

WASTE CHARACTERIZATION: IN-SITU SOIL LOCATED AT ISRA AREA II PLANNED EXCAVATION ELV-1D POND DEEP SOIL

Introduction

Supporting detailed information is provided in this report for the June 27, 2013 in-situ sampling of prospective ISRA soil wastes. Excavation and removal of soil is planned to take place at the ELV-1D Pond ISRA project site in SSFL Area II. Soil characterized in this report underlies the originally characterized shallow soil, which is addressed in a separate characterization report.

Background

This report represents a continuation of in-situ characterization of soil destined to be excavated from SSFL Area II in accordance with an approved ISRA Workplan. Following characterization of the originally targeted shallow soil at the former ELV impoundment referred to as the ELV-1D Pond, the decision was made to also remove deeper soil. Based on earlier investigation, distinctively darker soil was located beneath the originally characterized soil and was associated with significantly elevated Volatile Organic Compound (VOC) concentrations. To more fully characterize this deeper soil, a sampling plan was developed to collect two samples from the suspected low point of the former impoundment. The sample collection locations were identified using random sampling methodology within an approximate 12 foot by 28 foot area in the eastern portion of the planned excavation boundary.

Although the principal concern with respect to the ELV-1D Pond deep soil focused on VOCs, Regulated Metals and Semi-Volatile Organic Compounds (SVOC) were also identified as potential impacts that should be addressed in the excavation footprint. Each of the two (2) samples called for in the random sampling plan contained all soil collected between a depth of three or three and one-half feet down to a depth of 5 feet. The samples were analyzed for CAM 17 Metals, VOCs, and SVOC. Samples were collected, contained, and handled according to field practice requirements in SW-846.

Results

Analytical results for the planned ELV-1D Pond deep soil excavation area are presented in GEL Laboratories report No. 328453, issued on 7/17/13. The results included detection of an elevated Lead concentration at 66 mg/kg in one sample. Lead in the second sample was detected at 7.55 mg/kg. Follow-up leachate testing (i.e. the California WET) was not conducted despite the one detection that exceeded the STLC threshold of 50 mg/kg because the soil is already known to carry the hazardous waste F001/F002 listing. Metals testing was ordered primarily for waste disposal profiling purposes, and total concentrations provide sufficient information for profile completion and evaluation. Mercury also exceeded the applicable STLC threshold of 2 mg/kg with a detected concentration of 2.45 mg/kg in one sample. Again, no leachate testing was performed for the reasons cited above. Other detected Metals included Chromium at a maximum concentration of 44 mg/kg, Selenium at a maximum concentration of 4.23 mg/kg, Beryllium at a maximum concentration of 1.14 mg/kg, and Nickel at a maximum concentration of 28 mg/kg. The remaining detected Metals exhibited proportionately lower concentrations.

A significant VOC presence was detected in the ELV-1D Pond deep soil samples. Trichloroethylene (TCE) is the driving constituent of concern. It was detected in the two soil samples at 93.5 mg/kg and 281 mg/kg. Tetrachloroethylene (PCE), another likely spent solvent,

was detected at 0.144 mg/kg and 1.11 mg/kg. Cis-1,2-Dichloroethylene, a daughter product of TCE, was detected at 4.14 mg/kg and 6.94 mg/kg. Another of the more prominent VOCs detected in the soil was Bromofluorobenzene at 5.36 mg/kg and 5.98 mg/kg. Acetone at a maximum concentration of 1.2 mg/kg; 1,2,4-Trimethylbenzene at a maximum concentration of 4.29 mg/kg; and n-Butylbenzene at a maximum concentration of 1.7 mg/kg were some of the lower concentration VOCs detected. Historical background information indicated that the pond area may have been exposed to spent TCE and other solvents in the past. For this reason, the soil has been determined to be impacted by RCRA Listed waste, which carries-over to the environmental media hosting it.

Only one SVOC was detected in the ELV-1D deep soil samples. Phenanthrene was detected in one of the samples at 3.18 mg/kg. It was not detected in the other sample. It is not directly regulated under hazardous waste regulations and no thresholds or limits have been established for this compound. No other SVOCs were present above the laboratory Minimum Detection Limits (MDL). However, as a result of matrix interference issues, the MDLs for one of the samples are elevated. In five instances, the MDLs in this sample are higher than applicable hazardous waste thresholds for particular SVOCs. This was true for 2,4-Dinitrotoluene; 3,3-Dichlorobenzidine; Benzidine; Hexachlorobenzene; and Hexachlorobutadiene. Yet, extensive soil sampling at SSFL has not revealed these compounds to be among those routinely detected at concentrations approaching hazardous waste thresholds or limits. Furthermore, the two sample points from which soil was collected are less than 10 feet apart, and MDLs for the other sample are below hazardous waste thresholds and limits for all analyzed SVOCs. No SVOCs were detected in this sample either. Consequently, there are no indications of widespread, elevated SVOCs in this area. Taken together, the historically negligible compounds in question, and the fact that they were not detected nearby, suggest there is little likelihood that they are present at elevated concentrations in the elevated MDL sample.

Determination

According to analytical results and generator knowledge, the soil in the SSFL Area II ELV-1D Pond deep soil excavation site:

IS A RCRA F001/F002 Listed Waste (analytical results and generator knowledge)

Is Not ignitable (generator knowledge)

Is Not corrosive (generator knowledge)

Is Not reactive (generator knowledge)

IS TOXIC (analytical results)

Is Not Extremely or Acutely Hazardous Waste

EXCEEDS RCRA thresholds for TCE

IS SUBJECT TO the Prop. 65 listing

IS SUBJECT TO the Title 22 Appendix X list

Is Not known by experience or testing to pose a hazard to human health or environment because of its carcinogenicity, acute toxicity, chronic toxicity, bio-accumulative properties, or persistence in the environment.

The ELV-1D Pond deep soil is HAZARDOUS.

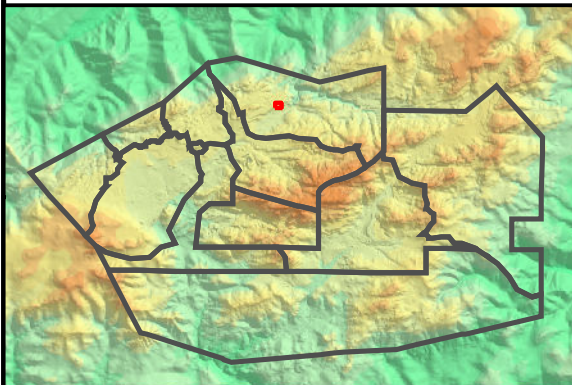
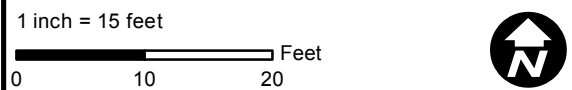
Outfall 009 Waste Characterization Sample Locations for ELV-1D

- Base Map Legend**
- Administrative Area Boundary
 - RFI Site Boundary
 - NPDES Outfall
 - A/C Paving
 - Drainage
 - Non Jurisdictional Surface Water Pathway
 - Surface Water Divide

- Figure Legend**
- Planned ISRA Excavation Boundary
 - Sample Location
 - Gray shading indicates sample not analyzed
 - Green shading indicates sample only analyzed for radionuclides
 - Blue shading indicates sample associated with deep soils waste certification

Note:
 1. Aerial imagery from 2010 Sage Consulting.
 2. Topographic contours from 2010 Sage Consulting.

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INTERIM SOURCE REMOVAL ACTION (ISRA) - OUTFALL 009

WASTE CHARACTERIZATION SAMPLE RESULTS – ELV-1D (Deep Soil)

THE BOEING COMPANY

SANTA SUSANA FIELD LABORATORY

		Object Name: Sample Name: Collection Date: Sample Depth (feet bgs):			ISWC0139 ISWC0139S001 6/27/2013 3 - 5	ISWC0140 ISWC0140S001 6/27/2013 3.5 - 5
ANALYTE	UNITS	TTLIC	WET Leachate Testing Trigger ^a	TCLP Leachate Testing Trigger ^b	RESULT ^c	RESULT ^c
METALS						
Antimony	mg/kg	500	150	--	<0.322	20.2
Arsenic	mg/kg	500	50	100	0.634	9.15
Barium	mg/kg	10,000	1,000	2,000	51.8	100
Beryllium	mg/kg	75	7.5	--	0.636	1.14
Cadmium	mg/kg	100	10	20	5.57	17.9
Chromium	mg/kg	500	50	100	16	44
Cobalt	mg/kg	8,000	800	--	6.23	11.6
Copper	mg/kg	2,500	250	--	8.52	55.4
Lead	mg/kg	1,000	50	100	7.55	66
Mercury	mg/kg	20	2	4	0.423	2.45
Molybdenum	mg/kg	3,500	3,500	--	0.438	2.22
Nickel	mg/kg	2,000	200	--	11	28
Selenium	mg/kg	100	10	20	4.23	4.08
Silver	mg/kg	500	50	100	<0.0977	0.227
Thallium	mg/kg	700	70	--	<0.488	13.9
Vanadium	mg/kg	2,400	240	--	26.5	51.5
Zinc	mg/kg	5,000	2,500	--	63	464
VOCs						
1,1,1,2-Tetrachloroethane	ug/kg	--	--	--	<30	<30
1,1,1-Trichloroethane	ug/kg	--	--	--	<30	<30
1,1,2,2-Tetrachloroethane	ug/kg	--	--	--	<30	<30
1,1,2-Trichloroethane	ug/kg	--	--	--	<30	<30
1,1-Dichloroethane	ug/kg	--	--	--	<30	<30
1,1-Dichloroethene	ug/kg	--	--	14,000	<30	<30
1,1-Dichloropropene	ug/kg	--	--	--	<30	<30
1,2,3-Trichlorobenzene	ug/kg	--	--	--	<40	<40
1,2,3-Trichloropropane	ug/kg	--	--	--	<30	<30
1,2,4-Trichlorobenzene	ug/kg	--	--	--	<30	<30
1,2,4-Trimethylbenzene	ug/kg	--	--	--	4290	3460
1,2-Dibromo-3-chloropropane	ug/kg	--	--	--	<50	<50
1,2-Dibromoethane (EDB)	ug/kg	--	--	--	<30	<30
1,2-Dichlorobenzene	ug/kg	--	--	--	<30	<30
1,2-Dichloroethane	ug/kg	--	--	10,000	<30	<30
1,2-Dichloropropane	ug/kg	--	--	--	<30	<30
1,3,5-Trimethylbenzene	ug/kg	--	--	--	<30	<30
1,3-Dichlorobenzene	ug/kg	--	--	--	<30	<30
1,3-Dichloropropane	ug/kg	--	--	--	<30	<30
1,4-Dichlorobenzene	ug/kg	--	--	--	<30	<30
2,2-Dichloropropane	ug/kg	--	--	--	<30	<30
2-Butanone (MEK)	ug/kg	--	--	4,000,000	<150	<150
2-Chloro-1,1,1-trifluoroethane	ug/kg	--	--	--	<300	<300

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ANALYTE	UNITS	TTLIC	WET Leachate Testing Trigger ^a	TCLP Leachate Testing Trigger ^b	RESULT ^c	RESULT ^c
2-Chloroethylvinyl ether	ug/kg	--	--	--	<150	<150
2-Chlorotoluene	ug/kg	--	--	--	<30	<30
2-Hexanone	ug/kg	--	--	--	<150	<150
4-Chlorotoluene	ug/kg	--	--	--	<30	<30
4-Methyl-2-pentanone (MIBK)	ug/kg	--	--	--	<150	<150
Acetone	ug/kg	--	--	--	1200	479
Benzene	ug/kg	--	--	10,000	<30	<30
Bromobenzene	ug/kg	--	--	--	<30	<30
Bromochloromethane	ug/kg	--	--	--	<30	<30
Bromodichloromethane	ug/kg	--	--	--	<30	<30
Bromofluorobenzene	ug/kg	--	--	--	5360	5980
Bromoform	ug/kg	--	--	--	<30	<30
Bromomethane	ug/kg	--	--	--	<30	<30
Carbon tetrachloride	ug/kg	--	--	10,000	<30	<30
Chlorobenzene	ug/kg	--	--	2,000,000	<30	<30
Chloroethane	ug/kg	--	--	--	<30	<30
Chloroform	ug/kg	--	--	120,000	<30	<30
Chloromethane	ug/kg	--	--	--	<30	<30
Chlorotrifluoroethylene	ug/kg	--	--	--	<300	<300
cis-1,2-Dichloroethene	ug/kg	--	--	--	4140	6940
cis-1,3-Dichloropropene	ug/kg	--	--	--	<30	<30
Dibromochloromethane	ug/kg	--	--	--	<30	<30
Dibromomethane	ug/kg	--	--	--	<30	<30
Dichlorodifluoromethane	ug/kg	--	--	--	<30	<30
Ethyl tert-butyl ether	ug/kg	--	--	--	<50	<50
Ethylbenzene	ug/kg	--	--	--	<30	<30
Hexachlorobutadiene	ug/kg	--	--	10,000	<30	<30
Isopropyl ether	ug/kg	--	--	--	<50	<50
Isopropylbenzene	ug/kg	--	--	--	<30	<30
m,p-Xylenes	ug/kg	--	--	--	1360	1200
Methyl tert-amyl ether	ug/kg	--	--	--	<50	<50
Methylene chloride	ug/kg	--	--	--	<200	<200
n-Butylbenzene	ug/kg	--	--	--	1700	1300
n-Propylbenzene	ug/kg	--	--	--	<30	<30
o-Xylene	ug/kg	--	--	--	669	545
p-Isopropyltoluene	ug/kg	--	--	--	1110	873
sec-Butylbenzene	ug/kg	--	--	--	1010	931
Styrene	ug/kg	--	--	--	<30	<30
tert-Butyl Alcohol	ug/kg	--	--	--	<1500	<1500
tert-Butyl methyl ether	ug/kg	--	--	--	<30	<30
tert-Butylbenzene	ug/kg	--	--	--	<30	<30
Tetrachloroethene	ug/kg	--	--	14,000	1110	144

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ANALYTE	UNITS	TTLIC	WET Leachate Testing Trigger ^a	TCLP Leachate Testing Trigger ^b	RESULT ^c	RESULT ^c
Toluene	ug/kg	--	--	--	153	159
trans-1,2-Dichloroethene	ug/kg	--	--	--	39	121
trans-1,3-Dichloropropene	ug/kg	--	--	--	<30	<30
Trichloroethene	ug/kg	2,040,000	2,040,000	10,000	281000	93500
Trichlorofluoromethane	ug/kg	--	--	--	<30	<30
Trichlorotrifluoroethane	ug/kg	--	--	--	<150	<150
Vinyl chloride	ug/kg	--	--	4,000	105	403
SVOCs						
1,1'-Biphenyl	ug/kg	--	--	--	<1990	<19900
1,2,4-Trichlorobenzene	ug/kg	--	--	--	<1990	<19900
1,2-Dichlorobenzene	ug/kg	--	--	--	<1990	<19900
1,2-Diphenylhydrazine	ug/kg	--	--	--	<1990	<19900
1,3-Dichlorobenzene	ug/kg	--	--	--	<1990	<19900
1,4-Dichlorobenzene	ug/kg	--	--	150,000	<1990	<19900
1-Methylnaphthalene	ug/kg	--	--	--	<199	<1990
1-Naphthylamine	ug/kg	--	--	--	<1990	<19900
2,4,5-Trichlorophenol	ug/kg	--	--	8,000,000	<1990	<19900
2,4,6-Trichlorophenol	ug/kg	--	--	40,000	<1990	<19900
2,4-Dichlorophenol	ug/kg	--	--	--	<1990	<19900
2,4-Dimethylphenol	ug/kg	--	--	--	<1990	<19900
2,4-Dinitrophenol	ug/kg	--	--	--	<1990	<19900
2,4-Dinitrotoluene	ug/kg	--	--	2,600	<1990	<19900
2,6-Dinitrotoluene	ug/kg	--	--	--	<1990	<19900
2-Chloronaphthalene	ug/kg	--	--	--	<199	<1990
2-Chlorophenol	ug/kg	--	--	--	<1990	<19900
2-Methylnaphthalene	ug/kg	--	--	--	<199	<1990
2-Naphthylamine	ug/kg	--	--	--	<1990	<19900
2-Nitroaniline	ug/kg	--	--	--	<2190	<21900
2-Nitrophenol	ug/kg	--	--	--	<1990	<19900
3,3-Dichlorobenzidine	ug/kg	10,000	--	--	<1990	<19900
3-Nitroaniline	ug/kg	--	--	--	<1990	<19900
3,5-Dimethylphenol	ug/kg	--	--	--	<1990	<19900
4,6-Dinitro-2-methylphenol	ug/kg	--	--	--	<1990	<19900
4-Aminobiphenyl	ug/kg	--	--	--	<1990	<19900
4-Bromophenyl phenyl ether	ug/kg	--	--	--	<1990	<19900
4-Chloro-3-methylphenol	ug/kg	--	--	--	<2660	<26500
4-Chloroaniline	ug/kg	--	--	--	<1990	<19900
4-Chlorophenyl-phenylether	ug/kg	--	--	--	<1990	<19900
4-Nitroaniline	ug/kg	--	--	--	<1990	<19900
4-Nitrophenol	ug/kg	--	--	--	<1990	<19900
Acenaphthene	ug/kg	--	--	--	<199	<1990
Acenaphthylene	ug/kg	--	--	--	<199	<1990

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ANALYTE	UNITS	TTLIC	WET Leachate Testing Trigger ^a	TCLP Leachate Testing Trigger ^b	RESULT ^c	RESULT ^c
Acetophenone	ug/kg	--	--	--	<1990	<19900
Aniline	ug/kg	--	--	--	<1990	<19900
Anthracene	ug/kg	--	--	--	<199	<1990
Atrazine	ug/kg	--	--	--	<2660	<26500
Benzaldehyde	ug/kg	--	--	--	<1990	<19900
Benzidine	ug/kg	10,000	--	--	<1990	<19900
Benzo(a)anthracene	ug/kg	--	--	--	<199	<1990
Benzo(a)pyrene	ug/kg	--	--	--	<199	<1990
Benzo(b)fluoranthene	ug/kg	--	--	--	<199	<1990
Benzo(ghi)perylene	ug/kg	--	--	--	<199	<1990
Benzo(k)fluoranthene	ug/kg	--	--	--	<199	<1990
Benzoic acid	ug/kg	--	--	--	<3320	<33100
Benzyl alcohol	ug/kg	--	--	--	<1990	<19900
bis(2-Chloroethoxy)methane	ug/kg	--	--	--	<1990	<19900
Bis(2-chloroethyl)ether	ug/kg	--	--	--	<1990	<19900
bis(2-Chloroisopropyl)ether	ug/kg	--	--	--	<1990	<19900
bis(2-Ethylhexyl) phthalate	ug/kg	--	--	--	<1990	<19900
Butyl benzyl phthalate	ug/kg	--	--	--	<1990	<19900
Caprolactam	ug/kg	--	--	--	<1990	<19900
Carbazole	ug/kg	--	--	--	<199	<1990
Chrysene	ug/kg	--	--	--	<199	<1990
Dibenzo(a,h)anthracene	ug/kg	--	--	--	<199	<1990
Dibenzofuran	ug/kg	--	--	--	<1990	<19900
Diethyl phthalate	ug/kg	--	--	--	<1990	<19900
Dimethyl phthalate	ug/kg	--	--	--	<1990	<19900
Di-n-butyl phthalate	ug/kg	--	--	--	<1990	<19900
Di-n-octyl phthalate	ug/kg	--	--	--	<1990	<19900
Diphenylamine	ug/kg	--	--	--	<1990	<19900
Fluoranthene	ug/kg	--	--	--	<199	<1990
Fluorene	ug/kg	--	--	--	<199	<1990
Hexachlorobenzene	ug/kg	--	--	2,600	<1990	<19900
Hexachlorobutadiene	ug/kg	--	--	10,000	<1990	<19900
Hexachlorocyclopentadiene	ug/kg	--	--	--	<1990	<19900
Hexachloroethane	ug/kg	--	--	60,000	<1990	<19900
Indeno(1,2,3-cd)pyrene	ug/kg	--	--	--	<199	<1990
Isophorone	ug/kg	--	--	--	<1990	<19900
m,p-Cresols	ug/kg	--	--	4,000,000	<1990	<19900
Naphthalene	ug/kg	--	--	--	<199	<1990
Nitrobenzene	ug/kg	--	--	40,000	<1990	<19900
N-Methyl-N-nitrosomethylamine	ug/kg	--	--	--	<1990	<19900
N-Nitroso-di-n-propylamine	ug/kg	--	--	--	<1990	<19900
o-Cresol	ug/kg	--	--	4,000,000	<1990	<19900

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ANALYTE	UNITS	TTLIC	WET Leachate Testing Trigger ^a	TCLP Leachate Testing Trigger ^b	RESULT ^c	RESULT ^c
p-(Dimethylamino)azobenzene	ug/kg	--	--	--	<1990	<19900
Pentachlorophenol	ug/kg	17,000	17,000	2,000,000	<1990	<19900
Phenanthrene	ug/kg	--	--	--	<199	3180
Phenol	ug/kg	--	--	--	<1990	<19900
Pyrene	ug/kg	--	--	--	<199	<1990
Pyridine	ug/kg	--	--	100	<1990	<19900
RADIONUCLIDES	--	--	--	--	R	R

Notes:

--" - not analyzed / not applicable

< - Analyte not detected at or above the stated method detection limit.

^a - WET Leachate Testing Trigger = STLC limit * 10

^b - TCLP Leachate Testing Trigger = TCLP limit * 20

^c Waste characterization sample results not validated

ug/kg - micrograms per kilogram

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

R - Radiological analysis performed on sample. Boeing has prepared a separate document that provides the radiological results and compares them to the draft provisional DTSC look-up table (LUT) values in order to determine if soil exceeds background as required for the NASA/DTSC Administrative Order on Consent (AOC).