mg/kg	---	8.9	13	12	18	
Vanadium, mg/kg	---	35	37	32	35	
Zinc, mg/kg	---	1100	1200	2300	2000	
Total Solids, Percent	64.1	79.7	65.7	83.4	71.6	
Lead, mg/kg	2000	720	740	1800	1400	
Nitric Acid Digestion, Date	01.21.87	01.21.87	01.21.87	01.21.87	01.21.87	



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LOG NO	SAMPLE DESCRIPTION, CALIF WASTE EXTRACT SAMPLES	DATE SAMPLED				
01-357-21	BC1UT FT2					09 JAN 87
01-357-22	BC1T FT3					09 JAN 87
01-357-23	CHR1UT FT4					09 JAN 87
01-357-24	CHR1T FT5					09 JAN 87
01-357-25	BC3UT FT8					09 JAN 87
PARAMETER	01-357-21	01-357-22	01-357-23	01-357-24	01-357-25	
CAM WET Extraction	01.21.87	01.21.87	01.21.87	01.21.87	01.21.87	
Lead, mg/L	210	4.3	160	1.4	93	



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LOG NO	SAMPLE DESCRIPTION, CALIF WASTE EXTRACT SAMPLES	DATE SAMPLED				
01-357-26	BC3T FT9	09 JAN 87				
01-357-27	BC4UT FT11	09 JAN 87				
01-357-28	BC4T FT12	09 JAN 87				
01-357-29	BC6UT FT15	09 JAN 87				
01-357-30	BC6T FT16	09 JAN 87				
PARAMETER	01-357-26	01-357-27	01-357-28	01-357-29	01-357-30	
CAM WET Extraction	01.21.87	01.23.87	01.23.87	01.23.87	01.23.87	
Lead, mg/L	66	230	1.4	34	1.7	



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LOG NO	SAMPLE DESCRIPTION, CALIF WASTE EXTRACT SAMPLES	DATE SAMPLED				
01-357-31	BC7UT FT17	09 JAN 87				
01-357-32	BC7T FT18	09 JAN 87				
01-357-33	BC3UT FT25	09 JAN 87				
01-357-34	BC3T FT26	09 JAN 87				
01-357-35	CHR1UT FT27	09 JAN 87				
PARAMETER		01-357-31	01-357-32	01-357-33	01-357-34	01-357-35
CAN WET Extraction		01.23.87	01.23.87	01.24.87	01.24.87	01.24.87
Lead, mg/L		330	2.8	270	0.72	190



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LOG NO	SAMPLE DESCRIPTION, CALIF WASTE EXTRACT SAMPLES					DATE SAMPLED
01-357-36	CHR1T FT28					09 JAN 87
01-357-37	BC5UT FT13					09 JAN 87
01-357-38	BC5T FT14					09 JAN 87
01-357-39	CHR2UT FT19					09 JAN 87
01-357-40	CHR2T FT20					09 JAN 87
PAPAMETER	01-357-36	01-357-37	01-357-38	01-357-39	01-357-40	
Antimony, mg/L	---	<0.1	<0.1	1.5	<0.1	
Arsenic, mg/L	---	0.34	0.20	0.23	0.19	
Barium, mg/L	---	3.9	2.1	3.3	2.5	
Beryllium, mg/L	---	0.02	<0.01	<0.01	<0.01	
Cadmium, mg/L	---	0.26	0.49	0.50	<0.01	
Chromium, mg/L	---	0.92	0.42	0.61	0.45	
Cobalt, mg/L	---	0.41	<0.05	0.48	0.07	
Copper, mg/L	---	39	12	35	7.9	
Mercury, mg/L	---	<0.001	<0.001	<0.001	<0.001	
Molybdenum, mg/L	---	0.12	<0.1	0.18	0.18	
Nickel, mg/L	---	2.2	0.48	1.7	0.45	
Selenium, mg/L	---	<0.01	<0.01	<0.01	<0.01	
Silver, mg/L	---	<0.01	0.03	0.03	<0.01	
Thallium, mg/L	---	0.4	0.6	0.6	0.5	
Vanadium, mg/L	---	1.5	0.5	0.6	0.6	
Zinc, mg/L	---	100	0.02	150	0.49	
CAM WET Extraction	01.24.87	01.24.87	01.24.87	01.24.87	01.24.87	
Lead, mg/L	0.17	72	0.28	140	2.0	

Jinda Brack FR
D. A. Mclean, Laboratory Director



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ENVIRONMENTAL LABORATORY

Mr. Marc Papineau
Earth Metrics
859 Cowan Road
Burlingame, CA 94010

LABORATORY RESULTS

Supply/Order No.:
Client's Survey No.:
Contract/PO No.: 02542
Release No.:

Laboratory Job No.: 870311
Date Received: 02/02/87
Date Reported: 02/05/87
Client Code: EART3

LEAD(AA ASSAY EPA 239.1)
COPPER(AA ASSAY,EPA 220.1)
CHROMIUM(AA ASSAY,EPA 218.1)
CADMIUM(AA ASSAY,EPA 213.1)

MATRIX:SOIL TOTAL DIGEST

LABNO	SMPLNO	COMPOUND	FOUND MG/KG	CA TTLC MG/KG	DET.LIM. MG/KG
2028	A	PB	3624.0	1000.00	96.90
		CU	1914.7	2500.00	3.9
		CR(TOTAL)	36.24	2500.00	0.97
		CD	11.163	100.00	0.097
2029	B	PB	2390.1	1000.00	95.60
		CU	740.0	2500.00	3.8
		CR(TOTAL)	73.61	2500.00	0.96
		CD	9.369	100.00	0.096
2030	C	PB	1604.4	1000.00	9.9
		CU	421.5	2500.00	4.0
		CR(TOTAL)	53.68	2500.00	0.99
		CD	10.636	100.00	0.099
2031	D	PB	1236.2	1000.00	9.8
		CU	643.7	2500.00	3.9
		CR(TOTAL)	78.15	2500.00	0.98
		CD	4.508	100.00	0.098

APPROVED BY
JERRY TUMA, PH.D., CIH
DIRECTOR, ENVIRONMENTAL LABORATORY

AKT



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L A B O R A T O R Y R E S U L T S

Laboratory Job No.: 870311

LABNO	SMPLNO	COMPOUND	FOUND MG/KG	CA TTLC MG/KG	DET.LIM. MG/KG
2032	E	PB	2644.1	1000.00	99.40
		CU	487.1	2500.00	4.0
		CR(TOTAL)	50.30	2500.00	0.99
		CD	7.376	100.00	0.099
2033	F	PB	1557.7	1000.00	9.6
		CU	682.7	2500.00	3.8
		CR(TOTAL)	59.04	2500.00	0.96
		CD	10.865	100.00	0.096
2034	G	PB	2543.7	1000.00	97.09
		CU	205.83	2500.00	0.39
		CR(TOTAL)	40.97	2500.00	0.97
		CD	2.194	100.00	0.097
2035	H	PB	61.49	1000.00	0.98
		CU	22.00	2500.00	0.39
		CR(TOTAL)	33.20	2500.00	0.98
		CD	0.540	100.00	0.098
2036	I	PB	2393.8	1000.00	96.53
		CU	650.6	2500.00	3.9
		CR(TOTAL)	37.26	2500.00	0.97
		CD	7.838	100.00	0.097
2037	J	PB	2797.6	1000.00	99.21
		CU	1763.9	2500.00	4.0
		CR(TOTAL)	70.63	2500.00	0.99
		CD	10.496	100.00	0.099
2038	K	PB	967.31	1000.00	0.96
		CU	177.12	2500.00	0.38
		CR(TOTAL)	100.19	2500.00	0.96
		CD	4.000	100.00	0.096



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L A B O R A T O R Y R E S U L T S

Laboratory Job No.: 870311

LABNO	SMPLNO	COMPOUND	FOUND MG/KG	CA TTLC MG/KG	DET.LIM. MG/KG
2039	L	PB	2206.8	1000.00	99.40
		CU	485.1	2500.00	4.0
		CR(TOTAL)	108.15	2500.00	0.99
		CD	19.324	100.00	0.099
2040	M	PB	419.29	1000.00	0.98
		CU	166.54	2500.00	0.39
		CR(TOTAL)	34.45	2500.00	0.98
		CD	3.051	100.00	0.098
2041	N	PB	564.96	1000.00	0.98
		CU	123.43	2500.00	0.39
		CR(TOTAL)	49.02	2500.00	0.98
		CD	2.795	100.00	0.098
2042	O	PB	998.0	1000.00	10.0
		CU	360.56	2500.00	0.40
		CR(TOTAL)	39.64	2500.00	1.00
		CD	8.207	100.00	0.100
2043	P	PB	289.77	1000.00	0.95
		CU	70.27	2500.00	0.38
		CR(TOTAL)	42.42	2500.00	0.95
		CD	1.222	100.00	0.095
2044	Q	PB	1448.1	1000.00	9.8
		CU	612.5	2500.00	3.9
		CR(TOTAL)	63.80	2500.00	0.98
		CD	8.376	100.00	0.098
2045	R	PB	1479.5	1000.00	9.8
		CU	151.47	2500.00	0.39
		CR(TOTAL)	34.25	2500.00	0.98
		CD	1.458	100.00	0.098



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L A B O R A T O R Y R E S U L T S

Laboratory Job No.: 870311

LABNO	SMPLNO	COMPOUND	FOUND MG/KG	CA TTLC MG/KG	DET.LIM. MG/KG
2046	S	PB	50.10	1000.00	0.95
		CU	48.00	2500.00	0.38
		CR(TOTAL)	33.71	2500.00	0.95
		CD	0.429	100.00	0.095
2047	T	PB	1047.8	1000.00	9.6
		CU	749.5	2500.00	3.8
		CR(TOTAL)	35.37	2500.00	0.96
		CD	4.015	100.00	0.096
2048	U	PB	359.68	1000.00	0.99
		CU	121.74	2500.00	0.40
		CR(TOTAL)	32.61	2500.00	0.99
		CD	2.312	100.00	0.099
2049	V	PB	1548.1	1000.00	9.8
		CU	97.64	2500.00	0.39
		CR(TOTAL)	31.04	2500.00	0.98
		CD	3.635	100.00	0.098
2050	W	PB	391.39	1000.00	0.98
		CU	105.09	2500.00	0.39
		CR(TOTAL)	57.14	2500.00	0.98
		CD	1.791	100.00	0.098
2051	X	PB	147.24	1000.00	0.95
		CU	64.57	2500.00	0.38
		CR(TOTAL)	33.14	2500.00	0.95
		CD	0.905	100.00	0.095
2052	Y	PB	660.98	1000.00	0.95
		CU	768.9	2500.00	3.8
		CR(TOTAL)	38.45	2500.00	0.95
		CD	3.466	100.00	0.095



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LABORATORY RESULTS

Laboratory Job No.: 870311

LABNO	SMPLNO	COMPOUND	FOUND MG/KG	CA TTLC MG/KG	DET.LIM. MG/KG
2053	Z	PB	143.11	1000.00	0.97
		CU	805.8	2500.00	3.9
		CR(TOTAL)	28.74	2500.00	0.97
		CD	1.136	100.00	0.097
2054	AA	PB	92.29	1000.00	0.99
		CU	66.01	2500.00	0.40
		CR(TOTAL)	31.82	2500.00	0.99
		CD	0.583	100.00	0.099
2055	BB	PB	212.77	1000.00	0.97
		CU	854.9	2500.00	3.9
		CR(TOTAL)	54.16	2500.00	0.97
		CD	2.108	100.00	0.097
2056	CC	PB	1574.5	1000.00	9.7
		CU	808.5	2500.00	3.9
		CR(TOTAL)	82.01	2500.00	0.97
		CD	5.861	100.00	0.097
2057	DD	PB	18.25	1000.00	0.99
		CU	14.09	2500.00	0.40
		CR(TOTAL)	15.58	2500.00	0.99
		CD	0.188	100.00	0.099

ANALYST: PRECY ROBINSON