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Closure Report for Underground Storage Tank 141-R3U1 and Its Associated Underground Piping

March 1994

Authors

**B. J. Mallon
R. G. Blake**

MASTER

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Closure Report for Underground Storage Tank 141-R3U1 and its Associated Underground Piping

Background

Underground storage tank (UST) 141-42R at Lawrence Livermore National Laboratory (LLNL), was registered with the State Water Resources Control Board on June 27, 1984. UST 141-42R was subsequently renamed UST 141-R3U1 (Fig. A-1, Appendix A). This tank system consisted of a concrete tank, lined with polyvinyl chloride (PVC), and approximately 100 feet of PVC underground piping. UST 141-R3U1 had a capacity of 450 gallons. The underground piping connected three floor drains and one sink inside Building 141 to UST 141-R3U1 (Fig. A-2, Appendix A). The wastewater collected in UST 141-R3U1 contained organic solvents, metals, and inorganic acids.

On November 30, 1987, the 141-R3U1 tank system failed a precision tank test performed by Gary Peters Enterprises (Appendix B). The 141-R3U1 tank system was subsequently emptied and removed from service pending further precision tests to determine the location of the leak within the tank system. A precision tank test on February 5, 1988, was performed to confirm the November 30, 1987, test, and is also included in Appendix B. Four additional precision tests were performed on this tank system between February 25, 1988, and March 6, 1988. The leak was located where the inlet piping from Building 141 penetrates the concrete side of UST 141-R3U1. The volume of wastewater that entered the backfill and soil around and/or beneath UST 141-R3U1 is unknown. On December 13, 1989, the LLNL Environmental Restoration Division (ERD) submitted a plan to close UST 141-R3U1 and its associated piping to the Alameda County Department of Environmental Health (ACDEH) (Appendix C). UST 141-R3U1 was closed as an UST, and shall be used instead as additional secondary containment for two aboveground storage tanks (ASTs), AST 141-R3O1 and AST 141-R3O2.

A list of the contractors and LLNL departments associated with this project is as follows:

- LLNL Plant Operations: PVC tank liner removal, concrete tank floor hole coring, and pipe system and tank floor grouting.
- LLNL Environmental Safety and Health Team 3 (ES&H3): work site evaluation and confined space entry permitting.
- LLNL Hazardous Waste Management (HWM): hazardous waste manifest preparation.
- LLNL ERD: closure plan preparation, regulatory agency interface, sample collection and closure report preparation.
- MP Environmental, Bakersfield, California: hazardous waste hauler.
- U.S. Pollution Control, Inc. (USPCI), Clive, Utah: hazardous waste disposal facility.
- Clayton Environmental Consultants, Inc., Pleasanton, California: laboratory analysis of liquid, swipe, sludge, and soil samples.

- Brown & Caldwell Analytical, Emeryville, California: laboratory analysis of soil samples.

Soil Sampling and Analysis (May 4, 1990)

On May 4, 1990, ERD personnel collected two soil samples beneath the UST 141-R3U1 inlet piping. See Fig. A-3 (Appendix A) for the soil sample locations. Soil samples were submitted to Brown & Caldwell Analytical for volatile organics and semivolatile organic analysis and Clayton Environmental Consultants, Inc., for Soluable Threshold Limit Concentration (STLC) metals analysis. The laboratory analytical results for these two soil samples are summarized in Table 1 and included in Appendix D.

Table 1. Analytes, EPA method numbers, laboratory analytical results, and detection limits used for the analysis of soil samples collected beneath the UST 141-R3U1 inlet piping on May 4, 1990.

Soil sample U141-R3U1-W1S-0.5U			
Analyte	EPA method number	Laboratory analytical results mg/kg	Detection limit mg/kg
ND	8240/8270	NA	NA
Soil sample U141-R3U1-W1S-1U			
Analyte	EPA method number	Laboratory analytical results (STLC) mg/L	Detection limit mg/L
Antimony	6010	<0.1	0.1
Arsenic	7060	<0.1	0.05
Barium	6010	4.8	0.1
Beryllium	6010	<0.05	0.05
Cadmium	6010	<0.05	0.05
Chromium	6010	0.3	0.1
Cobalt	6010	0.3	0.1
Copper	6010	2.4	0.1
Lead	6010	0.6	0.1
Mercury	7470	<0.01	0.01
Molybdenum	6010	<0.1	0.1
Nickel	6010	0.9	0.1
Selenium	7740	<0.05	0.05
Silver	6010	<0.1	0.1
Thallium	6010	<0.1	0.2
Vanadium	6010	0.2	0.1
Zinc	6010	2.0	0.1
Analyte	EPA method number	Laboratory analytical results mg/kg	Detection limit mg/kg
ND	8240/8270	NA	NA

NOTE:

mg/L = milligrams per liter.

NA = Not applicable.

ND = None Detected.

STLC = Soluable Threshold Limit Concentrations.

These results show that the soil samples collected beneath the UST 141-R3U1 inlet piping were below the STLC limits for the analytes in Title 22 California Code of Regulations (CCR) 66261.24.

UST Characterization for Closure

Liquid Sampling and Analysis

Figure A-2 (Appendix A) is a diagram of the configuration of the 141-R3U1 tank system. On November 5, 1991, ERD personnel determined that the PVC tank liner had failed. ERD personnel removed all of the liquid (approximately one liter) that was between the PVC tank liner and the concrete tank, and submitted a sample of the liquid to Clayton Environmental Consultants, Inc. for laboratory analysis. The laboratory analytical results for this liquid sample are summarized in Table 2, and included in Appendix D.

Table 2. Analytes, EPA method numbers, laboratory analytical results, and detection limits used for the analysis of liquid samples collected between the PVC tank liner and the concrete tank on November 5, 1991.

Liquid Sample U141-R3U1-SC			
Analyte	EPA method number	Laboratory analytical results (STLC) mg/L	Detection limit mg/L
Antimony	6010	<0.1	0.1
Arsenic	7060	<0.1	0.1
Barium	6010	0.4	0.1
Beryllium	6010	<0.05	0.05
Cadmium	6010	<0.05	0.05
Chromium	6010	0.9	0.1
Cobalt	6010	<0.1	0.1
Copper	6010	<0.1	0.1
Cyanide	335.2	<0.01	0.01
Fluoride	340.2	3.4	0.05
Lead	6010	<0.1	0.1
Mercury	7470	<0.01	0.01
Molybdenum	6010	<0.1	0.1
Nickel	6010	<0.1	0.1
Selenium	7740	<0.2	0.2
Silver	6010	<0.1	0.1
Thallium	6010	<0.2	0.2
Vanadium	6010	<0.1	0.1
Zinc	6010	<0.1	0.1

NOTE:

mg/L = milligrams per liter.

These results showed that the liquid sample collected between the PVC tank liner and the concrete tank was below the STLC limits for the analytes in 22 CCR 66261.24.

PVC Tank Liner Disposal

In December, 1991, ERD personnel removed the PVC tank liner from UST 141-R3U1. Based on generator knowledge, the PVC tank liner was disposed of as hazardous waste by MP Environmental to the USPCI site in Clive, Utah, on May 29, 1992. The Uniform Hazardous Waste Manifest for the disposal of this waste is included as Appendix E.

UST 141-R3U1 Sludge Sampling and Analysis

On December 16, 1991, ERD personnel found approximately 3 liters of sludge that was between the PVC tank liner and UST 141-R3U1. The sludge was sampled and submitted to Clayton Environmental Consultants, Inc., for laboratory analysis. The laboratory analytical results for this sludge sample are summarized in Table 3, and included in Appendix D.

Table 3. Analytes, EPA method numbers, laboratory analytical results, and detection limits used for the analysis of sludge collected from the concrete tank on December 16, 1991.

Sludge sample U141-R3U1-SC-SLUDGE			
Analyte	EPA method number	Laboratory analytical results (TTLC) mg/kg	Detection limit mg/kg
Antimony	6010	3	1
Arsenic	7060	5	1
Barium	6010	190	1
Beryllium	6010	0.2	0.1
Cadmium	6010	4.2	0.1
Chromium	6010	160	1
Cobalt	6010	34	1
Copper	6010	8,500	1
Cyanide	9010	0.3	0.3
Lead	6010	1,600	1
Mercury	7470	0.5	0.1
Molybdenum	6010	<1	1
Nickel	6010	300	1
Selenium	7740	<1	1
Silver	6010	5	0.5
Thallium	6010	<1	1
Vanadium	6010	10	1
Zinc	6010	460	1
Analyte	EPA method number	Laboratory analytical results mg/kg	Detection limit mg/kg
Naphthalene	8270	1.2	0.2

NOTE:

TTLC = Total Threshold Limit Concentration

mg/kg = milligrams per kilogram

These results showed that the sludge sample collected from the concrete tank was above the TTLC (Total Threshold Limit Concentration) limits for copper and lead in 22 CCR 66261.24. This sludge was disposed of with the PVC tank liner as hazardous waste, per the Uniform Hazardous Waste Manifest included as Appendix E.

UST 141-R3U1 Swipe Sampling and Analysis

On December 16, 1991, and after the sludge was removed from UST 141-R3U1, swipe samples from UST 141-R3U1 were taken to verify the cleanliness of the sludge removal

operation. Swipe samples were submitted to Clayton Environmental Consultants, Inc., for laboratory analysis. The laboratory analytical results for these swipe samples are summarized in Table 4 and included in Appendix D.

Table 4. Analytes, EPA method numbers, laboratory analytical results and detection limits used for the analysis of swipe samples collected from UST 141-R3U1 on December 16, 1991.

Swipe sample U141-SC-BO-PST-12:00			
Analyte	EPA method number	Laboratory analytical results mg/wipe	Detection limit mg/wipe
Antimony	6010	<0.003	0.003
Arsenic	6010	<0.003	0.003
Barium	6010	0.018	0.003
Beryllium	6010	<0.002	0.002
Cadmium	6010	<0.003	0.003
Chromium	6010	0.015	0.007
Cobalt	6010	<0.007	0.007
Copper	6010	0.29	0.007
Cyanide	9010	<0.003	0.003
Lead	6010	0.12	0.003
Mercury	OSHA ID145	<0.0001	0.0001
Molybdenum	6010	<0.003	0.003
Nickel	6010	0.020	0.007
Selenium	6010	<0.007	0.007
Silver	6010	<0.007	0.007
Thallium	6010	<0.02	0.02
Vanadium	6010	<0.007	0.007
Zinc	6010	0.029	0.007
Bis-(2-ethylhexyl)phthalate	8270	0.020	0.010

Table 4. (Continued)

Swipe sample U141-SC-NO-PST-12:00			
Analyte	EPA method number	Laboratory analytical results mg/wipe	Detection limit mg/wipe
Antimony	6010	<0.003	0.003
Arsenic	6010	<0.003	0.003
Barium	6010	0.021	0.003
Beryllium	6010	<0.002	0.002
Cadmium	6010	<0.003	0.003
Chromium	6010	0.039	0.007
Cobalt	6010	<0.007	0.007
Copper	6010	1.4	0.007
Cyanide	9010	<0.003	0.003
Lead	6010	0.31	0.003
Mercury	OSHA ID145	<0.0001	0.0001
Molybdenum	6010	<0.003	0.003
Nickel	6010	0.029	0.007
Selenium	6010	<0.007	0.007
Silver	6010	<0.007	0.007
Thallium	6010	<0.02	0.02
Vanadium	6010	<0.007	0.007
Zinc	6010	0.072	0.007
ND	8270	NA	NA

These results of the swipe samples from the walls of UST 141-R3U1 were used by ES&H3 to evaluate UST 141-R3U1 as a confined space for worker entry. The walls of UST 141-R3U1 were considered clean enough by ES&H3 to allow for confined space entry for soil sample collection below the tank.

Soil Sampling and Analysis (February 4, 1992)

In January, 1992, Labor Shop personnel cored through the concrete floor of UST 141-R3U1. On February 4, 1992, ERD personnel collected one soil sample beneath UST 141-R3U1. See Fig. A-3 (Appendix A) for the soil sample locations. Soil samples were submitted to Clayton Environmental Consultants, Inc., for laboratory analysis. The laboratory analytical results for this soil sample are summarized in Table 5 and included in Appendix D.

Table 5. Analytes, EPA method numbers, laboratory analytical results and detection limits used for the analysis of the soil sample collected beneath UST 141-R3U1 on February 4, 1992.

Soil sample U141-R3U1-BO-6.5U			
Analyte	EPA method number	Laboratory analytical results (STLC) mg/L	Detection limit mg/L
Antimony	6010	<0.1	0.1
Arsenic	7060	0.05	0.05
Barium	6010	9.5	0.1
Beryllium	6010	<0.05	0.05
Cadmium	6010	<0.05	0.05
Chromium	6010	0.1	0.1
Cobalt	6010	1.0	0.1
Copper	6010	0.3	0.1
Lead	6010	<0.1	0.1
Mercury	7470	<0.01	0.01
Molybdenum	6010	<0.1	0.1
Nickel	6010	0.5	0.1
Selenium	7740	<0.05	0.05
Silver	6010	<0.1	0.1
Thallium	6010	<0.2	0.2
Vanadium	6010	0.2	0.1
Zinc	6010	0.5	0.1
Analyte	EPA method number	Laboratory analytical results mg/kg	Detection limit mg/kg
ND	8010/8020	NA	NA

Note:

mg/L = milligrams per liter

ND = None Detected

These results showed that the soil sample collected from 6.5 ft beneath UST 141-R3U1 was below the limits for the analytes in 22 CCR 66261.24.

On June 27, 1992, ERD personnel oversaw the closure in place of the UST 141-R3U1 piping system by Plant Operations personnel. A slurry of portland cement, bentonite, and water was poured into all accessible portions of the piping system through standpipes, until the slurry level stabilized within the piping system. This slurry was left to harden for 72 hours before the piping system standpipes were removed. The soil sample collection hole in the bottom of UST 141-R3U1 was sealed shut with concrete and finished flush with the existing floor.

Conclusions

The analytical results of the soil samples were evaluated by LLNL ERD and compared to the 22 CCR 66261.24 STLC and TTLC values. Based upon the laboratory analytical results of the soil samples collected during tank closure, the soil beneath the UST 141-R3U1 and the underground piping inlet is nonhazardous. We therefore request that this closure report be used

by the ACDEH to grant a conditional case closure status for the 141-R3U1 tank system. A State Water Resources Control Board Underground Storage Tank Permit Application-Form B shall be completed and sent to the ACDEH within 2 weeks of the submittal of this closure report.

Appendix A

Figures

Figure A-1. Location map for underground storage tank 141-R3U1 at Lawrence Livermore National Laboratory, Livermore, California.

ERD-LSR-92-0262

Figure A-2. Plan view of the 141-R3U1 tank system.

ERD-LSR-92-0263

Figure A-3. Location of the soil sample collection points for the closure of underground storage tank 141-R3U1.

Appendix B

**Precision Tank Test Data from
November 30, 1987, and February 5, 1988**

GARY PETERS ENTERPRISES
11300 Coloma Road, B-7
Rancho Cordova, California 95670
(916) 638-7198

Date: 11/30/87
Ref #: 871110GP

DAVE CASTRO
U.C.L.L.N.L.
P.O.BOX 808 L-193
LIVERMORE, CA. 94550

Dear DAVE CASTRO:

We tested the storage tank(s) at LAWRENCE LIVERMORE LAB, TANK #141-41R/42R/43R, LIVERMORE, on 11/10/87 using the Tank Audit LEAK COMPUTER in accordance with the precision test requirements of NFPA 329-1983 and Section 2643 of the California Underground Tank Regulations (Aug, 1985). The criteria for acceptable tank integrity allowed by these documents is based upon a detection limit of 0.05 gal/hr and a consideration of other variable factors.

The results of the tests are given below and indicate whether the tanks and/or piping passed or failed the integrity criteria. Any piping that was tested only included that which is attached to the tank up to a pump or a check/control valve. The test level at which the tank and piping passed is given in inches above the bottom of the tank. *APP*

<u>Tank</u> <u>(gal)</u>	<u>Grade</u>	<u>Tank and</u> <u>Piping</u>	<u>Tank</u> <u>only</u>
450	SOLVENT RINSE	FAIL @ 60	PASS
450	CHROMATE RINSE	PASS @ 60	PASS
450	ACID RINSE	FAIL @ 60	PASS

A copy of the data is attached.

Sincerely,

GARY PETERS ENTERPRISES

By:

Enclosures

```

      TSC: 10      A = AMB: 63.755 F      V = LIQ VOLUME  >  < = 0.1 GAL
      M = MID T      B = BOT T      L = AVG LEAK 30 CYCLES
      T = TOP T
      FD 7.5
      T = TOP T
      AVG

```

**AUG
LEAK
RATE**

[illegible]

DATA CONSTANTS

TEST FLUID: WATER COE: .000115 DENSITY: -

TANK

```

10  A = AMB: 83.4444 L = AVG LEAK 30 CYCLES
M = MID T      B = BOT T

```

**AUG
LEAK
RATE**

E
GAL[illegible]

DATA CONSTANTS

ST FLUID: WATER

COE: .000115

DENSITY: 1.0

U = LIQ VOLUME > < = 0.1 GAL
L = AVG LEAK 30 CYCLES

[illegible]

DATA CONSTANTS

EST FLUID: WATER COE: 0.000115 DENSITY: 1.0

A RECORD: 871110GP.B04 FOR 450 GALLON CHROMATE RINSE TANK

7.5 TSC: 10 A = AMB: 57.3795 F
TOP T M = MID T B = BOT T

V = LIQ VOLUME > < = 0.1 GAL
L = AVG LEAK 30 CYCLES

												AVG LEAK RATE	
IE	GAL												
5	2.9500	B					ML			A		<	-0.02 9.99
		B				M	L			A		<	
4	2.9497	B					L	M		A		V	0.00 0.02
		B					L			M	A		<
3	2.9500	B					L			M	A		<
		B					L		M		A		<
.2	2.9499	B					L	M			A		<
		B					L		M		A		V
.1	2.9499	B					L			M	A		<
		B					L	M			A		<
.0	2.9499	B					L			M	A		<
		B					L			M	A		<
.9	2.9499	B					L			M	A		<
		B					L	M			A		<
.8	2.9498	B					L		M		A		V
		B					L	M			A		V
.7	2.9498	B					M	L			A		V
		B					L	M			A		V
.6	2.9498	B					L		M		A		V
		B					L		M		A		V
.5	2.9498	B					L	M			A		V
		B					L		M		A		V
.4	2.9496	B					L		M		A		V
		B					L		M		A		V
.3	2.9496	B					M	L			A		V
		B					L				A		V
.2	2.9498	B					L		M		A		V
		B					L		M		A		V
.2	2.9491	B					L		M		A		V
		B					L		M		A		V
.1	2.9492	B					L		M		A		V
		B					L		M		A		V
.0	2.9493	B					M	L			A		V
		B					M	L			A		V
.9	2.9495	B						ML			A		V
		B					M	L			A		V
.8	2.9493	B					M				A		V
		B					M				A		V
.7	2.9495	B						L	M		A		V
		B						L	M		A		V
.6	2.9495	B						L	M		A		V
		B						L	M		A		V
.5	2.9495	B					M	L			A		V

DATA CONSTANTS

ST FLUID: WATER COE: .00015 DENSITY: 1.0

ATA RECORD: 871110GP.C44 FOR 450 GALLON ACID RINSE TANK

FD 7.5 TSC: 10 A = AMB: 65.1545 F
= TOP T M = MID T B = BOT T

V = LIQ VOLUME > < = 0.1 GAL
L = AVG LEAK 30 CYCLES

[illegible]

DATA CONSTANTS

EST FLUID: WATER COE: .000115 DENSITY: 1.0

GARY PETERS ENTERPRISES
11300 COLOMA RD. B-7
RANCHO CORDOVA, CA. 95670
916-638-7198

DAVE CASTRO
U.C.L.L.N.L.
P.O. BOX 808 L193
LIVERMORE, CA. 94550

DATE 11-10-87

TEST # 8711106P

The tanks indicated below were tested, using the Tank Audit LEAK COMPUTER, in accordance with the precision test requirements of NFPA 329-1983 and Section 2643 of the California Underground Tank Regulations (Aug. 1985). The criteria for acceptable tank integrity allowed by these documents is based upon a detection limit of 0.05 gal/hr and a consideration of other variable factors.

Tank #1:	Type <i>SOLVENT RINSE</i>	Leak Rate: <i>0.37 GPH</i>
	ID # <i>MH-41R</i>	% Error : <i>0.03</i>
	Test Level: <i>60"</i>	Gals. : <i>450</i>
		<i>above Bottom</i>
Tank #2:	Type <i>CHROMATE RINSE</i>	Leak Rate: <i>0.00</i>
	ID # <i>141-42R</i>	% Error : <i>0.00</i>
	Test Level: <i>60"</i>	Gals. : <i>450</i>
		<i>above Bottom</i>
Tank #3:	Type <i>ACID RINSE</i>	Leak Rate: <i>3.58</i>
	ID # <i>141-43R</i>	% Error : <i>2.00</i>
	Test Level: <i>60"</i>	Gals. : <i>450</i>
		<i>above Bottom</i>
Tank #4:	Type	Leak Rate:
	ID #	% Error :
	Test Level:	Gals. :
		<i>above</i>
Tank #5:	Type	Leak Rate:
	ID #	% Error :
	Test Level:	Gals. :
		<i>above</i>
Tank #6:	Type	Leak Rate:
	ID #	% Error :
	Test Level:	Gals. :
		<i>above</i>

Gary Peters

GARY PETERS ENTERPRISES
11300 COLOMA RD. B-7
RANCHO CORDOVA, CA. 95670
916-638-7198

Date: 2-5-88
Ref. #: 880205GP

To: DAVE CASTRO
U.C.L.L.N.L.
P.O.BOX 808 L-193
LIVERMORE, CA. 94550

Test location: TANK #141-41R & 141-43R
2

On 2-5-88 testing was completed, using the Tank Audit LEAK COMPUTER in accordance with the precision test requirements of NFPA 329-1983 and Section 2643 of the California Underground Tank Regulations (Aug. 1985). The criteria for acceptable tank integrity allowed by these documents is based upon a detection limit of 0.05 gal/hr and a consideration of other variable factors.

Tank	gals.	contents	level	leak rate	tank	tank+ pipes
141-41R	450	SOLVENT RINSE	46"	.01GPH	PASS	N/A
141-43R	450	ACID RINSE	56"	3.44GPH	FAIL	N/A

1
2

A copy of the data is attached.

Sincerely

GARY PETERS ENT.

STATION IDENTIFICATION: 880205GP.ID

Customer:

JE CASTRO
S.L.L.N.L.
P.O. BOX 808 L-193
LIVERMORE
94550

Station Address:

LLNL
TANK #141-31S/31A
LIVERMORE
CA.

423-7556

Tank Size:

Grade:

Tank+Piping:

Tank only:

50
50

SOLVENT RINSE
ACID RINSE

UNK. @ 46
UNK. @ 56

PASS
FAIL

0
0

TANK #1 *Solvent* LEAK RATE 0.01
PERCENT ERROR 0.01

TANK #2 *Acid* LEAK RATE 3.44
PERCENT ERROR 4.60

SHORT TEST - GOES DRY

TANK #3 LEAK RATE _____
PERCENT ERROR _____

TANK #4 LEAK RATE _____
PERCENT ERROR _____

TANK #5 LEAK RATE _____
PERCENT ERROR _____

TANK #6 LEAK RATE _____
PERCENT ERROR _____

TEST FLUID: WATER COE: :00115 DENSITY: 1.0

IA RECORD: 880205GP.A58 FOR 450 GALLON SOLVENT RINSE TANK

7.5 TSC: 10 A = AMB: 55.358 F
TOP T M = MID T B = BOT T

V = LIQ VOLUME > < = 0.1 GAL
L = AVG LEAK 30 CYCLES

TIME	GAL											AUG LEAK RATE		
.0	2.9140	V									M	<	0.01	9.99
1.3	2.9138	T									M	<	0.01	0.01
1.6	2.9105	T									M	<	0.05	0.03
7.9	2.9102	T									M	<	0.03	0.03
3.2	2.9104	T									M	<	0.02	0.03
2.4	2.9102	T									M	<	0.02	0.02
1.7	2.9102	T									M	<	0.02	0.02
7.0	2.9103	T									M	<	0.02	0.02
7.2	2.9103	T									M	<	0.01	0.02
1.5	2.9106	T									M	<	0.01	0.02
3.7	2.9107	T									M	<	0.01	0.02
6.0	2.9106	T									M	<	0.01	0.02
8.3	2.9109	T									M	<	0.01	0.02
0.5	2.9105	T									M	<	0.01	0.02
2.8	2.9082	T									M	<	0.01	0.02
5.0	2.9086	T									M	<	0.01	0.02
7.3	2.9079	T									M	<	0.01	0.02
9.6	2.9071	T									M	<	0.01	0.01
1.8	2.9079	T									M	<	0.01	0.01
4.1	2.9090	T									M	<	0.00	0.01
6.3	2.9095	T									M	<	0.00	0.01
8.6	2.9091	T									M	<	0.00	0.01
10.8	2.9087	T									M	<	0.00	0.01
13.1	2.9084	T									M	<	0.01	0.01
15.4	2.9091	T									M	<	0.00	0.01
17.6	2.9082	T									M	<	0.01	0.01
19.9	2.9069	T									M	<	0.01	0.01

DATA CONSTANTS

ST FLUID: WATER COE: 0.00115 DENSITY: 1.0

Appendix C

Permit Application to Close Underground Piping Associated with UST 141-R3U1

Lawrence Livermore National Laboratory

December 13, 1989

Mr. Rafat Shahid
Hazardous Materials Division
Department of Environmental Health
80 Swan Way, Suite 200
Oakland, CA 94621

Attention: Lowell Miller

Dear Mr. Shahid:

Enclosed you will find three copies of an application for a permit to close piping connected to an underground sump at the Lawrence Livermore National Laboratory (LLNL) in Livermore, California. Also enclosed is a check in the amount of \$333.00 for the review and processing of the submitted plan. The piping connects the printed circuit board shop in Building 141 to sump 141-R3U1 (registered with the State Water Resources Control Board as 141-42R). The approximately 45 feet of piping will be closed in place because it is beneath the building. The piping carried acidic rinsewater to 450 gallon sump 141-R3U1. A leak has been found in the sump where the piping enters it. The sump has been taken out of service and above ground piping installed to bypass it. The leak will be repaired in the sump. After repair and environmental cleanup, the sump will be used only as secondary containment. The sump area is protected from rainfall and other means of spreading contamination.

The accompanying appendices have been enclosed to assist you in overseeing this project:

Appendix A:	Location Maps
Appendix B:	Typical Analysis of Acid Holding Sump
Appendix C:	Operational Safety Procedure
Appendix D:	Supplemental Information
Appendix E:	Precision Test Results

LLNL has scheduled sampling during December and January. The extent of potential environmental contamination and cleanup required are unknown at this time. The project will be completed within six months if no contamination or readily excavated contamination is encountered. Further time (a year or more) will be necessary if a large excavation is required because of the large amount of other sumps and equipment in the area.

Sincerely,

Richard C. Ragaini
Department Head
Environmental Protection Department

cc: J. Cullen, DOE/LLNL
R. Duazo, RWQCB
M. Kamiya, DOE/SAN
D. Whyte, RWQCB

Mr. Rafat Shahid
Hazardous Materials Division
December 13, 1989

bcc: A. J. Boegel
L. Cleland
S. Coleman
J. Copland
C. DeGrange
M. Dresen
K. Graham
C. Grandfield
M. Gross
F. Hoffman
B. Isherwood
B. Mallon
B. McConachie
D. Rice
B. Thompson
R. Thorpe

ALAMEDA COUNTY HEALTH CARE SERVICES AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH
HAZARDOUS MATERIALS DIVISION
470 - 27th STREET, ROOM 322
OAKLAND, CA 94612
PHONE NO. 415/874-7237

UNDERGROUND TANK CLOSURE/MODIFICATION PLANS

1. Business Name Lawrence Livermore National Laboratory
Business Owner University of California → Dept of Energy ^{per Jan Tulk 9/130}
2. Site Address 7000 East Avenue
City Livermore Zip 94550 Phone (415) 422-5167
3. Mailing Address P. O. Box 808, L-193
City Livermore Zip 94550 Phone (415) 422-5167
4. Land Owner U. S. Government Department of Energy
Address 1333 Broadway City, State Oakland, CA Zip 94612
5. EPA I.D. No. CA 2890012584
6. Contractor Lawrence Livermore National Laboratory
Address P.O. Box 808, L-654
City Livermore Phone (415) 422-3463
License Type General ID # DOE Prime Contractor #W740548
7. Other (specify) N/A
Address _____
City _____ Phone _____
8. Contact Person for Investigation _____
Name William F. Isherwood Title Project Leader, Livermore
Phone (415) 423-5058
9. Total No. of Tanks at facility 15 Four are underground. One was closed in 1981 and it is sand filled. The other two are tested leak-tight. This plan concerns the fourth.

10. Have permit applications for all tanks been submitted to this office?

Yes [X] No []

Eleven are above ground and do not require permits.

11. State Registered Hazardous Waste Transporters/Facilities (M.P. Vacuum may be substituted by contractors listed on the next page)

a) Product/Waste Transporter

Name M. P. Vacuum Truck Service EPA I.D. No. CAT00624247

Address 175 Ray Street

City Bakersfield State CA Zip 93308

b) Rinsate Transporter

Name M. P. Vacuum Truck Service EPA I.D. No. CAT00624247

Address 175 Ray Street

City Bakersfield State CA Zip 93308

c) Tank Transporter (if any removed)

Name M. P. Vacuum Truck Service EPA I.D. No. CAT00624247

Address 175 Ray Street

City Bakersfield State CA Zip 93308

d) Tank Disposal Site

Name H&H Ship Repair Service EPA I.D. No. CAD004771168

Address 220 China Basin

City San Francisco State CA Zip 94107

e) Contaminated Soil Transporter (if necessary)

Name M. P. Vacuum Truck Service EPA I.D. No. CAT00624247

Address 175 Ray Street

City Bakersfield State CA Zip 93308

Contractors

ID #

MP Vacuum Truck Service
175 Ray Street
Bakersfield, CA 93308

EPA # CAT000624247

ENSCO Environmental Services, Inc.
41674 Christy Street
Fremont, CA 94538

EPA# CAD980815054

US Pollution Control, Inc.
14080 Slover Avenue
Fontana, CA 92335

EPA# ETD991301748

International Technology Corp.
1680 Rogers Avenue
San Jose, CA 95112

EPA# CAD982373664

12. Sample Collector _____

Name A geologist from:

Company Weiss Associates

Address 2938 McClure

City Oakland State CA Zip 94609 Phone (415) 465-1100

13. Sampling Information for each tank or area.

Tank or Area		Material Sampled	Location & Depth
Capacity	Historic Contents (past 5 years)	Soil Water	Beneath and close to sump. 1 foot into fill. Native soil below fill. 5 feet deep in native soil. Further sampling based on the results. Pipe rinsate.
450 gallon	Acid solutions containing copper and lead. Occasionally zinc and chromium.		

14. Have tanks or pipes leaked in the past? Yes [X] No []

If yes, describe. Leak is above the liquid level in the tank during normal operation

(See Appendix E)

15. NFPA methods used for rendering tank inert? Yes [] No []

If yes, describe. N/A

16. Laboratories (for metals and solvents) (additional laboratories on next page)

Name Brown and Caldwell

Address 1255 Powell Street

City Emeryville State CA Zip 94608

State Certification No. 104

17. Chemical Methods to be used for Analyzing Samples.

Contaminant Sought	EPA, DHS, or Other Sample Preparation Method Number	EPA, DHS, or Other Analysis Number
Solvents in soil Solvents in water (sump) Metals in soil Gross Alpha, Beta in water	EPA method 5030 EPA method 3510 CAM WET Preparation	EPA 8010/8020 EPA 601 and one 624/625 CAM Metals STLC EPA 200 Series Metals TMA In-house Procedure EPA 9310

18. Site Safety Plan submitted? Yes ☒ No ☐

19. Workman's Compensation? Yes ☒ No ☐

Copy of Certificate enclosed? Yes ☐ No ☒

Name of Insurer Self-Insured

20. Plot Plan submitted? Yes ☒ No ☐

21. Deposit enclosed? Yes ☒ No ☐

22. Please forward to this office the following information within 60 days after receipt of sample results.

- a) Chain of Custody Sheets
- b) Original Signed Laboratory reports
- c) TSD to Generator copies of wastes shipped and received
- d) Attachment A Summarizing laboratory results

16. (cont.)

Laboratory for Radiation

TMA-Norcal
2030 Wright Avenue
Richmond, CA 94804
(415) 235-2633

License to receive and handle radioactive materials: 0023-07.

Additional Laboratory for Metals and Solvents:

Clayton Environmental Consultants
1252 Quarry Lane
Pleasanton, CA 94566
(415) 426-6000

State Certification No. 163.

I declare that, to the best of my knowledge and belief, the statements and information provided above are correct and true. I understand that information in addition to that provided above may be needed in order to obtain an approval from the Department of Environmental Health and that no work is to begin on this project until this plan is approved.

I understand that any changes in design, materials, or equipment will void this plan if prior approval is not obtained.

I will notify the Department of Environmental Health at least two (2) working days (48 hours) in advance to schedule any required inspections. I understand that site and worker safety are solely the responsibility of the property owner or his agent and that this responsibility is not shared nor assumed by the County of Alameda.

Signature of Contractor

Name (please type) N/A

Signature _____

Date _____

Signature of Site Owner or Operator

Name (please type) Richard C. Ragaini, Environmental Protection Department Head

Signature Richard C. Ragaini

Date 12-18-89

NOTES:

1. Any changes in this document must be approved by this Department.
2. Any leaks discovered must be submitted to this office on an underground storage tank unauthorized leak/contamination site report form within 5 days of its discovery.
3. Three (3) copies of this plan must be submitted to this Department. One copy must be at the construction site at all times.
4. A copy of your approved plan must be sent to the landowner.

APPENDIX A: Location Maps

Site Location Map
VOCs in Soil in Building 141 Area Map
Piping to be Closed in Place

A-1
A-2
A-3

Figure 1. Site map for the Building 141 sump modification and piping closure at Lawrence Livermore National Laboratory. Locations of nearby ground water monitoring wells are shown. Depth to ground water in the Building 141 is approximately 65 feet.

Figure 3. Acid lab rinsewater piping to be closed in place at Building 141.

APPENDIX B: Typical Analysis of Acid Holding Tank

Table 1. Concentration ranges of hazardous substances measured in 1,500-gallon tank filled with material passed through sump 141-42R at Building 141— 1987 to 1989.

Measured Quantity	Range	Sewer Limit Metal Finishing
		LLNL ^a mg/l
Copper	7.5 - 47.0 mg/l	2.0
Lead	1.9 - 13.8 mg/l	0.4
Zinc	0.18 - 6.7 mg/l	1.4
Chromium	0.18 - 3.38 mg/l	1.0
pH	2.2 - 3.8	5.0 - 10.0
Alpha	0.0012 -0.022 nCi/l	0.3 nCi/l
Beta	0.0036 - 1.5 nCi/l	3.0 nCi/l

^aRequirements for discharge to sanitary sewer for metal finishing rinsewater at LLNL.

APPENDIX C: Operational Safety Procedures and Hazards Analysis

Lawrence Livermore National Laboratory

**Operational Safety Procedure
No. L-46**

**Effective: 11/89
Expires: 11/90
Hazard Level B**

TITLE: REMOVAL OF SOIL AND MATERIALS AT BUILDING 141 POSSIBLY CONTAMINATED WITH COPPER, LEAD, CHROMIUM, AND ZINC.

REASON FOR ISSUE: "Health and Safety" operation involves potential dangers to life and health. Hazards associated with removal of possibly contaminated soil and materials.

RESPONSIBILITIES: I. C. Hand, Ext. 3-0486 and Jerry Duarte, Ext. 3-2638 (Alternate: Frank W. Lopez, Ext. 3-0486) ^{are} responsible for implementing the controls set forth in this safety procedure and in other applicable Laboratory safety standards and for the safety of this operation.

LOCATION: East side of Building 141.

WORK TO BE DONE: Removal of contaminated materials associated with underground storage tank. The junction between the sump, 141-R3U1, and the piping has been shown to leak. Soil is possibly contaminated with copper, lead, chromium, and zinc. This soil will be sampled by Environmental Restoration Division (ERD) personnel. Any soil found to have associated contamination will be excavated and removed by Plant Engineering and disposed of by Hazardous Waste Management (HWM).

HAZARDOUS MATERIALS INVOLVED: Soil and materials possibly contaminated with metals (copper, chromium, lead, and zinc) at low pH.

HAZARDS ANALYSIS: The hazardous materials involved present the following health hazards:

- Copper - The primary routes of exposure are through inhalation, ingestion, or eye contact.
- Lead - The primary routes of exposure are through inhalation, ingestion, or contact.
- Chromium - The primary routes of exposure are through inhalation and contact of the insoluble salts and inhalation and ingestion of the metal and insoluble salts.
- Zinc - The primary routes of exposure expected is through inhalation of zinc oxide dust.

-2-

CRITICALITY: The unit described is a Type N/A Criticality hazards (Ref. N/A).

CONTROLS:

1. Before excavation begins, all residual liquid will be drained out of the piping system from clean-outs located at the lowest possible level and will be collected as hazardous waste. All auxiliary piping leading to the main line will be capped off. The tank will be cleaned and decontaminated before tank entry. The two (2) above-ground storage acid waste storage tanks will be emptied. The below ground tank 141-R3U1 will be cleaned by one of the blanket order contracts held by Hazardous Waste Management.
2. If entry into the tank is required, all operational controls of confined space entry into underground tanks, Safety Supplement 26.14, will be enforced immediately. Hazards Control will be contacted to check for flammability and oxygen deficiency and toxicity prior to tank entry.
3. Barricades and flashers shall be placed around all open pits and trenches with a maximum separation of 10 feet staggered on either side. The excavation walls will be sloped 45° or shored prior to any personnel entry into the excavation. Personnel not directly involved in excavation activities will remain at least 10 feet away from the edge of the excavation.
4. Excavated soil/debris shall be stockpiled on plastic. In the event of inclement weather, all excavations and soil piles will be covered with plastic tarps to prevent ponding and runoff from possibly contaminated materials.
5. Typical dust suppression methods, such as soil misting, will be used to ensure that the concentration of dust particles in the air does not exceed the 10 mg/m³ nuisance dust limit.
6. All personnel ~~will~~^{must} wear the following protective equipment: hard hat, steel-toed boots, safety glasses, gloves, and cotton or tyvek coveralls ~~must be worn~~. If gloves or clothing become contaminated, they will be discarded as hazardous waste. Hearing protection is required for jackhammering.
7. In the event of a spill of unexpected residual liquid from the piping during removal operations, the Environmental Analyst, Brad Thomson, will be notified immediately by calling Ext. 3-2535 or by radio paging 3-7777-4266.
8. All contaminated materials removed during the operation will be handled and disposed of as hazardous waste through HWM via established disposal procedures (i.e., waste characterization and preparation of a waste disposal requisition).
9. Equipment used during the operation will be properly decontaminated by HWM when the operation is completed.

Operational Safety Procedure
No. L-46

Effective: 11/89
Review: 11/90
Hazards Level: B

- 3 -

10. Personnel involved in the removal of soil and materials must have the following training:

HS-1 New Employee Safety Orientation
HS-405 Health Hazard Communication

This OSP has been reviewed and approved by:

RESPONSIBLE INDIVIDUAL
John C. Hand
Supervisor Labor Shop
Maintenance Operations Dept.
Plant Engineering

HAZARDS CONTROL
Steve Leeds
Safety Team Leader
Operation Safety Division
Hazards Control

- AUTHORIZING INDIVIDUAL
Bernard G. Mattimore
Department Head
Maintenance/Operation Dept.
Plant Engineering

RESPONSIBLE INDIVIDUAL
Gerald Duarte
Livermore Site Restoration Group
Site Safety Officer
Environmental Restoration Division

DISTRIBUTION:

Duarte, Jerry	L-453
Eneidi, Walt	L-692
Fry, Laurlee	L-692
Halunan, Lois	L-384
Hand, Johnny	L-606
Krause, Wayne	L-373
Leahy, Ed	L-349
Leeds, Steve	L-692
Lopez, Frank	L-606
Mallon, Barbara	L-453
Ray, Jerry	L-692
Sierecki, Ken	L-384
Thomson, Brad	L-634

OSP L-46:sw

HAZARDS ANALYSIS: The hazardous materials involved present the following health hazards:

- Copper - The primary routes of exposure are through inhalation, ingestion, or eye contact. The threshold limit values for copper fume is 0.2 mg/m³ and 1.0 mg/m³ for copper dust.
- Lead - The primary routes of exposure are through inhalation, ingestion, and contact. The threshold limit value is 0.05 mg/m³ for airborne dust.
- Chromium - The primary routes of exposure are through inhalation and contact of the insoluble salts and inhalation and ingestion of the metal and insoluble salts. The threshold limit values are different depending on the oxidation state of chromium. They range from 0.5 mg/m³ for chromium metal, chromium (II), and chromium (III) compounds, to 0.05 mg/m³ for chromium (VI) compounds. The latter is a carcinogen.
- Zinc - The primary route of exposure expected is through inhalation of zinc oxide dust. The threshold limit value for this exposure is 5 mg/m³.

APPENDIX D: Supplemental Information

A leak was discovered in Sump 141-42R at the junction of the piping and the sump in February 1988. The sump collected metal-bearing acid rinsewater. An alarm notified the operator that the sump needed to be emptied. This level was below the leak site. Unfortunately, the liquid has reached the level of the leak before the contents were pumped. (The leak may have developed after these overfills.) The sump contents were then pumped to two, 1500-gallon, above-ground storage tanks. These temporary holding tanks were sampled and emptied approximately once a month and handled appropriately. Above-ground piping has been installed that bypasses the sump and the sump has been taken out of service. When repairs and any needed environmental cleanup are complete, the sump will be returned to service as part of the secondary containment for the two above-ground tanks.

The analyses of the samples from the above-ground tanks showed concentrations of copper, lead, and acid. Chromium and zinc concentrations were occasionally measured as well. Radiation limits were near background (see Appendix B). An analysis of the sludge in the bottom of the sump showed high concentrations of copper, lead, and chromium in January of 1989.

We attempted to sample in the fill beneath the location where the pipe enters the sump, but found the pipe and surrounding area encased in concrete. Alternative sampling methods to evaluate the extent of any contamination resulting from 141-42R leak are being evaluated. Some type of drilling through the concrete to sample native soil beneath and near the leak site will be done. This is a difficult task because of the confines of the location. Further sampling will be dependent on the results of this sampling to minimize the amount of excavated, contaminated soil until the extent of contamination is found. Contaminated soil and piping will be disposed of appropriately; i.e., if it is hazardous waste, it will be properly labeled and disposed of at a Class 1 landfill. Because of the time required, lack of further migration potential of this contamination, and more immediate contamination problems, work on this project may take up to a year.

Volatile organic compounds (VOCs) are not expected to have been released as a result of rinsewater received by sump 141-42R. However, soil gas surveys are being done in the area in connection with possible soil contamination resulting from the United States Navy's usage of the LLNL site during the 1940's. The Navy cleaned aircraft engines with solvents and the resulting contamination sources are being investigated as part of another project. The enclosed site soil gas survey map (A-2) indicates some contamination in the vicinity of the pipe leak. This is being investigated.

There is no evidence of ground water contamination in the analyses of water samples taken from wells located approximately 700 feet downgradient of the leak location see site figures one [(1) and two (2)]. Samples taken from the first

water-bearing zone at 64.5 to 71 feet of monitor well 218 showed normal background metal concentrations. The tetrachloroethylene (TCE) found was probably the result of other releases from the U.S. Navy's use of the site in the 1940's that are currently being investigated separately. Ground water flows west in this vicinity. A closer well, 175 feet due west of the sump, sampled the third water-bearing zone, 107 to 113 feet. Measured TCE concentrations in this well were from <0.05 to 95µg/L during the past two years. These analyses showed similar concentrations of copper and chromium to other wells at the Livermore site indicating no contamination from the acid rinsewater sump.

If any metals were released as a result of the leaks in 141-42R movement of contamination would be minimal. IF review of metal contaminant migration in regard to the impact on ground water quality by the quality of wastewater used for ground water recharge, Chang and Page¹ noted that most soils showed high effectiveness in removing trace metals from percolating waters. The metals may be retained for a long period of time before breakthrough to the ground water takes place. Migration of contamination from the leak in the piping at sump 141-42R, is additionally prevented because the area is protected from rainfall by cover, and runoff from other sources is prevented by berms.

Piping to be closed in place will be triple rinsed and the rinsate analyzed from the third rinse. The piping will be pressure grouted with Portland cement and capped.

A notice will be placed in the deed of the property describing:

- 1) the exact areal and vertical location of the piping,
- 2) the hazardous substances contained,
- 3) the closure method.

¹Chang, A. C., and A. L. Page (1980), "Fate of Inorganic Micro-Contaminants During Groundwater Recharge," in *Wastewater Reuse for Groundwater Recharge*, T. Asano and P.V. Roberts (Eds.), State Water Resources Control Board, Sacramento, Ca., NTIS/PB82-229063, pp. 118-136.

Appendix D

Laboratory Analytical Results and Chain of Custody Records

Analytical Report

LOG NO: E90-05-190

Received: 04 MAY 90

Reported: 15 MAY 90

Mr. Bill Isherwood
UC Lawrence Livermore National Lab
P.O. Box 808, Mail Stop L528
Livermore, California 94550
CC: Mr. Mike Dresen

Purchase Order: 5539000

Project: TC-013

REPORT OF ANALYTICAL RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED	
05-190-1	U141-R3U1-WIS-1U		
05-190-2	U141-R3U1-WIS-.5U		
PARAMETER		05-190-1	05-190-2
B/N,A Ext.Pri.Poll. (EPA-8270)		05.11.90	05.11.90
Date Analyzed		05.07.90	05.07.90
Date Extracted		10	1
Dilution Factor, Times		<0.3	<0.03
1,2,4-Trichlorobenzene, mg/kg		<0.3	<0.03
1,2-Dichlorobenzene, mg/kg		<0.3	<0.03
1,2-Diphenylhydrazine, mg/kg		<0.3	<0.03
1,3-Dichlorobenzene, mg/kg		<0.3	<0.03
1,4-Dichlorobenzene, mg/kg		<0.3	<0.03
2,4,6-Trichlorophenol, mg/kg		<0.3	<0.03
2,4-Dichlorophenol, mg/kg		<0.3	<0.03
2,4-Dimethylphenol, mg/kg		<3	<0.3
2,4-Dinitrophenol, mg/kg		<0.3	<0.03
2,4-Dinitrotoluene, mg/kg		<0.3	<0.03
2,6-Dinitrotoluene, mg/kg		<0.3	<0.03
2-Chloronaphthalene, mg/kg		<0.3	<0.03
2-Chlorophenol, mg/kg		<0.3	<0.03
2-Methyl-4,6-dinitrophenol, mg/kg		<0.3	<0.03
2-Nitrophenol, mg/kg		<0.3	<0.03
3,3'-Dichlorobenzidine, mg/kg		<0.3	<0.03
4-Bromophenylphenylether, mg/kg		<0.3	<0.03
4-Chloro-3-methylphenol, mg/kg		<0.3	<0.03
4-Chlorophenylphenylether, mg/kg		<7	<0.7
4-Nitrophenol, mg/kg		<0.3	<0.03
Acenaphthene, mg/kg		<0.3	<0.03
Acenaphthylene, mg/kg			

Analytical Report

LOG NO: E90-05-190

Received: 04 MAY 90

Reported: 15 MAY 90

Mr. Bill Isherwood
UC Lawrence Livermore National Lab
P.O. Box 808, Mail Stop L528
Livermore, California 94550
CC: Mr. Mike Dresen

Purchase Order: 5539000

Project: TC-013

REPORT OF ANALYTICAL RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED	
05-190-1	U141-R3U1-WIS-1U		
05-190-2	U141-R3U1-WIS-.5U		
PARAMETER		05-190-1	05-190-2
Anthracene, mg/kg		<0.3	<0.03
Benzidine, mg/kg		<10	<1
Benzo(a)anthracene, mg/kg		<0.3	<0.03
Benzo(a)pyrene, mg/kg		<0.3	<0.03
Benzo(b)fluoranthene, mg/kg		<0.3	<0.03
Benzo(g,h,i)perylene, mg/kg		<0.3	<0.03
Benzo(k)fluoranthene, mg/kg		<0.3	<0.03
Butylbenzylphthalate, mg/kg		<0.3	<0.03
Chrysene, mg/kg		<0.3	<0.03
Di-n-octylphthalate, mg/kg		<0.3	<0.03
Dibenzo(a,h)anthracene, mg/kg		<0.3	<0.03
Dibutylphthalate, mg/kg		<0.3	<0.03
Diethylphthalate, mg/kg		<0.3	<0.03
Dimethylphthalate, mg/kg		<0.3	<0.03
Fluoranthene, mg/kg		<0.3	<0.03
Fluorene, mg/kg		<0.3	<0.03
Hexachlorobenzene, mg/kg		<0.3	<0.03
Hexachlorobutadiene, mg/kg		<0.3	<0.03
Hexachlorocyclopentadiene, mg/kg		<0.3	<0.03
Hexachloroethane, mg/kg		<0.3	<0.03
Indeno(1,2,3-c,d)pyrene, mg/kg		<0.3	<0.03
Isophorone, mg/kg		<0.3	<0.03
N-Nitrosodimethylamine, mg/kg		<0.3	<0.03
N-Nitrosodiphenylamine, mg/kg		<0.3	<0.03
N-Nitrosodi-n-propylamine, mg/kg		<0.3	<0.03
Nitrobenzene, mg/kg		<0.3	<0.03

Analytical Report

LOG NO: E90-05-190

Received: 04 MAY 90

Reported: 15 MAY 90

Mr. Bill Isherwood
UC Lawrence Livermore National Lab
P.O. Box 808, Mail Stop L528
Livermore, California 94550

Purchase Order: 5539000

CC: Mr. Mike Dresen

Project: TC-013

REPORT OF ANALYTICAL RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED	
05-190-1	U141-R3U1-WIS-1U		
05-190-2	U141-R3U1-WIS-.5U		
PARAMETER		05-190-1	05-190-2
Naphthalene, mg/kg		<0.3	<0.03
Phenanthrene, mg/kg		<0.3	<0.03
Phenol, mg/kg		<0.3	<0.03
Pentachlorophenol, mg/kg		<0.3	<0.03
Pyrene, mg/kg		<0.3	<0.03
Bis(2-chloroethoxy)methane, mg/kg		<0.3	<0.03
Bis(2-chloroethyl)ether, mg/kg		<0.3	<0.03
Bis(2-chloroisopropyl)ether, mg/kg		<0.3	<0.03
Bis(2-ethylhexyl)phthalate, mg/kg		<30	<3
Semi-Quantified Results **			
C20-C35 Hydrocarbon Matrix, mg/kg		300	40

** Quantification based upon comparison of total ion count of the compound with that of the nearest internal standard.

Analytical Report

LOG NO: E90-05-190

Received: 04 MAY 90

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Mr. Bill Isherwood
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Project: TC-013

REPORT OF ANALYTICAL RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED	
05-190-1	U141-R3U1-WIS-1U		
05-190-2	U141-R3U1-WIS-.5U		
PARAMETER		05-190-1	05-190-2
Volatile Organics (EPA 8240)			
Date Analyzed		05.08.90	05.08.90
Time Analyzed		07:05	07:36
Analyst ID, No.		7038	7038
Detection Limit, mg/kg		0.2	0.2
Dilution Factor, Times		1	1
Instrument ID, No.		517-03	517-03
1,1,1-Trichloroethane, mg/kg		<0.2	<0.2
1,1,2,2-Tetrachloroethane, mg/kg		<0.2	<0.2
1,1,2-Trichloroethane, mg/kg		<0.2	<0.2
1,1-Dichloroethane, mg/kg		<0.2	<0.2
1,1-Dichloroethene, mg/kg		<0.2	<0.2
1,2-Dichloroethane, mg/kg		<0.2	<0.2
1,2-Dichloroethene (Total), mg/kg		<0.2	<0.2
1,2-Dichloropropane, mg/kg		<0.2	<0.2
1,3-Dichloropropene, mg/kg		<0.2	<0.2
2-Chloroethylvinylether, mg/kg		<0.2	<0.2
2-Hexanone, mg/kg		<2	<2
4-Methyl-2-Pentanone, mg/kg		<2	<2
Acetone, mg/kg		<5	<5
Bromodichloromethane, mg/kg		<0.2	<0.2
Bromomethane, mg/kg		<0.2	<0.2
Benzene, mg/kg		<0.2	<0.2
Bromoform, mg/kg		<0.2	<0.2
Chlorobenzene, mg/kg		<0.2	<0.2
Carbon Tetrachloride, mg/kg		<0.2	<0.2

Analytical Report

LOG NO: E90-05-190

Received: 04 MAY 90

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Mr. Bill Isherwood
UC Lawrence Livermore National Lab
P.O. Box 808, Mail Stop L528
Livermore, California 94550

Purchase Order: 5539000

CC: Mr. Mike Dresen

Project: TC-013

REPORT OF ANALYTICAL RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED	
05-190-1	U141-R3U1-WIS-1U		
05-190-2	U141-R3U1-WIS-.5U		
PARAMETER		05-190-1	05-190-2
Chloroethane, mg/kg		<0.2	<0.2
Chloroform, mg/kg		<0.2	<0.2
Chloromethane, mg/kg		<0.2	<0.2
Carbon Disulfide, mg/kg		<0.2	<0.2
Dibromochloromethane, mg/kg		<0.2	<0.2
Ethylbenzene, mg/kg		<0.2	<0.2
Methyl ethyl ketone, mg/kg		<2	<2
Methylene chloride, mg/kg		<0.2	<0.2
Styrene, mg/kg		<0.2	<0.2
Trichloroethene, mg/kg		<0.2	<0.2
Trichlorofluoromethane, mg/kg		<0.2	<0.2
Toluene, mg/kg		<0.2	<0.2
Tetrachloroethene, mg/kg		<0.2	<0.2
Vinyl acetate, mg/kg		<0.2	<0.2
Vinyl chloride, mg/kg		<0.2	<0.2
Total Xylene Isomers, mg/kg		<0.2	<0.2
cis-1,2-Dichloroethene, mg/kg		<0.2	<0.2
trans-1,2-Dichloroethene, mg/kg		<0.2	<0.2
trans-1,3-Dichloropropene, mg/kg		<0.2	<0.2

Hedy J. Ficklin
Sim D. Lessley Ph.D., Laboratory Director

1255 Powell Street
Emeryville, CA 94608

415/428-2300
Fax: 415/547-3643

Lawrence Livermore
National Laboratory
ENVIRONMENTAL RESTORATION
DIVISION, L-528
P.O. Box 808, Livermore, California 94550

Chain-of-Custody Record
and Analytic Instructions

Page 1 of 1 pages

Chain-of-Custody Doc. Number TC-013
Analytical Laboratory Log Number 900551010
Analytical Laboratory Name Brown + Caldwell

Analysis Requestor / Data Recipient (circle one):
☒ W. Isherwood-1
☐ W. Isherwood-2
☐ A. Lamarre-1
☐ A. Lamarre-2
 cc: Henry cc: McIlvride cc: Henry

Sampled By J. Duarte Company Name LLNL

Site and Technical Information Codes	Sampling Date	Sample/ Container Type ²	Number of Containers	Analyze/ Hold ³	Analysis & Turnaround Required ¹						Remarks
					ETA	BRAD	SPAD	BRAD			
U141-R341-W15-14	5/4/90	S T	2	A	F	F					-1
U141-R341-W15-.54	5/4/90	S T	1	A	F	F					-2

Signature	Company	Date	Time
Relinquished by <u>J. Duarte</u>	<u>LLNL</u>	<u>5-4-90</u>	
Received by <u>J. Ruff</u>	<u>BCA</u>	<u>5/4/90</u>	
Relinquished by <u>J. Ruff</u>	<u>BCA</u>	<u>5/4/90</u>	<u>1710</u>
Received by <u>Monika D.</u>	<u>BCA</u>	<u>5-4-90</u>	<u>1710</u>
Relinquished by			

1. N = Normal Turnaround, F = 1-Week Turnaround,
R = 24-Hour Turnaround.

2. Sample Type Codes: W = Water, S = Soil,
O = Other (specify).
Container Type Codes: V = VOA Bottle, P = Plastic Bottle,
G = Glass Bottle, T = Brass Tube, B = Bag,
O = Other (specify).

3. Analyze/Hold: A = Analyze, HOLD (spell out) =
DO NOT ANALYZE UNLESS REQUESTED.

Western Operations

1252 Quarry Lane
Pleasanton, CA 94566
(415) 426-2600
Fax (415) 426-0106

Clayton
ENVIRONMENTAL
CONSULTANTS

May 15, 1990

Mr. William Isherwood
LAWRENCE LIVERMORE NATIONAL LABORATORY
P.O. Box 808, L-528
Livermore, CA 94550

Client Ref. No. 5520400
Work Order No. 9005049
Lab Client Code 76226
Chain-of-Custody Doc. No. TC-013

Dear Mr. Isherwood:

Attached is our analytical laboratory and quality assurance report for the samples received on May 4, 1990. A copy of the Chain-of-Custody form acknowledging receipt of these samples is attached.

Please note that any unused portion of the samples will be disposed of 30 days after the date of this report, unless you have requested otherwise.

We appreciate the opportunity to be of assistance to you. If you have any questions, please contact Maryann Gambino, Client Services Representative, at (415) 426-2657.

Sincerely,

Mary D. Beck for
Ronald H. Peters, CIH
Manager, Laboratory Services
Western Operations

RHP/dt
Attachments

cc: Dresen (Weiss Assoc.)
Maureen Ridley (LLNL)
J. Duarte (LLNL)

RECEIVED
MAY 16 1990

ENVIRONMENTAL PROTECTION DEPT.
ENVIRONMENTAL RESTORATION DIV.

RECEIVED
MAY 10 1990

Clayton
ENVIRONMENTAL
CONSULTANTS

ENVIRONMENTAL RESTORATION
ENVIRONMENTAL RESTORATION

Page 2 of 5

SOLUBLE THRESHOLD LIMIT CONCENTRATION ANALYSIS
(STLC)
METALS

Sample I.D.: U141-R3U1-WIS-1U
Sample Received: 05/04/90
Sample Analyzed: See below
Sample Matrix: SOIL

Client: LLNL
Client Ref. No.: 5520400
Lab Client Code: 76226
Lab No.: 9005049-01A

Date Analyzed	Method No.	Analyte	Extract Concentration mg/L	STLC* mg/L	Limit of Detection mg/L
05/11/90	6010	Antimony	<0.1	15	0.1
05/11/90	6010	Arsenic	<0.1	5.0	0.1
05/11/90	6010	Barium	4.8	100	0.1
05/11/90	6010	Beryllium	<0.05	0.75	0.05
05/11/90	6010	Cadmium	<0.05	1.0	0.05
NA	7196	Chromium VI	NA	5	0.1
05/11/90	6010	Chromium	0.3	560	0.1
05/11/90	6010	Cobalt	0.3	80	0.1
05/11/90	6010	Copper	2.4	25	0.1
05/11/90	6010	Lead	0.6	5.0	0.1
05/11/90	7470	Mercury	<0.01	0.2	0.01
05/11/90	6010	Molybdenum	<0.1	350	0.1
05/11/90	6010	Nickel	0.9	20	0.1
05/11/90	6010	Selenium	<0.05	1.0	0.05
05/11/90	6010	Silver	<0.1	5	0.1
05/11/90	6010	Thallium	<0.1	7.0	0.1
05/11/90	6010	Vanadium	0.2	24	0.1
05/11/90	6010	Zinc	2.0	250	0.1

*STLC = Soluble Threshold Limit Concentration, 22CAC66693 (CA Title 22).
Sample prepared by Waste Extraction Test, 22CAC66700 (CA Title 22).

< = less than, below limit of detection

NA = Not Analyzed

Western Operations

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(510) 426-2600
Fax (510) 426-0106

Clayton
ENVIRONMENTAL
CONSULTANTS

December 12, 1991

Mr. Jerry Duarte
LAWRENCE LIVERMORE NATIONAL LABORATORY
P. O. Box 808, L-528
Livermore, CA 94550

Client Ref. TC040
Clayton Project No. 91120.50

Dear Mr. Duarte:

Attached is our analytical laboratory report for the samples received on December 5, 1991. A copy of the Chain-of-Custody form acknowledging receipt of these samples is attached.

Please note that any unused portion of the samples will be disposed of 30 days after the date of this report, unless you have requested otherwise.

We appreciate the opportunity to be of assistance to you. If you have any questions, please contact Maryann Gambino, Client Services Supervisor, at (510) 426-2657.

Sincerely,

Ronald H. Peters, CIH
Director, Laboratory Services
Western Operations

RHP/tb
Attachments

cc: Boegel

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC040
Clayton Project No. 91120.50

Sample Identification: U141-R3U1-SC	Date Sampled: 11/05/91
Lab Number: 9112050-01F	Date Received: 12/05/91
Sample Matrix/Media: WATER	Date Analyzed: See below
Analytical Method: See below	

Date Analyzed	Method No.	Analyte	Extract Concentration (mg/L)	STLC* (mg/L)	Limit of Detection (mg/L)
<u>Soluble Threshold Limit Concentration Analysis</u>					
12/09/91	6010	Antimony	<0.1	15	0.1
12/12/91	7060	Arsenic	<0.1	5.0	0.1
12/09/91	6010	Barium	0.4	100	0.1
12/09/91	6010	Beryllium	<0.05	0.75	0.05
12/09/91	6010	Cadmium	<0.05	1.0	0.05
--	7196	Chromium VI	--	5	0.1
12/09/91	6010	Chromium	0.9	560	0.1
12/09/91	6010	Cobalt	<0.1	80	0.1
12/09/91	6010	Copper	<0.1	25	0.1
12/09/91	6010	Lead	<0.1	5.0	0.1
12/09/91	7470	Mercury	<0.01	0.2	0.01
12/09/91	6010	Molybdenum	<0.1	350	0.1
12/09/91	6010	Nickel	<0.1	20	0.1
12/12/91	7740	Selenium	<0.2	1.0	0.2 ^a
12/09/91	6010	Silver	<0.1	5	0.1
12/09/91	6010	Thallium	<0.2	7.0	0.2
12/09/91	6010	Vanadium	<0.1	24	0.1
12/09/91	6010	Zinc	<0.1	250	0.1

< Less than, below limit of detection

-- Information not available or not applicable

*STLC = Soluble Threshold Limit Concentration, 22CAC66693 (CA Title 22).

^a Detection limit increased due to matrix interference

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC040
Clayton Project No. 91120.50

Sample Identification: METHOD BLANK
Lab Number: 9112050-02A
Sample Matrix/Media: WATER
Analytical Method: See below
Date Sampled: --
Date Received: --
Date Analyzed: See below

Date Analyzed	Method No.	Analyte	Extract Concentration (mg/L)	STLC* (mg/L)	Limit of Detection (mg/L)
<u>Soluble Threshold Limit Concentration Analysis</u>					
12/09/91	6010	Antimony	<0.1	15	0.1
12/12/91	7060	Arsenic	<0.1	5.0	0.1
12/09/91	6010	Barium	<0.1	100	0.1
12/09/91	6010	Beryllium	<0.05	0.75	0.05
12/09/91	6010	Cadmium	<0.05	1.0	0.05
--	7196	Chromium VI	--	5	0.1
12/09/91	6010	Chromium	<0.1	560	0.1
12/09/91	6010	Cobalt	<0.1	80	0.1
12/09/91	6010	Copper	<0.1	25	0.1
12/09/91	6010	Lead	<0.1	5.0	0.1
12/09/91	7470	Mercury	<0.01	0.2	0.01
12/09/91	6010	Molybdenum	<0.1	350	0.1
12/09/91	6010	Nickel	<0.1	20	0.1
12/12/91	7740	Selenium	<0.1	1.0	0.1
12/09/91	6010	Silver	<0.1	5	0.1
12/09/91	6010	Thallium	<0.2	7.0	0.2
12/09/91	6010	Vanadium	<0.1	24	0.1
12/09/91	6010	Zinc	<0.1	250	0.1

< Less than, below limit of detection

-- Information not available or not applicable

*STLC = Soluble Threshold Limit Concentration, 22CAC66693 (CA Title 22).

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TCO40
Clayton Project No. 91120.50

Sample Identification: U141-R3U1-SC
Lab Number: 9112050-01
Sample Matrix/Media: WATER

Date Sampled: 11/05/91
Date Received: 12/05/91

Analyte	Concentration	Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Analysis Method
Cyanide, total	<0.01	0.01	mg/L	--	12/09/91	--	EPA 335.2
Fluoride	3.4	0.05	mg/L	--	12/09/91	--	EPA 340.2

ND Not detected at or above limit of detection
< Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TCO40
Clayton Project No. 91120.50

Sample Identification: METHOD BLANK
Lab Number: 9112050-02
Sample Matrix/Media: WATER

Date Sampled: --
Date Received: --

Analyte	Concentration	Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Analysis Method
Cyanide, total	<0.01	0.01	mg/L	--	12/09/91	--	EPA 335.2
Fluoride	<0.05	0.05	mg/L	--	12/09/91	--	EPA 340.2

ND Not detected at or above limit of detection
< Not detected at or above limit of detection
-- Information not available or not applicable

Quality Assurance Results Summary
for
Clayton Project No. 91120.50

Clayton Lab Number: 9112050-01F
Ext./Prep. Method: EPA3010
Date: 12/06/91
Analyst: JSL
Std. Source: VH610140
Sample Matrix/Media: STLC

Analytical Method: EPA6010
Instrument ID: 03891
Date: 12/09/91
Time: 2 :
Analyst: JSL
Units: MG/L

Analyte	Sample Result	Spike Level	Matrix Spike Result	MS Recovery (%)	Matrix Spike Duplicate Result	MSD Recovery (%)	Average Recovery (% R)	LCL (% R)	UCL (% R)	RPD (%)	UCL (%RPD)
ANTIMONY	ND	10.0	10.0	100	10.1	101	101	76	116	1.0	20
BARIUM	0.430	10.0	10.3	99	10.4	100	99	73	113	1.0	20
BERYLLIUM	ND	10.0	10.1	101	10.3	103	102	73	113	2.0	20
CADMIUM	ND	10.0	9.90	99	10.0	100	100	76	116	1.0	20
CHROMIUM	ND	10.0	10.1	101	10.3	103	102	76	116	2.0	20
COBALT	ND	10.0	9.85	99	9.95	100	99	74	114	1.0	20
COPPER	0.910	10.0	10.9	100	11.0	101	100	73	113	0.9	20
LEAD	ND	10.0	10.1	101	10.1	101	101	74	114	0.0	20
MOLYBDENUM	ND	10.0	9.95	100	10.1	101	100	76	116	1.5	20
NICKEL	ND	10.0	9.80	98	9.95	100	99	73	113	1.5	20
SILVER	ND	10.0	10.0	100	10.1	101	101	75	115	1.0	20
THALLIUM	ND	10.0	9.35	94	9.63	96	95	72	112	3.0	20
VANADIUM	ND	10.0	9.95	100	10.0	100	100	74	114	0.5	20
ZINC	ND	10.0	10.5	105	10.5	105	105	80	120	0.0	20

LCS = Laboratory Control Sample
ND = Not detected at or above limit of detection

LCL = Lower Control Limit

UCL = Upper Control Limit
SOR = Spike out of range due to high sample concentration.

Quality Assurance Results Summary
for
Clayton Project No. 91120.50

Clayton Lab Number: 9112026-01A
Ext./Prep. Method: 3020
Date: 12/09/91
Analyst: HYW
Std. Source: B426141/B904183
Sample Matrix/Media: STLC

Analytical Method: EPA7060 7743
Instrument ID: 07467
Date: 12/12/91
Time: 2 :
Analyst: DS
Units: MG/L

Analyte	Sample Result	Spike Level	Matrix Spike Result	MS Recovery (%)	Matrix Spike Duplicate Result	MSD Recovery (%)	Average Recovery (% R)	LCL (% R)	UCL (% R)	RPD (%)	UCL (MRPD)
ARSENIC	ND	0.400	0.380	95	0.395	99	97	55	127	3.9	20
SELENIUM	ND	0.400	0.174	44	0.185	46	45*	55	121	6.1	20

Note: Due to matrix interference, selenium spike recoveries were out of control limits. Please see post-spike results

Quality Assurance Results Summary
for
Clayton Project No. 91120.50

Clayton Lab Number: 9112026-01A
Ext./Prep. Method: 3020
Date: 12/09/91
Analyst: HYW
Std. Source: B426141/B904183
Sample Matrix/Media: STLC

Analytical Method: EPA7060 7740
Instrument ID: 07467
Date: 12/12/91
Time: 2 :
Analyst: DS
Units: MG/L

Analyte	Sample Result	Spike Level	Matrix Spike Result	MS Recovery (%)	Matrix Spike Duplicate Result	MSD Recovery (%)	Average Recovery (% R)	LCL (% R)	UCL (% R)	RPD (%)	UCL (%RPD)
ARSENIC	ND	0.400	0.375	94	0.396	99	96	55	127	5.4	20
SELENIUM	ND	0.400	0.317	79	0.336	84	82	55	121	6.0	20

Note: Post-spike on 2x diluted sample.

LCS = Laboratory Control Sample
ND = Not detected at or above limit of detection

LCL = Lower Control Limit

UCL = Upper Control Limit
SOR = Spike out of range due to high sample concentration.

Quality Assurance Results Summary
for
Clayton Project No. 91020.50

Clayton Lab Number: 9112050-01F
Ext./Prep. Method: EPA7470
Date: 12/06/91
Analyst: JSL
Std. Source: BAKER #6934-1
Sample Matrix/Media: STLC

Analytical Method: EPA7470
Instrument ID: 05583
Date: 12/09/91
Time: 2 :
Analyst: JSL
Units: MG/L

Analyte	Sample Result	Spike Level	Matrix Spike Result	MS Recovery (%)	Matrix Spike Duplicate Result	MSD Recovery (%)	Average Recovery (% R)	LCL (% R)	UCL (% R)	RPD (%)	UCL (%RPD)
MERCURY	ND	0.100	0.0980	98	0.0980	98	98	68	123	0.0	20

Quality Assurance Results Summary
for
Clayton Project No. 91120.50

Clayton Lab Number: 9111227-01A
Ext./Prep. Method: EPA340.2
Date: 12/09/91
Analyst: LUZ
Std. Source: ORION 940907
Sample Matrix/Media: WATER

Analytical Method: EPA340.2
Instrument ID: 03892
Date: 12/09/91
Time: 2 :
Analyst: LUZ
Units: MG/L

Analyte	Sample Result	Spike Level	Matrix Spike Result	MS Recovery (%)	Matrix Spike Duplicate Result	MSD Recovery (%)	Average Recovery (% R)	LCL (% R)	UCL (% R)	RPD (%)	UCL (%RPD)
FLUORIDE	0.0824	1.00	0.912	83	0.916	83	83	75	125	0.4	20

LCS = Laboratory Control Sample
ND = Not detected at or above limit of detection

LCL = Lower Control Limit

UCL = Upper Control Limit
SOR = Spike out of range due to high sample concentration.

Quality Assurance Results Summary
for
Clayton Project No. 91120.50

Clayton Lab Number: 9112022-01A
Ext./Prep. Method: EPA335.2
Date: 12/06/91
Analyst: HYW
Std. Source: BAKER #3080-1
Sample Matrix/Media: WATER

Analytical Method: EPA335.2
Instrument ID: 07487
Date: 12/09/91
Time: 2 :
Analyst: HYW
Units: MG/L

Analyte	Sample Result	Spike Level	Matrix Spike Result	MS Recovery (%)	Matrix Spike Duplicate Result	MSD Recovery (%)	Average Recovery (% R)	LCL (% R)	UCL (% R)	RPD (%)	UCL (%RPD)
CYANIDE	ND	0.400	0.430	107	0.432	108	108	75	122	0.7	20

**Lawrence Livermore
National Laboratory**
ENVIRONMENTAL RESTORATION
DIVISION, L-528
P.O. Box 808, Livermore, California 94550

**Chain-of-Custody Record
and Analytic Instructions**

Chain-of-Custody Doc. Number

Analytical Laboratory Log Number

Analytical Laboratory Name

CLAYTON

Analysis Requestor / Data Recipient (circle one):

W. Isherwood-1 W. Isherwood-2 W. Isherwood-3 A. Lamarre-1 A. Lamarre-2 A. Lamarre-3
cc: Dresen cc: Mallon cc: Boegel cc: Ferry cc: Henry cc: Boegel

Sampled By KIM KAWAGUCHI Company Name LLNL

Site and Technical Information Codes	Sampling Date	Sample/ Container Type ²	Number of Containers	Analyze/ Hold ³	Analysis & Turnaround Required ¹						Remarks
					CYANIDE	STAL	MECL	FLUORINE	Fluoride	per gms bottle	
U141-R3U1-SC	11-5-91	W V	5	A	R			R			AD SAMPLES
U141-R3U1-SC	11-5-91	W P	1	A		R					RUSH

5xrad

PIL

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>LLNL</u>	<u>11-5-91</u>	<u>3:45</u>
Received by <u>[Signature]</u>	<u>Priority Express</u>	<u>12-5-91</u>	<u>17:15</u>
Relinquished by <u>[Signature]</u>	<u>"</u>	<u>12-5-91</u>	<u>17:50</u>
Received by <u>[Signature]</u>	<u>Clayton</u>	<u>12/5/91</u>	<u>5:50</u>
Relinquished by			
Received by			

1. N = Normal Turnaround, F = 1-Week Turnaround,
R = 24-Hour Turnaround.

2. Sample Type Codes: W = Water, S = Soil, VPR = Vapor,
O = Other (specify).
Container Type Codes: V = VOA Bottle, P = Plastic Bottle,
G = Glass Bottle, T = Brass Tube, B = Bag,
O = Other (specify).

3. Analyze/Hold: A = Analyze, HOLD (spell out) =
DO NOT ANALYZE UNLESS REQUESTED.

Western Operations

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(510) 426-2600
Fax (510) 426-0106

Clayton
ENVIRONMENTAL
CONSULTANTS

December 20, 1991

Mr. Jerry Duarte
LAWRENCE LIVERMORE NATIONAL LABORATORY
P. O. Box 808, L-528
Livermore, CA 94550

Client Ref. TC-042
Clayton Project No. 91121.56

Dear Mr. Duarte:

Attached is our analytical laboratory report for the samples received on December 16, 1991. A copy of the Chain-of-Custody form acknowledging receipt of these samples is attached.

Please note that any unused portion of the samples will be disposed of 30 days after the date of this report, unless you have requested otherwise.

We appreciate the opportunity to be of assistance to you. If you have any questions, please contact Maryann Gambino, Client Services Supervisor, at (510) 426-2657.

Sincerely,

Ronald H. Peters, CIH
Director, Laboratory Services
Western Operations

RHP/tb
Attachments

cc: Boegel

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification: U141-R3U1-SC-SLUDGE Date Sampled: 12/16/91
Lab Number: 9112156-01A Date Received: 12/16/91
Sample Matrix/Media: SLUDGE Date Analyzed: See below
Analytical Method: See below

Date Analyzed	Method No.	Analyte	Sample Concentration (mg/kg)	STLC* (mg/L)	TTLC** (mg/kg)	Limit of Detection (mg/kg)
<u>Total Threshold Limit Concentration Analysis</u>						
12/18/91	6010	Antimony	3	15	500	1
12/18/91	6010	Arsenic	5	5.0	500	1
12/18/91	6010	Barium	190	100	10,000	1
12/18/91	6010	Beryllium	0.2	0.75	75	0.1
12/18/91	6010	Cadmium	4.2	1.0	100	0.1
--	7196	Chromium VI	--	5	500	1
12/18/91	6010	Chromium	160	560	2,500	1
12/18/91	6010	Cobalt	34	80	8,000	1
12/18/91	6010	Copper	8,500	25	2,500	1
12/18/91	6010	Lead	1,600	5.0	1,000	1
12/19/91	7471	Mercury	0.5	0.2	20	0.1
12/18/91	6010	Molybdenum	<1	350	3,500	1
12/18/91	6010	Nickel	300	20	2,000	1
12/18/91	6010	Selenium	<1	1.0	100	1
12/18/91	6010	Silver	5.0	5	500	0.5
12/18/91	6010	Thallium	<1	7.0	700	1
12/18/91	6010	Vanadium	10	24	2,400	1
12/18/91	6010	Zinc	460	250	5,000	1

< Less than, below limit of detection

-- Information not available or not applicable

* STLC = Soluble Threshold Limit Concentration, 22CAC66693 (CA Title 22).

**TTLC = Total Threshold Limit Concentration, 22CAC66693 (CA Title 22), reported on wet weight basis.

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification: METHOD BLANK Date Sampled: --
Lab Number: 9112156-07A Date Received: --
Sample Matrix/Media: SLUDGE Date Analyzed: See below
Analytical Method: See below

Date Analyzed	Method No.	Analyte	Sample Concentration (mg/kg)	STLC* (mg/L)	TTLC** (mg/kg)	Limit of Detection (mg/kg)
<u>Total Threshold Limit Concentration Analysis</u>						
12/18/91	6010	Antimony	<1	15	500	1
12/18/91	6010	Arsenic	<1	5.0	500	1
12/18/91	6010	Barium	<1	100	10,000	1
12/18/91	6010	Beryllium	<0.1	0.75	75	0.1
12/18/91	6010	Cadmium	<0.1	1.0	100	0.1
--	7196	Chromium VI	--	5	500	1
12/18/91	6010	Chromium	<1	560	2,500	1
12/18/91	6010	Cobalt	<1	80	8,000	1
12/18/91	6010	Copper	<1	25	2,500	1
12/18/91	6010	Lead	<1	5.0	1,000	1
12/19/91	7471	Mercury	<0.1	0.2	20	0.1
12/18/91	6010	Molybdenum	<1	350	3,500	1
12/18/91	6010	Nickel	<1	20	2,000	1
12/18/91	6010	Selenium	<1	1.0	100	1
12/18/91	6010	Silver	<0.5	5	500	0.5
12/18/91	6010	Thallium	<1	7.0	700	1
12/18/91	6010	Vanadium	<1	24	2,400	1
12/18/91	6010	Zinc	<1	250	5,000	1

< Less than, below limit of detection

-- Information not available or not applicable

* STLC = Soluble Threshold Limit Concentration, 22CAC66693 (CA Title 22).

**TTLC = Total Threshold Limit Concentration, 22CAC66693 (CA Title 22), reported on wet weight basis.

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification: U141-R3U1-SC-SLUDGE
Lab Number: 9112156-01
Sample Matrix/Media: SLUDGE

Date Sampled: 12/16/91
Date Received: 12/16/91

Analyte	Concentration	Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Analysis Method
Total Cyanide	0.3	0.3	mg/kg	--	12/18/91	--	EPA 9010

ND Not detected at or above limit of detection
< Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification: METHOD BLANK
Lab Number: 9112156-07
Sample Matrix/Media: SLUDGE

Date Sampled: --
Date Received: --

Analyte	Concentration	Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Analysis Method
Total Cyanide	<0.3	0.3	mg/kg	--	12/18/91	--	EPA 9010

ND Not detected at or above limit of detection
< Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-R3U1-SC-SLUDGE	Date Sampled:	12/16/91
Lab Number:	9112156-01A	Date Received:	12/16/91
Sample Matrix/Media:	SLUDGE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Acid Extractables</u>			
Phenol	108-95-2	ND	0.2
2-chlorophenol	95-57-8	ND	0.2
2-methyl phenol	95-48-7	ND	0.2
4-methyl phenol	106-44-5	ND	0.2
2-nitrophenol	88-75-5	ND	0.2
2,4-dimethylphenol	105-67-9	ND	0.2
2,4-dichlorophenol	120-83-2	ND	0.2
4-chloro-3-methylphenol	59-50-7	ND	0.2
2,4,5-trichlorophenol	95-95-4	ND	0.2
2,4,6-trichlorophenol	88-06-2	ND	0.2
2,4-dinitrophenol	51-28-5	ND	1
4-nitrophenol	100-02-7	ND	1
2-methyl-4,6-dinitrophenol	534-52-1	ND	0.2
Pentachlorophenol	87-86-5	ND	0.2

Base/Neutral Extractables

Bis(2-chloroethyl)ether	111-44-4	ND	0.2
1,3-dichlorobenzene	541-73-7	ND	0.2
1,4-dichlorobenzene	106-46-7	ND	0.2
1,2-dichlorobenzene	95-50-1	ND	0.2
Bis-(2-chloroisopropyl)ether	108-60-1	ND	0.2
N-nitrosodi-n-propylamine	621-64-7	ND	0.2

ND Not detected at or above limit of detection
 -- Information not available or not applicable
 Results are reported on a wet weight basis, as received

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-R3U1-SC-SLUDGE	Date Sampled:	12/16/91
Lab Number:	9112156-01A	Date Received:	12/16/91
Sample Matrix/Media:	SLUDGE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Base/Neutral Extractables (continued)</u>			
Hexachloroethane	67-72-1	ND	0.2
Nitrobenzene	98-95-3	ND	0.2
Isophorone	78-59-1	ND	0.2
Bis-(2-chloroethoxy)methane	111-91-1	ND	0.2
1,2,4-trichlorobenzene	120-82-1	ND	0.2
Naphthalene	91-20-3	1.2	0.2
Hexachlorobutadiene	87-68-3	ND	0.2
2-chloronaphthalene	91-58-7	ND	0.2
2-methyl naphthalene	91-57-6	ND	0.2
4-chloroaniline	106-47-8	ND	1
2-nitroaniline	88-74-4	ND	1
3-nitroaniline	99-09-2	ND	1
4-nitroaniline	100-01-6	ND	1
Hexachlorocyclopentadiene	77-47-4	ND	2
Dimethyl phthalate	131-11-3	ND	0.2
Acenaphthylene	208-96-8	ND	0.2
Acenaphthene	83-32-9	ND	0.2
2,4-dinitrotoluene	121-14-2	ND	0.2
2,6-dinitrotoluene	606-20-2	ND	0.2
Diethyl phthalate	84-66-2	ND	0.2

ND Not detected at or above limit of detection

-- Information not available or not applicable

Results are reported on a wet weight basis, as received

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-R3U1-SC-SLUDGE	Date Sampled:	12/16/91
Lab Number:	9112156-01A	Date Received:	12/16/91
Sample Matrix/Media:	SLUDGE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Base/Neutral Extractables (continued)</u>			
4-chlorophenylphenylether	7005-72-3	ND	0.2
Fluorene	86-73-7	ND	0.2
N-nitrosodiphenylamine	86-30-6	ND	0.2
4-bromophenylphenylether	101-55-3	ND	0.2
Hexachlorobenzene	118-74-1	ND	0.2
Phenanthrene	85-01-8	ND	0.2
Anthracene	120-12-7	ND	0.2
Di-n-butylphthalate	84-74-2	ND	0.2
Fluoranthene	206-44-2	ND	0.2
Benzidine	92-87-5	ND	5
Pyrene	129-00-0	ND	0.2
Benzylbutylphthalate	85-68-7	ND	0.2
3,3'-dichlorobenzidine	91-94-1	ND	5
Benzo(a)anthracene	56-55-3	ND	0.2
Bis-(2-ethylhexyl)phthalate	117-81-7	ND	2
Chrysene	218-01-9	ND	0.4
Di-n-octylphthalate	117-84-0	ND	0.2
Benzo(b)fluoranthene	205-99-2	ND	0.4
Benzo(k)fluoranthene	207-08-9	ND	0.2
Benzo(a)pyrene	50-32-8	ND	0.2

ND Not detected at or above limit of detection

-- Information not available or not applicable

Results are reported on a wet weight basis, as received

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-R3U1-SC-SLUDGE	Date Sampled:	12/16/91
Lab Number:	9112156-01A	Date Received:	12/16/91
Sample Matrix/Media:	SLUDGE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
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Base/Neutral Extractables (continued)

Indeno(1,2,3-cd)pyrene	193-39-5	ND	0.2
Dibenzo(a,h)anthracene	53-70-3	ND	0.2
Benzo(ghi)perylene	191-24-2	ND	0.2

<u>Surrogates</u>		<u>Recovery (%)</u>	<u>QC Limits (%)</u>	
			LCL	UCL
2-Fluorophenol	367-12-4	23*	25	121
Phenol-d6	13127-88-3	17*	24	113
Nitrobenzene-d5	4165-60-0	25	23	120
2-Fluorobiphenyl	321-60-8	27*	30	115
2,4,6-Tribromophenol	118-79-6	28	19	122
Terphenyl-d14	---	18	18	137

ND Not detected at or above limit of detection

-- Information not available or not applicable

Results are reported on a wet weight basis, as received

* Surrogates recovery out of control limits due to matrix interference

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification: METHOD BLANK	Date Sampled: --
Lab Number: 9112156-07A	Date Received: --
Sample Matrix/Media: SLUDGE	Date Extracted: 12/17/91
Extraction Method: EPA 3550	Date Analyzed: 12/17/91
Analytical Method: EPA 8270	

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Acid Extractables</u>			
Phenol	108-95-2	ND	0.2
2-chlorophenol	95-57-8	ND	0.2
2-methyl phenol	95-48-7	ND	0.2
4-methyl phenol	106-44-5	ND	0.2
2-nitrophenol	88-75-5	ND	0.2
2,4-dimethylphenol	105-67-9	ND	0.2
2,4-dichlorophenol	120-83-2	ND	0.2
4-chloro-3-methylphenol	59-50-7	ND	0.2
2,4,5-trichlorophenol	95-95-4	ND	0.2
2,4,6-trichlorophenol	88-06-2	ND	0.2
2,4-dinitrophenol	51-28-5	ND	1
4-nitrophenol	100-02-7	ND	1
2-methyl-4,6-dinitrophenol	534-52-1	ND	0.2
Pentachlorophenol	87-86-5	ND	0.2
<u>Base/Neutral Extractables</u>			
Bis(2-chloroethyl)ether	111-44-4	ND	0.2
1,3-dichlorobenzene	541-73-7	ND	0.2
1,4-dichlorobenzene	106-46-7	ND	0.2
1,2-dichlorobenzene	95-50-1	ND	0.2
Bis-(2-chloroisopropyl)ether	108-60-1	ND	0.2
N-nitrosodi-n-propylamine	621-64-7	ND	0.2

ND Not detected at or above limit of detection
 -- Information not available or not applicable
 Results are reported on a wet weight basis, as received

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9112156-07A	Date Received:	--
Sample Matrix/Media:	SLUDGE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Base/Neutral Extractables (continued)</u>			
Hexachloroethane	67-72-1	ND	0.2
Nitrobenzene	98-95-3	ND	0.2
Isophorone	78-59-1	ND	0.2
Bis-(2-chloroethoxy)methane	111-91-1	ND	0.2
1,2,4-trichlorobenzene	120-82-1	ND	0.2
Naphthalene	91-20-3	ND	0.2
Hexachlorobutadiene	87-68-3	ND	0.2
2-chloronaphthalene	91-58-7	ND	0.2
2-methyl naphthalene	91-57-6	ND	0.2
4-chloroaniline	106-47-8	ND	1
2-nitroaniline	88-74-4	ND	1
3-nitroaniline	99-09-2	ND	1
4-nitroaniline	100-01-6	ND	1
Hexachlorocyclopentadiene	77-47-4	ND	2
Dimethyl phthalate	131-11-3	ND	0.2
Acenaphthylene	208-96-8	ND	0.2
Acenaphthene	83-32-9	ND	0.2
2,4-dinitrotoluene	121-14-2	ND	0.2
2,6-dinitrotoluene	606-20-2	ND	0.2
Diethyl phthalate	84-66-2	ND	0.2

ND Not detected at or above limit of detection

-- Information not available or not applicable

Results are reported on a wet weight basis, as received

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9112156-07A	Date Received:	--
Sample Matrix/Media:	SLUDGE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Base/Neutral Extractables (continued)</u>			
4-chlorophenylphenylether	7005-72-3	ND	0.2
Fluorene	86-73-7	ND	0.2
N-nitrosodiphenylamine	86-30-6	ND	0.2
4-bromophenylphenylether	101-55-3	ND	0.2
Hexachlorobenzene	118-74-1	ND	0.2
Phenanthrene	85-01-8	ND	0.2
Anthracene	120-12-7	ND	0.2
Di-n-butylphthalate	84-74-2	ND	0.2
Fluoranthene	206-44-2	ND	0.2
Benzidine	92-87-5	ND	5
Pyrene	129-00-0	ND	0.2
Benzylbutylphthalate	85-68-7	ND	0.2
3,3'-dichlorobenzidine	91-94-1	ND	5
Benzo(a)anthracene	56-55-3	ND	0.2
Bis-(2-ethylhexyl)phthalate	117-81-7	ND	2
Chrysene	218-01-9	ND	0.4
Di-n-octylphthalate	117-84-0	ND	0.2
Benzo(b)fluoranthene	205-99-2	ND	0.4
Benzo(k)fluoranthene	207-08-9	ND	0.2
Benzo(a)pyrene	50-32-8	ND	0.2

ND Not detected at or above limit of detection

-- Information not available or not applicable

Results are reported on a wet weight basis, as received

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9112156-07A	Date Received:	--
Sample Matrix/Media:	SLUDGE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
---------	-------	--------------------------	----------------------------------

Base/Neutral Extractables (continued)

Indeno(1,2,3-cd)pyrene	193-39-5	ND	0.2
Dibenzo(a,h)anthracene	53-70-3	ND	0.2
Benzo(ghi)perylene	191-24-2	ND	0.2

<u>Surrogates</u>		<u>Recovery (%)</u>	<u>QC Limits (%)</u>	
			LCL	UCL
2-Fluorophenol	367-12-4	76	25	121
Phenol-d6	13127-88-3	80	24	113
Nitrobenzene-d5	4165-60-0	79	23	120
2-Fluorobiphenyl	321-60-8	87	30	115
2,4,6-Tribromophenol	118-79-6	85	19	122
Terphenyl-d14	---	54	18	137

ND Not detected at or above limit of detection
 -- Information not available or not applicable
 Results are reported on a wet weight basis, as received

9112156

Page 1 of 2 pa.

Lawrence Livermore
National Laboratory
ENVIRONMENTAL RESTORATION
DIVISION, L-528
P.O. Box 808, Livermore, California 94550

Chain-of-Custody Record and Analytic Instructions

Chain-of-Custody Doc. Number

Analytical Laboratory Log Number

Analytical Laboratory Name

TC-042

C. Clayton

Analysis Requestor / Data Recipient (circle one):

W. Isherwood-1 W. Isherwood-2 W. Isherwood-3 A. Lamarre-1 A. Lamarre-2 A. Lamarre-3
cc: Dresen cc: Mallon cc: Boegel cc: Ferry cc: Henry cc: Boegel

Analysis & Turnaround Required						Remarks
TLC	CYANIDE	GAA 625				
R	R	R				SLUDGE 500ml 1/25/91
R						SWIPE 240ml
	R					SWIPE
		R				SWIPE
R						SWIPE
	R					SWIPE
		R				SWIPE

Site and Technical Information Codes	Sampling Date	Sample/ Container Type ²	Number of Containers	Analyze/ Hold ³
U141-R3U1-SC-SLUDGE	12-16-91	O G	1	A
U141-SC-BO-PST 1000	"	O V	1	A
U141-SC-BO-PST 1000	"	O V	1	A
U141-SC-BO-PST 1000	"	O V	1	A
U141-SC-WE-PST 1000	"	O V	1	A
U141-SC-WE-PST 1000	"	O V	1	A
U141-SC-WE-PST 1000	"	O V	1	A

C-22

Signature	Company	Date	Time
Relinquished by <i>[Signature]</i>	LLNL	12-16-91	1350
Received by <i>[Signature]</i>	Priority Express	12-16-91	1630
Relinquished by <i>[Signature]</i>	" "	12-16-91	1715
Received by <i>[Signature]</i>	C. CLAYTON	12-16-91	5:15P
Relinquished by			
Received by			

1. N = Normal Turnaround, F = 1-Week Turnaround,
R = 24-Hour Turnaround.

2. Sample Type Codes: W = Water, S = Soil, V = Vapor, O = Other (specify).
Container Type Codes: V = VOA Bottle, P = Plastic Bottle,
G = Glass Bottle, T = Brass Tube, B = Bag,
O = Other (specify).

3. Analyze/Hold: A = Analyze, HOLD (spell out) =
DO NOT ANALYZE UNLESS REQUESTED.

Revision 1.7, 5 Oct 89

Pink: Leave with ERD

Yellow: Analytical Lab

White: Return to ERD

RECEIVED

1992 JAN - 2 P 3:13

ENVIRONMENTAL
RESTORATION

Lawrence Livermore
National Laboratory
ENVIRONMENTAL RESTORATION
DIVISION, L-528
P.O. Box 808, Livermore, California 94550

Chain-of-Custody Record
and Analytic Instructions

9112156

Chain-of-Custody Doc. Number

Analytical Laboratory Log Number

Analytical Laboratory Name CLAYTON

Page 2 of 2 p. 25

TC-042

Analysis Requestor / Data Recipient (circle one):

W. Isherwood-1 W. Isherwood-2 W. Isherwood-3 A. Lamarre-1 A. Lamarre-2 A. Lamarre-3
cc: Dresen cc: Mallon cc: Boegel cc: Ferry cc: Henry cc: Boegel

Sampled By J. KILMER

Company Name LLNL

Analysis & Turnaround
Required¹

Site and Technical Information Codes	Sampling Date	Sample/ Container Type ²	Number of Containers	Analyze/ Hold ³	TZC	CYANIDE	SPA 625	Remarks
U141-SC-NO-PST 1000	12-16-91	O B	1	A	R			SWIPE <u>OK</u>
U141-SC-NO-PST 1000	"	O V	1	A		R		SWIPE
U141-SC-NO-PST 1000	"	O V	1	A			R	SWIPE
U141-SC-NO-PST 1200	"	O V	1	A	R			SWIPE
U141-SC-NO-PST 1200	"	O V	1	A		R		SWIPE
U141-SC-NO-PST 1200	"	O V	1	A			R	SWIPE
U141-SC-BO-PST 1200	"	O V	1	A	R			SWIPE
U141-SC-BO-PST 1200	"	O V	1	A		R		SWIPE
U141-SC-BO-PST 1200	"	O V	1	A			R	SWIPE

C-23

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	<u>LLNL</u>	<u>12-16-91</u>	<u>1350</u>
Received by <u>[Signature]</u>	<u>Priority Express</u>	<u>12-16-91</u>	<u>1630</u>
Relinquished by <u>[Signature]</u>	<u>"</u>	<u>12-16-91</u>	<u>1715</u>
Received by <u>[Signature]</u>	<u>CLAYTON</u>	<u>12-16-91</u>	<u>5:15 PM</u>
Relinquished by			
Received by			

1. N = Normal Turnaround, F = 1-Week Turnaround,
R = 24-Hour Turnaround.

2. Sample Type Codes: W = Water, S = Soil, VPR = Vapor,
O = Other (specify).
Container Type Codes: V = VOA Bottle, P = Plastic Bottle,
G = Glass Bottle, T = Brass Tube, B = Bag,
O = Other (specify).

3. Analyze/Hold: A = Analyze, HOLD (spell out) =
DO NOT ANALYZE UNLESS REQUESTED.

Revision 1.7, 5 Oct 89

Pink: Leave with ERD

Yellow : Analytical Lab

White : Return to ERD

Western Operations

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(510) 426-2600
Fax (510) 426-0106

RECEIVED

Clayton
ENVIRONMENTAL
CONSULTANTS

1992 JAN -2 P 3: 11

ENVIRONMENTAL
RESTORATION

December 20, 1991

Mr. Jerry Duarte
LAWRENCE LIVERMORE NATIONAL LABORATORY
P. O. Box 808, L-528
Livermore, CA 94550

Client Ref. TC-042
Clayton Project No. 91121.56

Dear Mr. Duarte:

Attached is our analytical laboratory report for the samples received on December 16, 1991. A copy of the Chain-of-Custody form acknowledging receipt of these samples is attached.

Please note that any unused portion of the samples will be disposed of 30 days after the date of this report, unless you have requested otherwise.

We appreciate the opportunity to be of assistance to you. If you have any questions, please contact Maryann Gambino, Client Services Supervisor, at (510) 426-2657.

Sincerely,

Ronald H. Peters, CIH
Director, Laboratory Services
Western Operations

RHP/tb
Attachments

cc: Boegel

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-SC-NO-PST-1200	Date Sampled:	12/16/91
Lab Number:	9112156-05C	Date Received:	12/16/91
Sample Matrix/Media:	WIPE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
<u>Acid Extractables</u>			
Phenol	108-95-2	ND	5
2-chlorophenol	95-57-8	ND	5
2-methyl phenol	95-48-7	ND	5
4-methyl phenol	106-44-5	ND	5
2-nitrophenol	88-75-5	ND	5
2,4-dimethylphenol	105-67-9	ND	5
2,4-dichlorophenol	120-83-2	ND	5
4-chloro-3-methylphenol	59-50-7	ND	5
2,4,5-trichlorophenol	95-95-4	ND	5
2,4,6-trichlorophenol	88-06-2	ND	5
2,4-dinitrophenol	51-28-5	ND	20
4-nitrophenol	100-02-7	ND	20
2-methyl-4,6-dinitrophenol	534-52-1	ND	20
Pentachlorophenol	87-86-5	ND	20
<u>Base/Neutral Extractables</u>			
Bis(2-chloroethyl)ether	111-44-4	ND	5
1,3-dichlorobenzene	541-73-7	ND	5
1,4-dichlorobenzene	106-46-7	ND	5
1,2-dichlorobenzene	95-50-1	ND	5
Bis-(2-chloroisopropyl)ether	108-60-1	ND	5
N-nitrosodi-n-propylamine	621-64-7	ND	5

ND Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-SC-NO-PST-1200	Date Sampled:	12/16/91
Lab Number:	9112156-05C	Date Received:	12/16/91
Sample Matrix/Media:	WIPE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
<u>Base/Neutral Extractables (continued)</u>			
Hexachloroethane	67-72-1	ND	5
Nitrobenzene	98-95-3	ND	5
Isophorone	78-59-1	ND	5
Bis-(2-chloroethoxy)methane	111-91-1	ND	5
1,2,4-trichlorobenzene	120-82-1	ND	5
Naphthalene	91-20-3	ND	5
Hexachlorobutadiene	87-68-3	ND	5
2-chloronaphthalene	91-58-7	ND	5
2-methyl naphthalene	91-57-6	ND	5
4-chloroaniline	106-47-8	ND	20
2-nitroaniline	88-74-4	ND	20
3-nitroaniline	99-09-2	ND	20
4-nitroaniline	100-01-6	ND	20
Hexachlorocyclopentadiene	77-47-4	ND	5
Dimethyl phthalate	131-11-3	ND	10
Acenaphthylene	208-96-8	ND	5
Acenaphthene	83-32-9	ND	5
2,4-dinitrotoluene	121-14-2	ND	5
2,6-dinitrotoluene	606-20-2	ND	5
Diethyl phthalate	84-66-2	ND	5

ND Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-SC-NO-PST-1200	Date Sampled:	12/16/91
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Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
<u>Base/Neutral Extractables (continued)</u>			
4-chlorophenylphenylether	7005-72-3	ND	5
Fluorene	86-73-7	ND	5
N-nitrosodiphenylamine	86-30-6	ND	5
4-bromophenylphenylether	101-55-3	ND	5
Hexachlorobenzene	118-74-1	ND	5
Phenanthrene	85-01-8	ND	5
Anthracene	120-12-7	ND	5
Di-n-butylphthalate	84-74-2	ND	5
Fluoranthene	206-44-2	ND	5
Benzidine	92-87-5	ND	30
Pyrene	129-00-0	ND	5
Benzylbutylphthalate	85-68-7	ND	5
3,3'-dichlorobenzidine	91-94-1	ND	40
Benzo(a)anthracene	56-55-3	ND	5
Bis-(2-ethylhexyl)phthalate	117-81-7	ND	10
Chrysene	218-01-9	ND	5
Di-n-octylphthalate	117-84-0	ND	5
Benzo(b)fluoranthene	205-99-2	ND	5
Benzo(k)fluoranthene	207-08-9	ND	5
Benzo(a)pyrene	50-32-8	ND	5

ND Not detected at or above limit of detection
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Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
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Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
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Base/Neutral Extractables (continued)

Indeno(1,2,3-cd)pyrene	193-39-5	ND	5
Dibenzo(a,h)anthracene	53-70-3	ND	5
Benzo(ghi)perylene	191-24-2	ND	5

<u>Surrogates</u>		<u>Recovery (%)</u>	<u>QC Limits (%)</u>	
			LCL	UCL
2-Fluorophenol	367-12-4	78	21	100
Phenol-d6	13127-88-3	87	10	94
Nitrobenzene-d5	4165-60-0	83	35	114
2-Fluorobiphenyl	321-60-8	82	43	116
2,4,6-Tribromophenol	118-79-6	91	10	123
Terphenyl-d14	---	66	33	141

ND Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-SC-BO-PST-1200	Date Sampled:	12/16/91
Lab Number:	9112156-06C	Date Received:	12/16/91
Sample Matrix/Media:	WIPE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
<u>Acid Extractables</u>			
Phenol	108-95-2	ND	5
2-chlorophenol	95-57-8	ND	5
2-methyl phenol	95-48-7	ND	5
4-methyl phenol	106-44-5	ND	5
2-nitrophenol	88-75-5	ND	5
2,4-dimethylphenol	105-67-9	ND	5
2,4-dichlorophenol	120-83-2	ND	5
4-chloro-3-methylphenol	59-50-7	ND	5
2,4,5-trichlorophenol	95-95-4	ND	5
2,4,6-trichlorophenol	88-06-2	ND	5
2,4-dinitrophenol	51-28-5	ND	20
4-nitrophenol	100-02-7	ND	20
2-methyl-4,6-dinitrophenol	534-52-1	ND	20
Pentachlorophenol	87-86-5	ND	20
<u>Base/Neutral Extractables</u>			
Bis(2-chloroethyl)ether	111-44-4	ND	5
1,3-dichlorobenzene	541-73-7	ND	5
1,4-dichlorobenzene	106-46-7	ND	5
1,2-dichlorobenzene	95-50-1	ND	5
Bis-(2-chloroisopropyl)ether	108-60-1	ND	5
N-nitrosodi-n-propylamine	621-64-7	ND	5

ND Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-SC-BO-PST-1200	Date Sampled:	12/16/91
Lab Number:	9112156-06C	Date Received:	12/16/91
Sample Matrix/Media:	WIPE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
<u>Base/Neutral Extractables (continued)</u>			
Hexachloroethane	67-72-1	ND	5
Nitrobenzene	98-95-3	ND	5
Isophorone	78-59-1	ND	5
Bis-(2-chloroethoxy)methane	111-91-1	ND	5
1,2,4-trichlorobenzene	120-82-1	ND	5
Naphthalene	91-20-3	ND	5
Hexachlorobutadiene	87-68-3	ND	5
2-chloronaphthalene	91-58-7	ND	5
2-methyl naphthalene	91-57-6	ND	5
4-chloroaniline	106-47-8	ND	20
2-nitroaniline	88-74-4	ND	20
3-nitroaniline	99-09-2	ND	20
4-nitroaniline	100-01-6	ND	20
Hexachlorocyclopentadiene	77-47-4	ND	5
Dimethyl phthalate	131-11-3	ND	10
Acenaphthylene	208-96-8	ND	5
Acenaphthene	83-32-9	ND	5
2,4-dinitrotoluene	121-14-2	ND	5
2,6-dinitrotoluene	606-20-2	ND	5
Diethyl phthalate	84-66-2	ND	5

ND Not detected at or above limit of detection
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Results of Analysis
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Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-SC-BO-PST-1200	Date Sampled:	12/16/91
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Sample Matrix/Media:	WIPE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
<u>Base/Neutral Extractables (continued)</u>			
4-chlorophenylphenylether	7005-72-3	ND	5
Fluorene	86-73-7	ND	5
N-nitrosodiphenylamine	86-30-6	ND	5
4-bromophenylphenylether	101-55-3	ND	5
Hexachlorobenzene	118-74-1	ND	5
Phenanthrene	85-01-8	ND	5
Anthracene	120-12-7	ND	5
Di-n-butylphthalate	84-74-2	ND	5
Fluoranthene	206-44-2	ND	5
Benzidine	92-87-5	ND	30
Pyrene	129-00-0	ND	5
Benzylbutylphthalate	85-68-7	ND	5
3,3'-dichlorobenzidine	91-94-1	ND	40
Benzo(a)anthracene	56-55-3	ND	5
Bis-(2-ethylhexyl)phthalate	117-81-7	20	10
Chrysene	218-01-9	ND	5
Di-n-octylphthalate	117-84-0	ND	5
Benzo(b)fluoranthene	205-99-2	ND	5
Benzo(k)fluoranthene	207-08-9	ND	5
Benzo(a)pyrene	50-32-8	ND	5

ND Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	U141-SC-BO-PST-1200	Date Sampled:	12/16/91
Lab Number:	9112156-06C	Date Received:	12/16/91
Sample Matrix/Media:	WIPE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
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Base/Neutral Extractables (continued)

Indeno(1,2,3-cd)pyrene	193-39-5	ND	5
Dibenzo(a,h)anthracene	53-70-3	ND	5
Benzo(ghi)perylene	191-24-2	ND	5

<u>Surrogates</u>		<u>Recovery (%)</u>	<u>QC Limits (%)</u>	
			LCL	UCL
2-Fluorophenol	367-12-4	65	21	100
Phenol-d6	13127-88-3	85	10	94
Nitrobenzene-d5	4165-60-0	76	35	114
2-Fluorobiphenyl	321-60-8	78	43	116
2,4,6-Tribromophenol	118-79-6	88	10	123
Terphenyl-d14	---	60	33	141

ND Not detected at or above limit of detection
-- Information not available or not applicable

AIM

Association for Information and Image Management

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Silver Spring, Maryland 20910
301/587-8202

Centimeter

Inches

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BY APPLIED IMAGE, INC.

2 of 2

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9112156-08A	Date Received:	--
Sample Matrix/Media:	WIPE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
<u>Acid Extractables</u>			
Phenol	108-95-2	ND	5
2-chlorophenol	95-57-8	ND	5
2-methyl phenol	95-48-7	ND	5
4-methyl phenol	106-44-5	ND	5
2-nitrophenol	88-75-5	ND	5
2,4-dimethylphenol	105-67-9	ND	5
2,4-dichlorophenol	120-83-2	ND	5
4-chloro-3-methylphenol	59-50-7	ND	5
2,4,5-trichlorophenol	95-95-4	ND	5
2,4,6-trichlorophenol	88-06-2	ND	5
2,4-dinitrophenol	51-28-5	ND	20
4-nitrophenol	100-02-7	ND	20
2-methyl-4,6-dinitrophenol	534-52-1	ND	20
Pentachlorophenol	87-86-5	ND	20
<u>Base/Neutral Extractables</u>			
Bis(2-chloroethyl)ether	111-44-4	ND	5
1,3-dichlorobenzene	541-73-7	ND	5
1,4-dichlorobenzene	106-46-7	ND	5
1,2-dichlorobenzene	95-50-1	ND	5
Bis-(2-chloroisopropyl)ether	108-60-1	ND	5
N-nitrosodi-n-propylamine	621-64-7	ND	5

ND Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9112156-08A	Date Received:	--
Sample Matrix/Media:	WIPE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
<u>Base/Neutral Extractables (continued)</u>			
Hexachloroethane	67-72-1	ND	5
Nitrobenzene	98-95-3	ND	5
Isophorone	78-59-1	ND	5
Bis-(2-chloroethoxy)methane	111-91-1	ND	5
1,2,4-trichlorobenzene	120-82-1	ND	5
Naphthalene	91-20-3	ND	5
Hexachlorobutadiene	87-68-3	ND	5
2-chloronaphthalene	91-58-7	ND	5
2-methyl naphthalene	91-57-6	ND	5
4-chloroaniline	106-47-8	ND	20
2-nitroaniline	88-74-4	ND	20
3-nitroaniline	99-09-2	ND	20
4-nitroaniline	100-01-6	ND	20
Hexachlorocyclopentadiene	77-47-4	ND	5
Dimethyl phthalate	131-11-3	ND	10
Acenaphthylene	208-96-8	ND	5
Acenaphthene	83-32-9	ND	5
2,4-dinitrotoluene	121-14-2	ND	5
2,6-dinitrotoluene	606-20-2	ND	5
Diethyl phthalate	84-66-2	ND	5

ND Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9112156-08A	Date Received:	--
Sample Matrix/Media:	WIPE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
<u>Base/Neutral Extractables (continued)</u>			
4-chlorophenylphenylether	7005-72-3	ND	5
Fluorene	86-73-7	ND	5
N-nitrosodiphenylamine	86-30-6	ND	5
4-bromophenylphenylether	101-55-3	ND	5
Hexachlorobenzene	118-74-1	ND	5
Phenanthrene	85-01-8	ND	5
Anthracene	120-12-7	ND	5
Di-n-butylphthalate	84-74-2	ND	5
Fluoranthene	206-44-2	ND	5
Benzidine	92-87-5	ND	30
Pyrene	129-00-0	ND	5
Benzylbutylphthalate	85-68-7	ND	5
3,3'-dichlorobenzidine	91-94-1	ND	40
Benzo(a)anthracene	56-55-3	ND	5
Bis-(2-ethylhexyl)phthalate	117-81-7	ND	10
Chrysene	218-01-9	ND	5
Di-n-octylphthalate	117-84-0	ND	5
Benzo(b)fluoranthene	205-99-2	ND	5
Benzo(k)fluoranthene	207-08-9	ND	5
Benzo(a)pyrene	50-32-8	ND	5

ND Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9112156-08A	Date Received:	--
Sample Matrix/Media:	WIPE	Date Extracted:	12/17/91
Extraction Method:	EPA 3550	Date Analyzed:	12/17/91
Analytical Method:	EPA 8270		

Analyte	CAS #	Concentration (ug/wipe)	Limit of Detection (ug/wipe)
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Base/Neutral Extractables (continued)

Indeno(1,2,3-cd)pyrene	193-39-5	ND	5
Dibenzo(a,h)anthracene	53-70-3	ND	5
Benzo(ghi)perylene	191-24-2	ND	5

<u>Surrogates</u>		<u>Recovery (%)</u>	<u>QC Limits (%)</u>	
			LCL	UCL
2-Fluorophenol	367-12-4	81	21	100
Phenol-d6	13127-88-3	82	10	94
Nitrobenzene-d5	4165-60-0	82	35	114
2-Fluorobiphenyl	321-60-8	84	43	116
2,4,6-Tribromophenol	118-79-6	94	10	123
Terphenyl-d14	---	63	33	141

ND Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification: U141-SC-NO-PST-1200
Lab Number: 9112156-05
Sample Matrix/Media: WIPE

Date Sampled: 12/16/91
Date Received: 12/16/91

Analyte	Concentration	Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Analysis Method
Antimony	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Arsenic	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Barium	0.021	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Beryllium	<0.002	0.002	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Cadmium	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Chromium	0.039	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Cobalt	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Copper	1.4	0.007	mg/wipe	12/19/91	12/19/91	EPA 3050	EPA 6010
Cyanide, total	<0.003	0.003	mg/wipe	--	12/18/91	--	EPA 9010
Lead	0.31	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Mercury	<0.0001	0.0001	mg/wipe	12/18/91	12/19/91	OSHA ID145	OSHA ID14
Molybdenum	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Nickel	0.029	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Selenium	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Silver	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Thallium	<0.02	0.02	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Vanadium	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Zinc	0.072	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010

ND Not detected at or above limit of detection
< Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification: U141-SC-BO-PST-1200
Lab Number: 9112156-06
Sample Matrix/Media: WIPE

Date Sampled: 12/16/91
Date Received: 12/16/91

Analyte	Concentration	Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Analysis Method
Antimony	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Arsenic	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Barium	0.018	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Beryllium	<0.002	0.002	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Cadmium	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Chromium	0.015	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Cobalt	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Copper	0.29	0.007	mg/wipe	12/19/91	12/19/91	EPA 3050	EPA 6010
Cyanide, total	<0.003	0.003	mg/wipe	--	12/18/91	--	EPA 9010
Lead	0.12	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Mercury	<0.0001	0.0001	mg/wipe	12/18/91	12/19/91	OSHA ID145	OSHA ID145
Molybdenum	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Nickel	0.020	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Selenium	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Silver	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Thallium	<0.02	0.02	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Vanadium	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Zinc	0.029	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010

ND Not detected at or above limit of detection
< Not detected at or above limit of detection
-- Information not available or not applicable

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC-042
Clayton Project No. 91121.56

Sample Identification: METHOD BLANK
Lab Number: 9112156-08
Sample Matrix/Media: WIPE

Date Sampled: --
Date Received: --

Analyte	Concentration	Detection Limit	Units	Date Prepared	Date Analyzed	Prep Method	Analysis Method
Antimony	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Arsenic	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Barium	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Beryllium	<0.002	0.002	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Cadmium	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Chromium	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Cobalt	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Copper	<0.007	0.007	mg/wipe	12/19/91	12/19/91	EPA 3050	EPA 6010
Cyanide, total	<0.003	0.003	mg/wipe	--	12/18/91	--	EPA 9010
Lead	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Mercury	<0.0001	0.0001	mg/wipe	12/18/91	12/19/91	OSHA ID145	OSHA ID14
Molybdenum	<0.003	0.003	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Nickel	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Selenium	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Silver	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Thallium	<0.02	0.02	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Vanadium	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010
Zinc	<0.007	0.007	mg/wipe	12/18/91	12/18/91	EPA 3050	EPA 6010

ND Not detected at or above limit of detection
< Not detected at or above limit of detection
-- Information not available or not applicable

9112156

Page 1 of 2 pa

Lawrence Livermore
National Laboratory
ENVIRONMENTAL RESTORATION
DIVISION, L-528
P.O. Box 808, Livermore, California 94550

Chain-of-Custody Record and Analytic Instructions

Chain-of-Custody Doc. Number

Analytical Laboratory Log Number

Analytical Laboratory Name

TC-042

C. Layton

Analysis Requestor / Data Recipient (circle one):

W. Isherwood-1 W. Isherwood-2 W. Isherwood-3
cc: Dresen cc: Mallon cc: Boegel
A. Lamarre-1 A. Lamarre-2 A. Lamarre-3
cc: Ferry cc: Henry cc: Boegel

Sampled By J. KILMER

Company Name LLNL

C-22

Site and Technical Information Codes	Sampling Date	Sample/ Container Type ²	Number of Containers	Analyze/ Hold ³	TLC	CYANIDE	GAA 625	Remarks
U141-R3U1-SC-SLUDGE	12-16-91	O G	1	A	R	R	R	SLUDGE 500ml Lg 50 Jan
U141-SC-B0-PST 1000	"	O V	1	A	R			SWIPE 940ml
U141-SC-B0-PST 1000	"	O V	1	A		R		SWIPE
U141-SC-B0-PST 1000	"	O V	1	A			R	SWIPE
U141-SC-WE-PST 1000	"	O V	1	A	R			SWIPE
U141-SC-WE-PST 1000	"	O V	1	A		R		SWIPE
U141-SC-WE-PST 1000	"	O V	1	A			R	SWIPE

1992 JAN - 2 P 3:13

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Signature	Company	Date	Time
Relinquished by [Signature]	LLNL	12-16-91	1350
Received by [Signature]	Priority Express	12-16-91	1630
Relinquished by [Signature]	" "	12-16-91	1715
Received by [Signature]	CLAYTON	12-16-91	5:15P
Relinquished by			
Received by			

1. N = Normal Turnaround, F = 1-Week Turnaround
R = 24-Hour Turnaround.

2. Sample Type Codes: W = Water, S = Soil, V = Vapor, O = Other (specify).
Container Type Codes: V = VOA Bottle, P = Plastic Bottle, G = Glass Bottle, T = Brass Tube, B = Bag, O = Other (specify).

3. Analyze/Hold: A = Analyze, HOLD (spell out) = DO NOT ANALYZE UNLESS REQUESTED.

Revision 1.7, 5 Oct 89

Pink: Leave with ERD

Yellow: Analytical Lab

White: Return to ERD

Lawrence Livermore
National Laboratory
ENVIRONMENTAL RESTORATION
DIVISION, L-528
P.O. Box 808, Livermore, California 94550

Chain-of-Custody Record
and Analytic Instructions

9112156

Page 2 of 2 p. 25

Chain-of-Custody Doc. Number

TC-042

Analytical Laboratory Log Number

Analytical Laboratory Name CLAYTON

Analysis Requestor / Data Recipient (circle one):

W. Isherwood-1 W. Isherwood-2 W. Isherwood-3 A. Lamarre-1 A. Lamarre-2 A. Lamarre-3
cc: Dresen cc: Mallon cc: Boegel cc: Ferry cc: Henry cc: Boegel

Sampled By J. KILMER

Company Name LLNL

Site and Technical Information Codes	Sampling Date	Sample/ Container Type ²	Number of Containers	Analyze/ Hold ³	Analysis & Turnaround Required ¹					Remarks
					TTZC	CYANIDE	EPA 625			
U141-SC-NO-PST 1000	12-16-91	O B	1	A	R					SWIPE 6/2 940d
U141-SC-NO-PST 1000	"	O V	1	A		R				SWIPE
U141-SC-NO-PST 1000	"	O V	1	A			R			SWIPE
U141-SC-NO-PST 1200	"	O V	1	A	R					SWIPE
U141-SC-NO-PST 1200	"	O V	1	A		R				SWIPE
U141-SC-NO-PST 1200	"	O V	1	A			R			SWIPE
U141-SC-BO-PST 1200	"	O V	1	A	R					SWIPE
U141-SC-BO-PST 1200	"	O V	1	A		R				SWIPE
U141-SC-BO-PST 1200	"	O V	1	A			R			SWIPE

Signature	Company	Date	Time
Relinquished by [Signature]	LLNL	12-16-91	1350
Received by [Signature]	Priority Express	12-16-91	1630
Relinquished by [Signature]	"	12-16-91	1715
Received by [Signature]	CLAYTON	12-16-91	5:15
Relinquished by			
Received by			

1. N = Normal Turnaround, F = 1-Week Turnaround,
R = 24-Hour Turnaround.

2. Sample Type Codes: W = Water, S = Soil, VPR = Vapor,
O = Other (specify).
Container Type Codes: V = VOA Bottle, P = Plastic Bottle,
G = Glass Bottle, T = Brass Tube, B = Bag,
O = Other (specify).

3. Analyze/Hold: A = Analyze, HOLD (spell out) =
DO NOT ANALYZE UNLESS REQUESTED.

Western Operations

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(510) 426-2600
Fax (510) 426-0106

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Clayton
ENVIRONMENTAL
CONSULTANTS

1992 FEB 21 P 11:40

ENVIRONMENTAL
RESTORATION

February 13, 1992

Mr. John Ziagos
LAWRENCE LIVERMORE NATIONAL LABORATORY
P. O. Box 808, L-528
Livermore, CA 94550

Client Ref. TC046
Clayton Project No. 92020.40

Dear Mr. Ziagos:

Attached is our analytical laboratory report for the samples received on February 4, 1992. A copy of the Chain-of-Custody form acknowledging receipt of these samples is attached.

Please note that any unused portion of the samples will be disposed of 30 days after the date of this report, unless you have requested otherwise.

We appreciate the opportunity to be of assistance to you. If you have any questions, please contact Maryann Gambino, Client Services Supervisor, at (510) 426-2657.

Sincerely,

Michael Lynch for

Ronald H. Peters, CIH
Director, Laboratory Services
Western Operations

RHP/caa
Attachments

cc: Mallon
Boegel

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Page 2 of 13

Results of Analysis
for
Lawrence Livermore National Laboratory

ENVIRONMENTAL
RESTORATION

Client Reference: TC046
Clayton Project No. 92020.40

Sample Identification: U141-R3U1-BO-6.5U Date Sampled: 02/04/92
Lab Number: 9202040-01A Date Received: 02/04/92
Sample Matrix/Media: SOIL Date Prepared: 02/07/92
Preparation Method: EPA 5030 Date Analyzed: 02/10/92
Analytical Method: EPA 8010

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Measurable Halocarbons</u>			
Chloromethane	74-87-3	ND	0.06
Bromomethane	74-83-9	ND	0.07
Vinyl chloride	75-01-4	ND	0.05
Chloroethane	75-00-3	ND	0.05
Methylene chloride	75-09-2	ND	0.2
1,1-Dichloroethene	75-35-4	ND	0.03
1,1-Dichloroethane	75-35-3	ND	0.04
Trans-1,2-Dichloroethene	156-60-5	ND	0.04
Cis-1,2-Dichloroethene	156-59-2	ND	0.04
Chloroform	67-66-3	ND	0.05
1,2-Dichloroethane	107-06-2	ND	0.03
1,1,1-Trichloroethane	71-55-6	ND	0.05
Carbon tetrachloride	56-23-5	ND	0.06
Bromodichloromethane	75-27-4	ND	0.07
1,2-Dichloropropane	78-87-5	ND	0.05
Cis-1,3-Dichloropropene	10061-01-5	ND	0.05
Trichloroethene	79-01-6	ND	0.03
Dibromochloromethane	124-48-1	ND	0.06
1,1,2-Trichloroethane	79-00-5	ND	0.06
Trans-1,3-Dichloropropene	10061-02-6	ND	0.06

ND Not detected at or above limit of detection

-- Information not available or not applicable

Results are reported on a wet weight basis, as received

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC046
Clayton Project No. 92020.40

Sample Identification:	U141-R3U1-BO-6.5U	Date Sampled:	02/04/92
Lab Number:	9202040-01A	Date Received:	02/04/92
Sample Matrix/Media:	SOIL	Date Prepared:	02/07/92
Preparation Method:	EPA 5030	Date Analyzed:	02/10/92
Analytical Method:	EPA 8010		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Purgeable Halocarbons (continued)</u>			
2-Chloroethylvinylether	110-75-8	ND	0.1
Bromoform	75-25-2	ND	0.07
Tetrachloroethene	127-18-4	ND	0.05
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.05
Chlorobenzene	108-90-7	ND	0.07
1,3-Dichlorobenzene	541-73-7	ND	0.2
1,2-Dichlorobenzene	95-50-1	ND	0.4
1,4-Dichlorobenzene	106-46-7	ND	0.4
Dichlorodifluoromethane	75-71-8	ND	0.1
Trichlorofluoromethane	75-69-4	ND	0.04
Freon 113	76-13-1	ND	0.06

ND Not detected at or above limit of detection
 -- Information not available or not applicable
 Results are reported on a wet weight basis, as received

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC046
Clayton Project No. 92020.40

Sample Identification:	U141-R3U1-BO-6.5U	Date Sampled:	02/04/92
Lab Number:	9202040-01A	Date Received:	02/04/92
Sample Matrix/Media:	SOIL	Date Prepared:	02/07/92
Preparation Method:	EPA 5030	Date Analyzed:	02/10/92
Analytical Method:	EPA 8020		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
---------	-------	--------------------------	----------------------------------

Purgeable Aromatics

Benzene	71-43-2	ND	0.04
Chlorobenzene	108-90-7	ND	0.03
1,2-Dichlorobenzene	95-50-1	ND	0.05
1,3-Dichlorobenzene	541-73-7	ND	0.03
1,4-Dichlorobenzene	106-46-7	ND	0.05
Ethylbenzene	100-41-4	ND	0.03
Toluene	108-88-3	ND	0.03
p m-Xylenes	---	ND	0.04
o-Xylene	95-47-6	ND	0.04

<u>Surrogates</u>		<u>Recovery (%)</u>	<u>QC Limits (%)</u>	
			LCL	UCL
Bromochloromethane	74-97-5	72	50	150
1,4-Difluorobenzene	540-36-3	85	50	150

ND Not detected at or above limit of detection
 -- Information not available or not applicable
 Results are reported on a wet weight basis, as received

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Page 5 of 13

Results of Analysis
for

1992 FEB 21 P Lawrence Livermore National Laboratory

Client Reference: TC046
Clayton Project No. 92020.40

ENVIRONMENTAL
RESTORATION

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9202040-02A	Date Received:	--
Sample Matrix/Media:	SOIL	Date Prepared:	02/07/92
Preparation Method:	EPA 5030	Date Analyzed:	02/10/92
Analytical Method:	EPA 8010		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Purgeable Halocarbons</u>			
Chloromethane	74-87-3	ND	0.06
Bromomethane	74-83-9	ND	0.07
Vinyl chloride	75-01-4	ND	0.05
Chloroethane	75-00-3	ND	0.05
Methylene chloride	75-09-2	ND	0.2
1,1-Dichloroethene	75-35-4	ND	0.03
1,1-Dichloroethane	75-35-3	ND	0.04
Trans-1,2-Dichloroethene	156-60-5	ND	0.04
Cis-1,2-Dichloroethene	156-59-2	ND	0.04
Chloroform	67-66-3	ND	0.05
1,2-Dichloroethane	107-06-2	ND	0.03
1,1,1-Trichloroethane	71-55-6	ND	0.05
Carbon tetrachloride	56-23-5	ND	0.06
Bromodichloromethane	75-27-4	ND	0.07
1,2-Dichloropropane	78-87-5	ND	0.05
Cis-1,3-Dichloropropene	10061-01-5	ND	0.05
Trichloroethene	79-01-6	ND	0.03
Dibromochloromethane	124-48-1	ND	0.06
1,1,2-Trichloroethane	79-00-5	ND	0.06
Trans-1,3-Dichloropropene	10061-02-6	ND	0.06

ND Not detected at or above limit of detection
 -- Information not available or not applicable
 Results are reported on a wet weight basis, as received

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC046
Clayton Project No. 92020.40

Sample Identification: METHOD BLANK	Date Sampled: --
Lab Number: 9202040-02A	Date Received: --
Sample Matrix/Media: SOIL	Date Prepared: 02/07/92
Preparation Method: EPA 5030	Date Analyzed: 02/10/92
Analytical Method: EPA 8010	

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Purgeable Halocarbons (continued)</u>			
2-Chloroethylvinylether	110-75-8	ND	0.1
Bromoform	75-25-2	ND	0.07
Tetrachloroethene	127-18-4	ND	0.05
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.05
Chlorobenzene	108-90-7	ND	0.07
1,3-Dichlorobenzene	541-73-7	ND	0.2
1,2-Dichlorobenzene	95-50-1	ND	0.4
1,4-Dichlorobenzene	106-46-7	ND	0.4
Dichlorodifluoromethane	75-71-8	ND	0.1
Trichlorofluoromethane	75-69-4	ND	0.04
Freon 113	76-13-1	ND	0.06

ND Not detected at or above limit of detection

-- Information not available or not applicable

Results are reported on a wet weight basis, as received

Results of Analysis
for
Lawrence Livermore National Laboratory

Client Reference: TC046
Clayton Project No. 92020.40

Sample Identification:	METHOD BLANK	Date Sampled:	--
Lab Number:	9202040-02A	Date Received:	--
Sample Matrix/Media:	SOIL	Date Prepared:	02/07/92
Preparation Method:	EPA 5030	Date Analyzed:	02/10/92
Analytical Method:	EPA 8020		

Analyte	CAS #	Concentration (mg/kg)	Limit of Detection (mg/kg)
<u>Purgeable Aromatics</u>			
Benzene	71-43-2	ND	0.04
Chlorobenzene	108-90-7	ND	0.03
1,2-Dichlorobenzene	95-50-1	ND	0.05
1,3-Dichlorobenzene	541-73-7	ND	0.03
1,4-Dichlorobenzene	106-46-7	ND	0.05
Ethylbenzene	100-41-4	ND	0.03
Toluene	108-88-3	ND	0.03
p,m-Xylenes	---	ND	0.04
o-Xylene	95-47-6	ND	0.04

<u>Surrogates</u>		<u>Recovery (%)</u>	<u>QC Limits (%)</u>	
			<u>LCL</u>	<u>UCL</u>
Bromochloromethane	74-97-5	75	50	150
1,4-Difluorobenzene	540-36-3	84	50	150

ND Not detected at or above limit of detection

-- Information not available or not applicable

Results are reported on a wet weight basis, as received

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Results of Analysis
for

Lawrence Livermore National Laboratory

1992 FEB 21 P 10 40

Client Reference: TC046
Clayton Project No. 92020.40

ENVIRONMENTAL

Sample Identification: U141-R3U1-BO-6.5U Date Sampled: 02/04/92
Lab Number: 9202040-01A Date Received: 02/04/92
Sample Matrix/Media: SOIL Date Extracted: 02/07/92
Extraction Method: 22CAC66700 Date Analyzed: See below
Analytical Method: See below

Date Analyzed	Method No.	Analyte	Extract Concentration (mg/L)	STLC* (mg/L)	Limit of Detection (mg/L)
---------------	------------	---------	------------------------------	--------------	---------------------------

Soluble Threshold Limit Concentration Analysis

02/10/92	6010	Antimony	<0.1	15	0.1
02/12/92	7060	Arsenic	0.05	5.0	0.05
02/10/92	6010	Barium	9.5	100	0.1
02/10/92	6010	Beryllium	<0.05	0.75	0.05
02/10/92	6010	Cadmium	<0.05	1.0	0.05
02/10/92	6010	Chromium	0.1	560	0.1
02/10/92	6010	Cobalt	1.0	80	0.1
02/10/92	6010	Copper	0.3	25	0.1
02/10/92	6010	Lead	<0.1	5.0	0.1
02/11/92	7470	Mercury	<0.01	0.2	0.01
02/10/92	6010	Molybdenum	<0.1	350	0.1
02/10/92	6010	Nickel	0.5	20	0.1
02/12/92	7740	Selenium	<0.05	1.0	0.05
02/10/92	6010	Silver	<0.1	5	0.1
02/10/92	6010	Thallium	<0.2	7.0	0.2
02/10/92	6010	Vanadium	0.2	24	0.1
02/10/92	6010	Zinc	0.5	250	0.1

< Less than, below limit of detection

-- Information not available or not applicable

*STLC = Soluble Threshold Limit Concentration, 22CAC66693 (CA Title 22).

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Results of Analysis
for

1992 FEB 19 10 40 Lawrence Livermore National Laboratory

Client Reference: TC046

ENVIRONMENTAL Clayton Project No. 92020.40

Sample Identification: METHOD BLANK
Lab Number: 9202040-02A
Sample Matrix/Media: SOIL
Extraction Method: 22CAC66700
Analytical Method: See below

Date Sampled: --
Date Received: --
Date Extracted: 02/07/92
Date Analyzed: See below

Date Analyzed	Method No.	Analyte	Extract Concentration (mg/L)	STLC* (mg/L)	Limit of Detection (mg/L)
<u>Soluble Threshold Limit Concentration Analysis</u>					
02/10/92	6010	Antimony	<0.1	15	0.1
02/12/92	7060	Arsenic	<0.05	5.0	0.05
02/10/92	6010	Barium	<0.1	100	0.1
02/10/92	6010	Beryllium	<0.05	0.75	0.05
02/10/92	6010	Cadmium	<0.05	1.0	0.05
02/10/92	6010	Chromium	<0.1	560	0.1
02/10/92	6010	Cobalt	<0.1	80	0.1
02/10/92	6010	Copper	<0.1	25	0.1
02/10/92	6010	Lead	<0.1	5.0	0.1
02/11/92	7470	Mercury	<0.01	0.2	0.01
02/10/92	6010	Molybdenum	<0.1	350	0.1
02/10/92	6010	Nickel	<0.1	20	0.1
02/12/92	7740	Selenium	<0.05	1.0	0.05
02/10/92	6010	Silver	<0.1	5	0.1
02/10/92	6010	Thallium	<0.2	7.0	0.2
02/10/92	6010	Vanadium	<0.1	24	0.1
02/10/92	6010	Zinc	<0.1	250	0.1

Less than, below limit of detection

-- Information not available or not applicable

*STLC = Soluble Threshold Limit Concentration, 22CAC66693 (CA Title 22).

**Lawrence Livermore
National Laboratory**
ENVIRONMENTAL RESTORATION
DIVISION, L-528
P.O. Box 808, Livermore, California 94550

Chain-of-Custody Doc. Number

Page 1 of 1 pages

TC - 046

Analytical Laboratory Log Number 1

Analytical Laboratory Name Clayton

Analysis Requestor / Data Recipient (circle one):

W. Isherwood-1 cc: Dresen W. Isherwood-2 cc: Mallon W. Isherwood-3 cc: Boegel A. Lamarre-1 cc: Ferry A. Lamarre-2 cc: Henry A. Lamarre-3 cc: Boegel

Sampled By Kilmer/Kawaguchi

Company Name LLNL

Site and Technical Information Codes	Sampling Date	Sample/ Container Type ²	Number of Containers	Analyze/ Hold ³	STL	EPA						Remarks
V141-R311-B0-6.511	2-4-92	S T	1	A	N	N						1 1/2 x 6 BC <i>ck</i>
		/		/								
		/		/								
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		/		/								

RECEIVED

ENVIRONMENTAL
RESTORATION

1992 FEB 21 P 4:40

Signature	Company	Date	Time
Relinquished by <i>Scott K. Kinsinger</i>	<i>LLNL</i>	<i>2-4-92</i>	<i>1530</i>
Received by <i>Ernie D. Bost</i>	<i>Primary Officer</i>	<i>2-4-92</i>	<i>1700</i>
Relinquished by <i>Ernie D. Bost</i>	<i>" "</i>	<i>2-4-92</i>	<i>555</i>
Received by <i>Ernie D. Bost</i>	<i>Plasma</i>	<i>2-4-92</i>	<i>555</i>
Relinquished by			
Received by			

1. N = Normal Turnaround, F = 1-Week Turnaround,
R = 24-Hour Turnaround.
2. Sample Type Codes: W = Water, S = Soil, VPR = Vapor,
O = Other (specify).
Container Type Codes: V = VOA Bottle, P = Plastic Bottle,
G = Glass Bottle, T = Brass Tube, B = Bag,
O = Other (specify).
3. Analyze/Hold: A = Analyze, HOLD (spell out) =
DO NOT ANALYZE UNLESS REQUESTED.

Revision 1.7, 5 Oct 89

Pink: Leave with ERD

Yellow : Analytical Lab

White : Return to ERD

Appendix E

**Hazardous Waste Requisitions and
Uniform Hazardous Waste Manifests**

2.4.92

APR 28 1992

1. Infancy

NONALDAMA
LIVRENE LIVERMONE ANOMAL LABORATORY

NON-RMMA
HAZARDOUS WASTE DISPOSAL REQUISITION

HAZARDOUS WASTE MGMT.

W* RCO RL=

HMM USE ONLY

\$-30.90

Scheduled Pick Up:

612

AK

Program: EE FAB	Building: 141/outside 141A	WAA: 3940-46	Account No:	Waste Form: ☒ Dry Solids ☐ Liquid ☐ Sludge ☐ Powder ☐ Gas ☐ Pressurized Liquid ☐ Other
Container: ☒ Drum ☐ Can ☐ Carboy	☐ Box-7A ☐ Box-Cardboard	☐ Tank Portable ☐ Tank Fixed	☐ Pump Out	Other Container:
Process Producing Waste: Sump Repair				
Hazards: ☐ Flammable ☐ Explosive ☒ Toxic ☐ Organic ☐ Corrosive	Other Hazards:		Profile No: HP 0097	Analysis Sample No:

HWM USE ONLY

[illegible]

Originator Name (Print) <i>Mark D. Hollister</i>	L-Code <i>225</i>	Ext. <i>30970</i>	Hazards Control Name (Print) <i>Kmuck</i>	L-Code <i>620</i>	Ext. <i>31496</i>
Signature <i>Mark D. Hollister</i>	Date <i>3-9-92</i>	Signature <i>[Signature]</i>	Date <i>3-9-92</i>		

Generator – Send all copies of this requisition to Hazardous Waste Management at L-620 for review.

2-4-92

APR 28 1932

INDEPENDENCE NATIONAL LABORATORY

NON-RMMA

MAR 10 1992

HWM USE ONLY

Scheduled Pick Up:

HAZARDOUS WASTE DISPOSAL REQUISITION

HAZARDOUS WASTE MGMT.
RCO YCS

1012 *AB*

Program: EE FAB		Building: 141 outside		WAA: 141 A		Account No: 3940-46		Waste Form: ☒ Dry Solids ☐ Liquid ☐ Sludge ☐ Powder ☐ Gas ☐ Pressurized Liquid ☐ Other					
Container: ☐ Can ☐ Carboy ☐ Box-7A ☐ Box-Cardboard ☐ Tank-Portable ☐ Tank-Fixed ☐ Pump Out		Other Container:				Process Producing Waste: Sump Repair							
Hazards: ☐ Flammable ☐ Explosive ☐ Organic ☒ Toxic ☐ Corrosive		Other Hazards:				Profile No: HP0097				Analysis Sample No:			

HWM USE ONLY

[illegible]

USE CONTINUATION FORM FOR ADDITIONAL ITEMS

Original Name (Print) Mark D. Hollister	L-Code 225	Ext. 2090	Hazards Control Name (Print) Rmundo	L-Code 620	Ext. 21996
Signature Mark D. Hollister	Date 3-7-92	Signature Rmundo	Date 3-9-92		

Generator – Send all copies of this requisition to Hazardous Waste Management at L-620 for review.

2-4-92

APR 28 1992

Wancy

HAZARDOUS WASTE DISPOSAL REQUISITION **NON-RMMA** HAZARDOUS WASTE MGMT. RCO 760

MAR 10 1992

HYPERMUSEUM USE ONLY

4.30.92
Scheduled Pick Up:
5.7.92

612 *ak*

Program: EK FAB	Building: 141/outside	WAA: 741A	Account No: 3940-46	Waste Form: ☒ Dry Solids ☐ Liquid ☐ Sludge ☐ Powder ☐ Gas ☐ Pressurized Liquid ☐ Other
Container: ☒ Drum ☐ Can ☐ Carboy ☐ Box-7A ☐ Box-Cardboard ☐ Tank-Portable ☐ Tank-Fixed ☐ Pump Out	Other Container:	Process Producing Waste: Sure Repair		
Hazards: ☐ Flammable ☐ Explosive ☐ Organic ☒ Toxic ☐ Corrosive	Other Hazards:	Profile No: HP0097		
		Analysis Sample No:		

HWM USE ONLY

[illegible]

Original Name (Print) Mark D. Halperin	L-Code 22.5	Ext. 30970	Hazards Control Name (Print) ROONEY MURON	L-Code 620	Ext. 31996
Signature Mark D. Halperin		Date 3-9-92	Signature B. Russell		Date 3-9-92

Generator – Send all copies of this requisition to Hazardous Waste Management at L-620 for review.

HAZARDOUS WASTE REQUISITION

req : H077626

hwm # :
:

program : EE FAB

bldg : 141

WAA : 141

account : 3940-46

container : DRUM

waste str : SUMP REPAIR

sample # :

sch pickup : 30-apr-1992

act pickup : 30-apr-1992

deliver to : 612

deliver by : TM

pumpout request :

pumpout date :

originator : HOLLISTER, MARK

: OUTSIDE

lcode : 225

extension : 30970

date : 09-mar-1992

HC name : MUDD

: RODNEY

lcode : 620

extension : 31996

date : 09-mar-1992

profile # : HP0097 -HAZARDS-

flammable :

explosive :

-WASTE FORM-

dry solids : X

organic :

liquid :

toxic : X

sludge :

corrosive :

powder :

other :

gas :

press liq :

entered by: travis

other :

on: 28-apr-1992 14:09:02

<u>ITEM</u>	<u>RECHARGE</u>	<u>DESCRIPTION</u>
001	U 5C	RINSE WATER FROM SPECIAL PROCESSING AREA

<u>QUANTITY</u>	<u>UNITS</u>	<u>DOT #</u>	<u>HAZ CLASS</u>	<u>PRE</u>	<u>LBAN</u>
200.000	lb			N	N

<u>EPA</u>	<u>DOHS</u>	<u>TREAT#</u>	<u>LOCATION</u>	<u>BY</u>	<u>DATE</u>	<u>LP REQ#</u>	<u>DISPOSITION</u>	<u>DATE</u>
	352	LP	612-B-1	IT	5/21/92	L101826	M 91760160	5/29/92
		S01	612-3-8	IT	5/1/92			
		S01	612-B-1	RBL	5/21/92			
		S01	STAGE	RBL	5/29/92	L101826		

COMPONENTS

00 refer to profile # 0097

req : H077627
hwm # :

program : EE FAB
bldg : 141
WAA : 141
account : 3940-46
container : DRUM
waste str : SUMP REPAIR
sample # :
sch pickup : 30-apr-1992
act pickup : 30-apr-1992
deliver to : 612
deliver by : TM

pumpout request :
pumpout date :
originator : HOLLISTER, MARK
 : OUTSIDE
lcode : 225
extension : 30970
date : 09-mar-1992
HC name : MUDD
 : RODNEY
lcode : 620
extension : 31996
date : 09-mar-1992

profile # : HP0097 -HAZARDS-
flammable :
explosive :
-WASTE FORM-
dry solids : X organic :
liquid : toxic : X
sludge : corrosive :
powder : other :
gas :
press liq : entered by: travis
other : on: 28-apr-1992 14:17:38

ITEM	RECHARGE	DESCRIPTION	QUANTITY	UNITS	DOT #	HAZ CLASS	PRE N	LBAN N
001	U 5C	RINSE WATER FROM SPECIAL PROCESSING AREA	300.000	lb				

EPA	DOHS	TREAT#	LOCATION	BY	DATE	LP REQ#	DISPOSITION	DATE
	352	LP	612-B-1	IT	5/21/92	L101826	M 91760160	5/29/92
		S01	612-3-8	IT	5/1/92			
		S01	612-B-1	MK	5/21/92			
		S01	STAGE	RBL	5/29/92	L101826		

COMMENTS
00 refer to profile # 0097

reg : H077628
 hwm # :
 :
 program : EE FAB
 bldg : 141
 WAA : 141
 account : 3940-46
 container : DRUM
 waste str : SUMP REPAIR
 sample # :
 sch pickup : 30-apr-1992
 act pickup : 30-apr-1992
 deliver to : 612
 deliver by : TM

pumpout request :
 pumpout date :
 originator : HOLLISTER, MARK
 : OUTSIDE
 lcode : 225
 extension : 30970
 date : 09-mar-1992
 HC name : MUDD
 : RODNEY
 lcode : 620
 extension : 31996
 date : 09-mar-1992

profile # : HP0097 -HAZARDS-
 flammable :
 -WASTE FORM- explosive :
 dry solids : X organic :
 liquid : toxic : X
 sludge : corrosive :
 powder : other :
 gas :
 press liq : entered by: travis
 other : on: 28-apr-1992 14:20:23

ITEM	RECHARGE	DESCRIPTION
001	U 5C	RINSE WATER FROM SPECIAL PROCESSING AREA

QUANTITY	UNITS	DOT #	HAZ CLASS	PRE	LBAN
100.000	lb			N	N

EPA	DOHS	TREAT#	LOCATION	BY	DATE	LP REQ#	DISPOSITION	DATE
	352	LP	612-B-1	RBL	5/21/92	L101826	M 91760160	5/29/92
		S01	612-3-8	IT	5/1/92			
		S01	612-B-1	MK	5/21/92			
		S01	STAGE	RBL	5/29/92	L101826		

COMPONENTS
 00 refer to profile # 0097

459

See Instructions on back of page 6.

25

Department of Health Services
Hazardous Waste Control Program
Sacramento, California

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator's US EPA ID No. CA 2890012584	Manifest Document No. 92190	2. Page 1 of 1	Information in the shaded areas is not required by Federal law.
3. Generator's Name and Mailing Address Lawrence Livermore National Laboratory 7000 East Ave., Livermore, CA 94550			A. State Manifest Document Number 91760160		
4. Generator's Phone (510) 432-1985 ATTN: JEAN SCHREIBER L-650			B. State Generator's ID N/A Federal Facility		
5. Transporter 1 Company Name MP Environmental		6. US EPA ID Number CAT000624247		C. State Transporter's ID 302359	
7. Transporter 2 Company Name		8. US EPA ID Number		D. Transporter's Phone (503) 404-3000	
9. Designated Facility Name and Site Address USPCI GRASSY MT., 3 miles east 7 miles north of exit 41 off I-80, Clive UT		10. US EPA ID Number UTD991301748		E. State Transporter's ID	
				F. Transporter's Phone	
				G. State Facility's ID	
				H. Facility's Phone (801) 995-3900	
11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)		12. Containers No. Type		13. Total Quantity	14. Unit Wt/Vol
a. Non-RCRA Hazardous waste, solid (Crushed drums and debris)		x x 1 CM		00021	Y
b.					
c.					
d.					
J. Additional Descriptions for Materials Listed Above GSA-90-2296		K. Handling Codes for Wastes Listed Above			
		a. 03 ✓		b.	
		c.		d.	
15. Special Handling Instructions and Additional Information: EMERGENCY CONTACT: (510) 447-6880 Wear protective clothing while handling Bin Certificate # 206873 These materials are NOT radioactively contaminated. CERTIFICATION # 32547					
16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations. If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.					
Printed/Typed Name Michael N. Hayes on behalf of LLNL		Signature <i>Michael N. Hayes</i>		Month Day Year 05 12 19 92	
17. Transporter 1 Acknowledgement of Receipt of Materials Printed/Typed Name DANIEL J. SIMPSON		Signature <i>Daniel J. Simpson</i>		Month Day Year 05 12 19 92	
18. Transporter 2 Acknowledgement of Receipt of Materials Printed/Typed Name		Signature		Month Day Year	
19. Discrepancy Indication Space					
20. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in item 19. Printed/Typed Name Arlene Halladay					
Signature <i>Arlene Halladay</i>		Month Day Year 06 10 19 92			

DO NOT WRITE BELOW THIS LINE.

IN CASE OF EMERGENCY OR SPILL, CALL THE NATIONAL RESPONSE CENTER 1-800-424-8802; WITHIN CALIFORNIA, CALL 1-800-852-7530

DATE

FILMED

6/15/94

END