



Technical Memorandum

To: Lynn Nakashima, Department of Toxic Substances Control (DTSC) (Electronic Format Only)
From: Andrew Romolo, P.G.; Terraphase Engineering
cc: William Marsh, Esq
Date: November 18, 2011
Subject: University of California Richmond Field Station Biologically Active Permeable Barrier Groundwater Sampling Results

Terraphase Engineering Inc. (Terraphase) has prepared this technical memorandum on behalf of Zeneca Inc. (Zeneca) to transmit the results of groundwater samples collected from select wells located in the portion of the Biologically Active Permeable Barrier (BAPB) located on the University of California Richmond Field Station (UCRFS) property (the "Site"). At the request of the DTSC, Terraphase collected groundwater samples from select wells within the BAPB to confirm the previous sampling results reported by Arcadis US, Inc. in their March 11, 2011 letter titled "Transmittal of Groundwater Data Collected in Select Areas at the University of California Richmond Field Station, Richmond, California."

On August 10, 2011, a representative from Terraphase collected groundwater samples from wells MW-35, MW-37, and MW-38. The monitoring well locations are shown on Figure 1. Groundwater samples were collected using the low-flow purging techniques that are implemented during the groundwater monitoring/sampling activities at Campus Bay and described in Appendix A of the July 15, 2011 Terraphase report, "Semi-Annual Groundwater and Surface Water Monitoring Report, January 1 Through June 30, 2011, Campus Bay, Richmond, California" ("the Semi-Annual Report"). The following field parameters were measured and recorded prior to sample collection using a YSI 556 Multiparameter Water Quality Meter equipped with a flow-through cell:

- Dissolved oxygen (DO)
- oxidation-reduction potential (ORP)
- pH
- specific conductance
- temperature
- turbidity

Groundwater samples were collected from each well and placed in laboratory-supplied containers. The samples were transported in an ice-chilled cooler to Curtis & Tompkins, LTD of Berkeley, California for Title 22 Metals analysis using EPA Method 6010 (EPA Method 7470 for mercury) under chain of custody protocol. The results of the field measurements are summarized in Table 1. The groundwater analytical results are summarized in Table 2.

If you have any questions, please do not hesitate to call Mr. Andrew Romolo, P.G. of Terraphase at (510) 326-1473.

Tables

Table 1: UCRFS BAPB Sampling Water Quality Parameters

Table 2: UCRFS Sampling Analytical Results

Figures

Figure 1: UCRFS BAPB Groundwater Monitoring Well Locations

Attachments

Attachment 1: Laboratory Analytical Report

TABLES

Table 1
UCRFS BAPB Sampling Water Quality Parameters
 Campus Bay Richmond, California

Sample ID	Sample Date	Temperature °C	Dissolved Oxygen mg/L	pH SU	Conductivity µS/cm	ORP mV	Turbidity NTU
MW-38	10-Aug-11	16.82	0.17	6.23	8544	13.7	16.6
MW-35	10-Aug-11	17.36	0.19	6.63	8748	-114.5	22.8
MW-37	10-Aug-11	16.54	0.15	5.03	7528	72	9.06

Notes

- °C= Degrees Celsius
- mg/L= milligrams per liter
- SU= standard units
- µS/cm= Microsiemens per centimeter
- mV= Milivolts
- NTU= Nephelometric Turbidity Units

Table 2
UCRFS BAPB Sampling Analytical Results
 Campus Bay Richmond, California

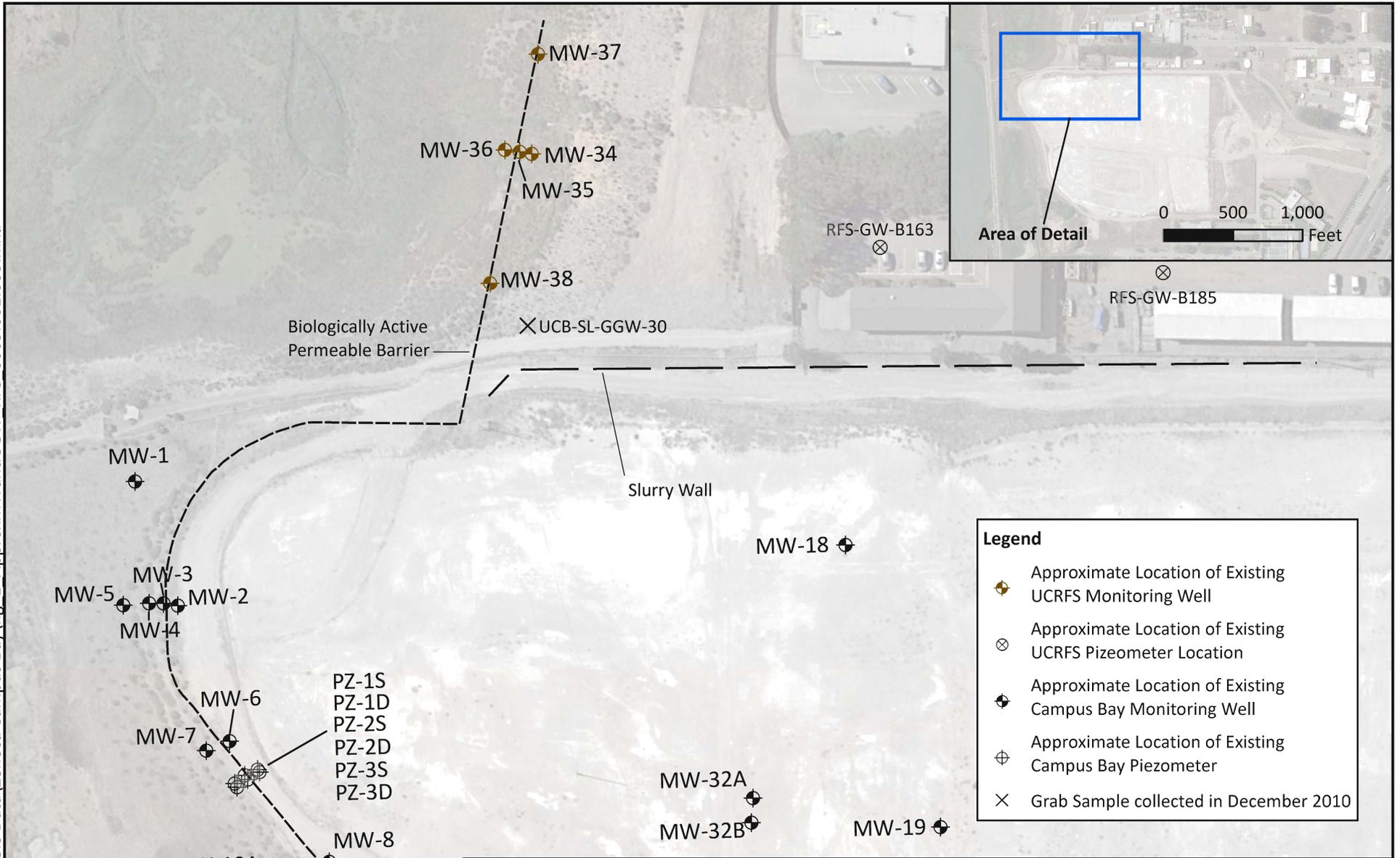
Sample ID	Sample Date	Antimony µg/L	Arsenic µg/L	Barium µg/L	Beryllium µg/L	Cadmium µg/L	Chromium µg/L	Cobalt µg/L	Copper µg/L	Lead µg/L	Mercury µg/L	Molybdenum µg/L	Nickel µg/L	Selenium µg/L	Silver µg/L	Thallium µg/L	Vanadium µg/L	Zinc µg/L	
MW-38	10-Aug-11	<10	52	78	<2	<5	<5	22	<5	<5	<0.2	<5	110	48	<5	<10	<5	710	
MW-35	10-Aug-11	<10	15	120	<2	<5	<5	<5	<5	<5	<0.2	<5	<5	28	<5	<10	<5	<20	
MW-37	10-Aug-11	<10	<7.1	20	<2	<5	<5	500	<5	5.8	<0.2	<5	630	50	<5	<10	<5	43,000	
Screening Criteria																			
5x Aquatic Criteria		2.20E+05	1.80E+02	-	-	4.70E+01	-	-	1.60E+01	4.10E+01	1.10E+01	-	4.10E+01	2.50E+01	9.50E+00	3.20E+02	-	4.10E+02	

Notes

µg/L = Micrograms per Liter

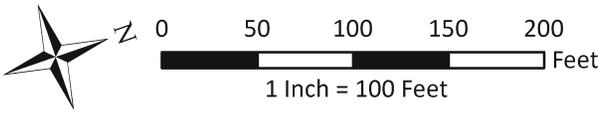
indicates a detection in upper horizon groundwater above 5x the aquatic criterion (Campus Bay Site Specific, Upper Horizon Near BAPB)

FIGURES



Legend

- Approximate Location of Existing UCRFS Monitoring Well
- Approximate Location of Existing UCRFS Piezometer Location
- Approximate Location of Existing Campus Bay Monitoring Well
- Approximate Location of Existing Campus Bay Piezometer
- Grab Sample collected in December 2010



<p>SAFETY FIRST</p>	CLIENT:	Zeneca, Inc.	<p>UCRFS BAPB Groundwater Monitoring Well Locations DRAFT</p> <p>FIGURE 1</p>
	PROJECT:	Campus Bay Richmond, CA	
	PROJECT NUMBER:	0009.002.003	

Attachment 1:

Laboratory Analytical Reports



Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878





Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

**Laboratory Job Number 230147
ANALYTICAL REPORT**

Terraphase Engineering
414 13th Street
Oakland, CA 94612

Project : STANDARD
Location : Zeneca
Level : II

<u>Sample ID</u>	<u>Lab ID</u>
MW-38	230147-001
MW-35	230147-002
MW-37	230147-003

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: _____

Project Manager

Date: 08/19/2011

NELAP # 01107CA

CASE NARRATIVE

Laboratory number: 230147
Client: Terraphase Engineering
Location: Zeneca
Request Date: 08/10/11
Samples Received: 08/10/11

This data package contains sample and QC results for three water samples, requested for the above referenced project on 08/10/11. The samples were received cold and intact.

Metals (EPA 6010B and EPA 7470A):

No analytical problems were encountered.

COOLER RECEIPT CHECKLIST



Curtis & Tompkins, Ltd.

Login # 230147 Date Received 8/10/11 Number of coolers 1
Client TerraPhase Project Zeneca

Date Opened 8/10/11 By (print) V. J. ... (sign)
Date Logged in By (print) (sign)

1. Did cooler come with a shipping slip (airbill, etc) YES NO
Shipping info

2A. Were custody seals present? ... YES (circle) on cooler on samples NO
How many Name Date

2B. Were custody seals intact upon arrival? YES NO N/A

3. Were custody papers dry and intact when received? YES NO

4. Were custody papers filled out properly (ink, signed, etc)? YES NO

5. Is the project identifiable from custody papers? (If so fill out top of form) YES NO

6. Indicate the packing in cooler: (if other, describe)

- Bubble Wrap, Cloth material, Foam blocks, Cardboard, Bags, Styrofoam, None, Paper towels

7. Temperature documentation: * Notify PM if temperature exceeds 6°C

Type of ice used: Wet, Blue/Gel, None Temp(°C)

Samples Received on ice & cold without a temperature blank

Samples received on ice directly from the field. Cooling process had begun

8. Were Method 5035 sampling containers present? YES NO
If YES, what time were they transferred to freezer?

9. Did all bottles arrive unbroken/unopened? YES NO

10. Are samples in the appropriate containers for indicated tests? YES NO

11. Are sample labels present, in good condition and complete? YES NO

12. Do the sample labels agree with custody papers? YES NO

13. Was sufficient amount of sample sent for tests requested? YES NO

14. Are the samples appropriately preserved? YES NO N/A

15. Did you check preservatives for all bottles for each sample? YES NO N/A

16. Did you document your preservative check? YES NO N/A

17. Did you change the hold time in LIMS for unpreserved VOAs? YES NO N/A

18. Are bubbles > 6mm absent in VOA samples? YES NO N/A

19. Was the client contacted concerning this sample delivery? YES NO
If YES, Who was called? By Date:

COMMENTS

Multiple horizontal lines for handwritten comments.

California Title 22 Metals

Lab #:	230147	Project#:	STANDARD
Client:	Terraphase Engineering	Location:	Zeneca
Field ID:	MW-38	Diln Fac:	1.000
Lab ID:	230147-001	Sampled:	08/10/11
Matrix:	Water	Received:	08/10/11
Units:	ug/L		

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	ND	10	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Arsenic	52	7.1	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Barium	78	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Beryllium	ND	2.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Cadmium	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Chromium	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Cobalt	22	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Copper	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Lead	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Mercury	ND	0.20	177768	08/12/11	08/12/11	METHOD	EPA 7470A
Molybdenum	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Nickel	110	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Selenium	48	10	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Silver	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Thallium	ND	10	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Vanadium	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Zinc	710	20	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B

ND= Not Detected
 RL= Reporting Limit

California Title 22 Metals			
Lab #:	230147	Project#:	STANDARD
Client:	Terraphase Engineering	Location:	Zeneca
Field ID:	MW-35	Diln Fac:	1.000
Lab ID:	230147-002	Sampled:	08/10/11
Matrix:	Water	Received:	08/10/11
Units:	ug/L		

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	ND	10	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Arsenic	15	7.1	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Barium	120	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Beryllium	ND	2.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Cadmium	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Chromium	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Cobalt	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Copper	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Lead	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Mercury	ND	0.20	177768	08/12/11	08/12/11	METHOD	EPA 7470A
Molybdenum	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Nickel	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Selenium	28	10	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Silver	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Thallium	ND	10	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Vanadium	ND	5.0	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Zinc	ND	20	177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B

ND= Not Detected
 RL= Reporting Limit

California Title 22 Metals

Lab #:	230147	Project#:	STANDARD
Client:	Terraphase Engineering	Location:	Zeneca
Field ID:	MW-37	Units:	ug/L
Lab ID:	230147-003	Sampled:	08/10/11
Matrix:	Water	Received:	08/10/11

Analyte	Result	RL	Diln	Fac	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	ND	10	1.000		177741	08/11/11	08/17/11	EPA 3010A	EPA 6010B
Arsenic	ND	7.1	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Barium	20	5.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Beryllium	ND	2.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Cadmium	ND	5.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Chromium	ND	5.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Cobalt	500	5.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Copper	ND	5.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Lead	5.8	5.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Mercury	ND	0.20	1.000		177768	08/12/11	08/12/11	METHOD	EPA 7470A
Molybdenum	ND	5.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Nickel	630	5.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Selenium	50	10	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Silver	ND	5.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Thallium	ND	10	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Vanadium	ND	5.0	1.000		177741	08/11/11	08/16/11	EPA 3010A	EPA 6010B
Zinc	43,000	200	10.00		177741	08/11/11	08/17/11	EPA 3010A	EPA 6010B

ND= Not Detected
 RL= Reporting Limit

Batch QC Report

California Title 22 Metals			
Lab #:	230147	Location:	Zeneca
Client:	Terraphase Engineering	Prep:	EPA 3010A
Project#:	STANDARD	Analysis:	EPA 6010B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC603956	Batch#:	177741
Matrix:	Water	Prepared:	08/11/11
Units:	ug/L	Analyzed:	08/15/11

Analyte	Result	RL
Antimony	ND	10
Arsenic	ND	7.1
Barium	ND	5.0
Beryllium	ND	2.0
Cadmium	ND	5.0
Chromium	ND	5.0
Cobalt	ND	5.0
Copper	ND	5.0
Lead	ND	5.0
Molybdenum	ND	5.0
Nickel	ND	5.0
Selenium	ND	10
Silver	ND	5.0
Thallium	ND	10
Vanadium	ND	5.0
Zinc	ND	20

ND= Not Detected

RL= Reporting Limit

Batch QC Report

California Title 22 Metals			
Lab #:	230147	Location:	Zeneca
Client:	Terraphase Engineering	Prep:	EPA 3010A
Project#:	STANDARD	Analysis:	EPA 6010B
Matrix:	Water	Batch#:	177741
Units:	ug/L	Prepared:	08/11/11
Diln Fac:	1.000	Analyzed:	08/15/11

Type: BS Lab ID: QC603957

Analyte	Spiked	Result	%REC	Limits
Antimony	500.0	493.8	99	75-120
Arsenic	100.0	111.0	111	80-128
Barium	2,000	1,950	98	80-120
Beryllium	50.00	48.29	97	80-121
Cadmium	50.00	49.80	100	80-120
Chromium	200.0	196.4	98	80-120
Cobalt	500.0	462.0	92	80-120
Copper	250.0	236.5	95	77-120
Lead	100.0	90.02	90	77-120
Molybdenum	400.0	381.4	95	80-120
Nickel	500.0	481.4	96	80-120
Selenium	100.0	98.01	98	80-123
Silver	50.00	47.41	95	79-120
Thallium	100.0	104.9	105	80-124
Vanadium	500.0	497.4	99	80-120
Zinc	500.0	487.1	97	80-120

Type: BSD Lab ID: QC603958

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	500.0	477.1	95	75-120	3	20
Arsenic	100.0	102.4	102	80-128	8	20
Barium	2,000	1,859	93	80-120	5	20
Beryllium	50.00	46.34	93	80-121	4	20
Cadmium	50.00	48.45	97	80-120	3	20
Chromium	200.0	188.0	94	80-120	4	20
Cobalt	500.0	451.3	90	80-120	2	20
Copper	250.0	227.3	91	77-120	4	20
Lead	100.0	87.12	87	77-120	3	20
Molybdenum	400.0	371.8	93	80-120	3	20
Nickel	500.0	461.3	92	80-120	4	20
Selenium	100.0	90.78	91	80-123	8	24
Silver	50.00	46.20	92	79-120	3	20
Thallium	100.0	100.7	101	80-124	4	20
Vanadium	500.0	477.3	95	80-120	4	20
Zinc	500.0	475.2	95	80-120	2	20

RPD= Relative Percent Difference

Batch QC Report

California Title 22 Metals			
Lab #:	230147	Location:	Zeneca
Client:	Terraphase Engineering	Prep:	EPA 3010A
Project#:	STANDARD	Analysis:	EPA 6010B
Field ID:	ZZZZZZZZZZ	Batch#:	177741
MSS Lab ID:	230113-006	Sampled:	08/08/11
Matrix:	Water	Received:	08/09/11
Units:	ug/L	Prepared:	08/11/11
Diln Fac:	1.000	Analyzed:	08/15/11

Type: MS Lab ID: QC603959

Analyte	MSS Result	Spiked	Result	%REC	Limits
Antimony	<2.386	500.0	485.1	97	68-121
Arsenic	2.447	100.0	102.5	100	70-139
Barium	<0.7027	2,000	1,905	95	71-120
Beryllium	<0.2364	50.00	47.25	94	79-123
Cadmium	<1.000	50.00	48.94	98	70-123
Chromium	<1.529	200.0	191.6	96	70-120
Cobalt	<0.5262	500.0	457.3	91	72-120
Copper	2.206	250.0	233.4	92	66-124
Lead	<1.425	100.0	87.77	88	58-120
Molybdenum	1.057	400.0	378.7	94	76-120
Nickel	<0.8294	500.0	469.7	94	66-120
Selenium	<3.189	100.0	92.22	92	64-132
Silver	<0.6196	50.00	46.24	92	50-127
Thallium	<2.373	100.0	98.81	99	64-129
Vanadium	<1.246	500.0	483.6	97	73-120
Zinc	<4.355	500.0	483.6	97	69-126

Type: MSD Lab ID: QC603960

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	500.0	484.4	97	68-121	0	20
Arsenic	100.0	101.2	99	70-139	1	28
Barium	2,000	1,896	95	71-120	0	24
Beryllium	50.00	46.87	94	79-123	1	23
Cadmium	50.00	48.66	97	70-123	1	22
Chromium	200.0	189.7	95	70-120	1	22
Cobalt	500.0	456.0	91	72-120	0	22
Copper	250.0	231.9	92	66-124	1	30
Lead	100.0	87.67	88	58-120	0	29
Molybdenum	400.0	375.6	94	76-120	1	25
Nickel	500.0	467.4	93	66-120	0	22
Selenium	100.0	92.54	93	64-132	0	31
Silver	50.00	46.94	94	50-127	1	27
Thallium	100.0	101.3	101	64-129	2	25
Vanadium	500.0	484.0	97	73-120	0	25
Zinc	500.0	480.2	96	69-126	1	23

RPD= Relative Percent Difference

Batch QC Report

California Title 22 Metals			
Lab #:	230147	Location:	Zeneca
Client:	Terraphase Engineering	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7470A
Analyte:	Mercury	Diln Fac:	1.000
Type:	BLANK	Batch#:	177768
Lab ID:	QC604070	Prepared:	08/12/11
Matrix:	Water	Analyzed:	08/12/11
Units:	ug/L		

Result	RL
ND	0.20

ND= Not Detected
 RL= Reporting Limit

Batch QC Report

California Title 22 Metals			
Lab #:	230147	Location:	Zeneca
Client:	Terraphase Engineering	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7470A
Analyte:	Mercury	Batch#:	177768
Matrix:	Water	Prepared:	08/12/11
Units:	ug/L	Analyzed:	08/12/11
Diln Fac:	1.000		

Type	Lab ID	Spiked	Result	%REC	Limits	RPD	Lim
BS	QC604071	2.500	2.650	106	80-120		
BSD	QC604072	2.500	2.700	108	80-120	2	27

RPD= Relative Percent Difference

Batch QC Report

California Title 22 Metals			
Lab #:	230147	Location:	Zeneca
Client:	Terraphase Engineering	Prep:	METHOD
Project#:	STANDARD	Analysis:	EPA 7470A
Analyte:	Mercury	Batch#:	177768
Field ID:	ZZZZZZZZZZ	Sampled:	08/11/11
MSS Lab ID:	230198-001	Received:	08/11/11
Matrix:	Water	Prepared:	08/12/11
Units:	ug/L	Analyzed:	08/12/11
Diln Fac:	1.000		

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	RPD	Lim
MS	QC604073	<0.03605	2.500	2.810	112	67-120		
MSD	QC604074		2.500	2.830	113	67-120	1	39

RPD= Relative Percent Difference