DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 377TH AIR BASE WING (AFMC)

CERTIFIED RETURN-RECEIPT REQUESTED

Colonel Tom D. Miller
377 ABW/CC
2000 Wyoming Blvd SE
Kirtland AFB NM 87117-5600

Mr. John Kieling, Chief
Hazardous Waste Bureau (HWB)
New Mexico Environment Department (NMED)
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303

Dear Mr. Kieling

Well Development

Well development was performed on groundwater extraction well KAFB-106157 prior to conducting aquifer testing to ensure that the aquifer test accurately characterizes groundwater conditions in the vicinity of the well and to improve the performance of the well and optimize the overall yield. Well development was conducted from September 27 through 29, 2013 and was conducted in accordance with the industry standard practices and in general accordance with the United States Environmental Protection Agency's (EPA) Resource Conservation and Recovery Act (RCRA) Ground-Water Monitoring: Draft Technical Guidance (EPA, 1992), and with the Kirtland Air Force Base (AFB) RCRA Permit (NMED, 2010). In addition, well development was conducted in accordance with the Groundwater Extraction Well KAFB-106157 Well Development Work Plan (USACE, 2013) approved by NMED on October 10, 2013. The well development record and well completion diagram for KAFB-106157 are provided in Appendix A.

Because well KAFB-106157 was not developed when installed in December 2011, well development procedures used were more rigorous than those that would have been used if the well were developed at the time of installation; procedures included the following:

1. Prior to well development, the depth to water, total water column, and total well depth were determined. The depth to water before developing the well was 482.74 feet (ft.) below ground surface. The total water column was 60.7 feet. The total well depth was measured at 543.4 ft. below ground surface. According to the well completion diagram, the total well depth at the time of installation was 545 ft below ground surface. This discrepancy in total well depth could be either from the accumulation of sediment or an imprecise approximation of ground surface elevation during well installation.

2. The well was bailed prior to surging and swabbing. Minimal sediment was brought up in the bailer, and the subcontractor was confident that the bailer was hitting hard bottom. This indicates that there was no appreciable sediment accumulation in the well.

3. The well was mechanically surged and swabbed using a surge block. Because it was not possible to have both a pump and the surge block operating simultaneously, the well was bailed both before and after surging and swabbing.

   a. Multiple runs of swabbing and pumping were conducted along each 20 ft section of screen.

   b. A total of 25 gallons of water was removed during bailing. The water produced during bailing was too dirty to measure field parameters.

4. Following surging and swabbing the well screen, overpumping of the screened interval was conducted at different depth intervals along the well screen.

   - The pump intake was set to 20 ft below water level, and 445 gallons were pumped.
   - The pump intake was raised to 10 ft below water level, and 960 gallons were pumped.
   - The pump intake was lowered back to 20 ft below water level, and 500 gallons were pumped.
   - The pump intake was lowered to 40 ft below water level, and 975 gallons were pumped.
   - The pump intake was lowered so that it sat at the bottom of the well screen, and the well was pumped until field parameters stabilized. 2,285 gallons were pumped with the pump intake at this level.

   a. During overpumping, the following field parameters were measured periodically on the generated well development water: turbidity, dissolved oxygen, temperature, pH, specific conductivity, alkalinity, and oxidation-reduction potential (ORP). Field parameters were measured at least once every 15 minutes during pumping. During overpumping, a pressure transducer was used to measure drawdown.

   b. Well development was completed when the well volume plus the volume of water added during drilling had been removed, turbidity was below 10 NTU, and the remaining field parameters, with the exception of ORP, stabilized to within 10% for three consecutive readings. The ORP did not stabilize in the measurements during pumping. It has been observed during quarterly groundwater sampling that the ORP probe on the In-Situ Troll 9500 multi-parameter meter, which was used to collect readings during well development, is not sensitive enough to stabilize to within 10%, especially at low dissolved oxygen levels.

5. After overpumping, the total depth of the well was re-measured, and bailing was conducted to remove any sediment that may have accumulated during overpumping. The contractor was confident that the bailer hit hard bottom, and very little sediment was brought up in the bailer. This indicates that there was no appreciable sediment accumulation in the well.

6. One day after the completion of well development, a groundwater sample was collected from the well and analyzed for EDB, VOCs, SVOCs, TPH, metals, and general chemistry, as outlined in Section 3.1.1.2 of the NMED-accepted Quality Assurance Project Plan (August 2011). The analytical results from the samples collected are shown in Appendix B. This data will be used to verify carbon loading during future aquifer testing activities and determine if changes to the design of the treatment system are necessary.

7. The final disposition of the water pumped during the well development has been determined by the analytical data results. The water results are below hazardous standards and a Notice of Intent (NOI)

to discharge wastewater will be submitted to NMED. After approval of the NOI, the wastewater will be discharged on site.

References

NMED. 2010. *Hazardous Waste Treatment Facility Operating Permit, EPA ID No. NM9570024423,* New Mexico Environment Department Hazardous Waste Bureau, Santa Fe, New Mexico, July.

USACE. 2013. *Groundwater Extraction Well KAFB-106157 Well Development Work Plan, Bulk Fuels Facility Spill, Solid Waste Management Units SS-106 and SS-111,* Prepared by Shaw Environmental & Infrastructure, Inc. for the USACE Albuquerque District under USACE Contract No. W912DY-10-D-0014, Delivery Order 0002. September.

Please contact Mr. L. Wayne Bitner at 505.853.3484 or at ludie.bitner@us.af.mil or Mrs. Victoria R. Branson at 505.846.6362 or at victoria.branson@us.af.mil if you have any questions.

Sincerely

TOM D. MILLER, Colonel USAF
Commander

cc:
NMED-EHD (Blaine) w/o attch
NMED-HWB (Cobrain, Moats, McDonald, Brandwein) w/attch
NMED-GWQB (J. Schoeppner) w/attch
NMED-PSTB (Reuter) w/attch
NMED-OGC (deSaillan) w/o attch
EPA Region 6 (King) w/o attch
AFCEE/CMSE (Oyelowo) w/o attch
Public Info Repository (Central New Mexico) w/attch
Administrative Record/Information Repository (AR/IR) w/attch
File, w/attch

40 CFR 270.11
DOCUMENT CERTIFICATION
FEBRUARY 2014

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Tom D. Miller

TOM D. MILLER, Colonel, USAF
Commander, 377th Air Base Wing

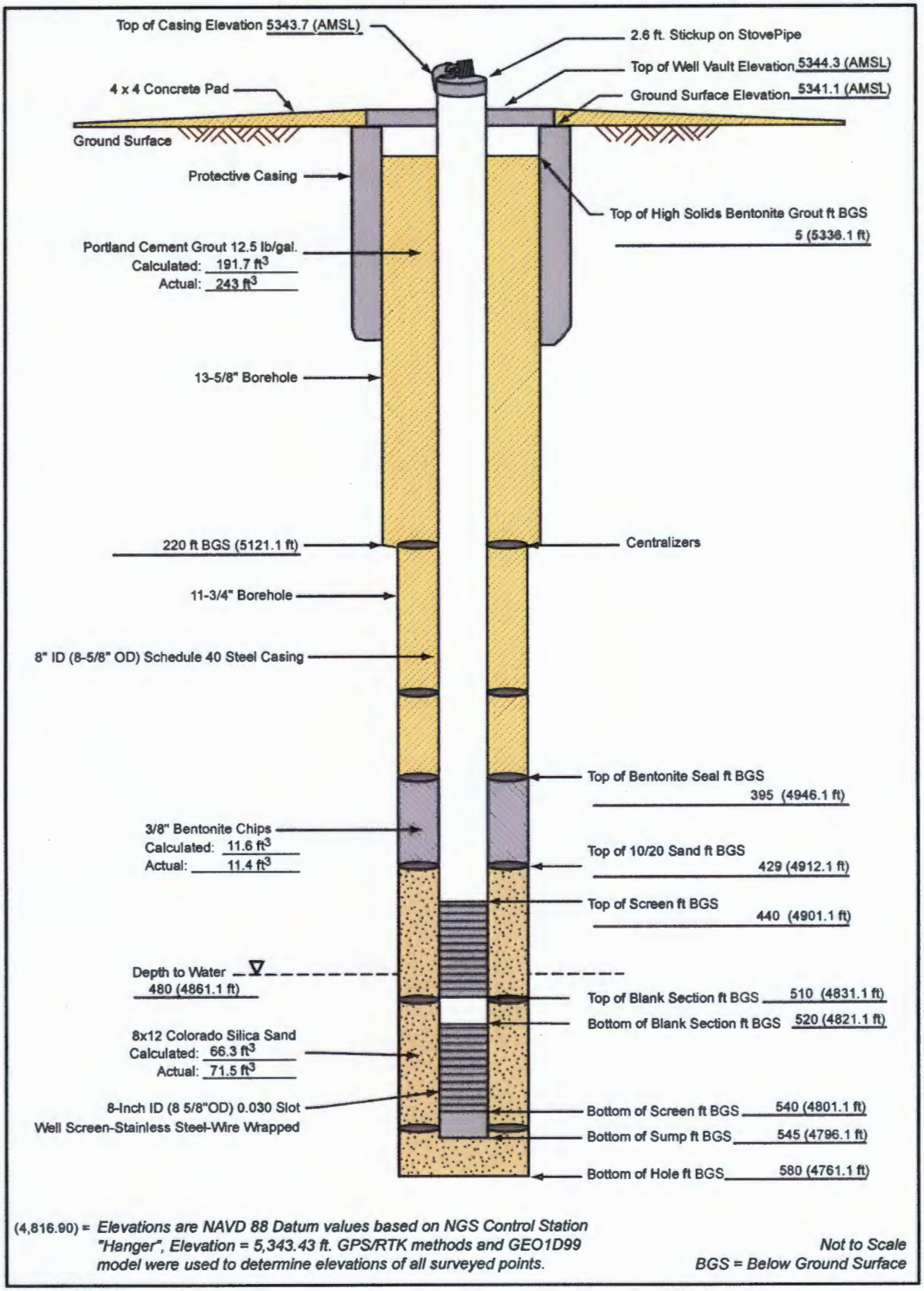
This document has been approved for public release.

KIRTLAND AIR FORCE BASE
377th Air Base Wing Public Affairs

APPENDIX A

LNAPL Extraction Well 106157

Installation Start Date/Time: 12/10/11 @ 0800
Installation End Date/Time: 12/16/11 @ 0900



(4,816.90) = *Elevations are NAVD 88 Datum values based on NGS Control Station "Hanger", Elevation = 5,343.43 ft. GPS/RTK methods and GEO1D99 model were used to determine elevations of all surveyed points.*

Not to Scale
BGS = Below Ground Surface

140705.DA010010_A2

Shaw Shaw Environmental, Inc.

Well Development Record

Project Name: KAFB BFF

Location: New VA Lot

Well/Piez. No.: KAFB-106157

Personnel: V. Bracht

Date Installed: 12/16/11

Date: 9/27/13

Csg. Diameter (I.D.): 8"

Samplers: N/A

Total Depth (ft. BGL): 545 (546 ft below TOC)

Method of Development:

X Surging X Bailing X Pumping

X Original Development ☐Redevelopment ☐Other

Development Date: 9/27/13

Depth to Water Before Developing Well (ft. BGL): 485.34 ft below TOC

Vol. (V) Purge Factor Volume to Purge

Height of Water Column: feet = gal. * 1 =

$V=(B * r_c^2 * L_c * 7.48)+(B * (r_w^2 - r_c^2) * L_s * \emptyset_s * 7.48)+(H_2O$ added during drilling/installation) = 1313 gallons

Depth Purging From (ft): Variable

Time Purging Begins: 1015, 9/27

Weather: 9/27: Cloudy and Cool; 9/28-9/29: Sunny and Warm

Screened Interval (ft BGL): 480 - 540

Equipment Nos.: pH Meter: In-Situ 50499

EC Meter: In-Situ 50499

Turbidity Meter: LVE 003050

Equipment Decontaminated Prior to Development: Y X N

Describe: Steam Cleaned

Collected Sample of Water Added to Well: Y N X

Describe: N/A

Comment:

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	pH	Conductivity (ms/cm)	Turbidity (N.T.U.)	DO (mg/L)	Alkalinity (mg/L as CaCO3)	ORP (mV)	Comments
9/27/2013	1015	485.34	0	–	–	–	–	–	–	–	Begin Bailing.
9/27/2013	1040	–	3	–	–	–	–	–	–	–	Begin Swabbing and Surging[a].
9/27/2013	1245	–	3	–	–	–	–	–	–	–	Finish Swabbing.
9/27/2013	1300	–	25	–	–	–	–	–	–	–	Bailed. Too dirty for readings.
9/27/2013	1559	485.91	25	–	–	–	–	–	–	–	Begin Pumping 506 ft to intake.
9/27/2013	1611	487.12	355	NR	6.99	610.1	>1000	3.86	NR[b]	104	Water is Brown.
9/27/2013	1615	487.16	420	Unable to receive updated readings[b]							Water is Brown.
9/27/2013	1618	487.18	470	Unable to receive updated readings[b]							Water is Brown. End of Day.
9/28/2013	0824	483.05	470	Unable to receive updated readings[b]							Resume Pumping @ 27 GPM. Pump raised to 10 ft below water.
9/28/2013	0830	484.86	635	18.74	7.21	595.7	35.3	0.66	NR	106	

Notes:
* Water Levels - Reported to the nearest 0.01 foot
* pH - Reading rounded to 0.1 pH units
* Water temperature - Reported to nearest 0.1C
* Turbidity report in NTV nearest whole #
[a] Performed multiple runs of swabbing and surging over each 20 ft length of screen.
[b] Water is too dirty to receive readings.
DO = Dissolved Oxygen
GPM = Gallons Per Minute
KAFB = Kirtland Air Force Base
NR = Not Recorded
ORP = Oxidation-Reduction Potential

Where:
B=3.14
$\emptyset_s$= porosity of the sand pack
r_c= radius of the well casing and screen in feet
L_c= length of water column inside the casing and screen in feet
r_w= radius of the well bore in feet
L_s= length of saturated portion of the sand pack in feet
7.48 gallons/cubic foot= conversion from cubic feet to gallons

Shaw Shaw Environmental, Inc.

Well Development Record

Project: KAFB BFF

Well No: KAFB-106157

Project Number: 140705

Geologist: V. Bracht

Date: 9/27/13

Checked By:

Time Start: 1015, 9/27/13

Time Finish: 0901, 9/29/13

Field Chemistry (cont'd)

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	pH	Conductivity (ms/cm)	Turbidity (N.T.U.)	DO (mg/L)	Alkalinity (mg/L as CaCO3)	ORP (mV)	Comments
9/28/2013	0835	484.91	785	18.92	7.28	592.3	NR	0.28	176	101	
9/28/2013	0840	483.79	900	19.05	7.32	587.7	17.8	0.22	160	61	
9/28/2013	0842	483.24	940	NR	NR	NR	NR	NR	NR	NR	Stop Pumping.
9/28/2013	0922	484.87	940	NR	NR	NR	NR	NR	NR	NR	Resume Pumping.
9/28/2013	0925	484.94	1105	18.26	7.36	591.4	14.1	0.27	180	98	
9/28/2013	0930	485.01	1220	19.20	7.38	583.4	10.3	0.24	168	102	
9/28/2013	0935	485.04	1350	19.27	7.38	581.1	8.90	0.25	172	103	
9/28/2013	0938	483.29	1430	NR	NR	NR	NR	NR	NR	NR	Stop Pumping.
9/28/2013	1023	484.75	1430	NR	NR	NR	NR	NR	NR	NR	Resume Pumping. Pump lowered to 20 ft below water.
9/28/2013	1030	484.94	1585	16.67	7.39	582.3	18.0	0.34	184	151	
9/28/2013	1035	484.99	1745	19.26	7.39	584.3	9.50	0.31	180	129	
9/28/2013	1040	483.62	1870	19.50	7.40	582.1	5.06	0.35	172	124	
9/28/2013	1042	483.26	1930	NR	NR	NR	NR	NR	NR	NR	Stop Pumping.
9/28/2013	1149	484.69	1930	NR	NR	NR	NR	NR	NR	NR	Resume Pumping. Pump lowered to 40 ft below water.
9/28/2013	1155	484.86	2095	20.01	7.41	553.9	180	0.64	152	110	

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Shaw Shaw Environmental, Inc.

Well Development Record

Project: KAFB BFF

Well No: KAFB-106157

Project Number: 140705

Geologist: V. Bracht

Date: 9/27/13

Checked By:

Time Start: 1015, 9/27/13

Time Finish: 0901, 9/29/13

Field Chemistry (cont'd)

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	pH	Conductivity (ms/cm)	Turbidity (N.T.U.)	DO (mg/L)	Alkalinity (mg/L as CaCO3)	ORP (mV)	Comments
9/28/2013	1200	484.91	2220	20.00	7.42	582.9	8.03	0.65	168	82	
9/28/2013	1205	484.94	2345	20.01	7.41	584.6	5.66	0.61	178	72	
9/28/2013	1208	483.23	2420	NR	NR	NR	NR	NR	NR	NR	Stop Pumping.
9/28/2013	1246	484.73	2420	NR	NR	NR	NR	NR	NR	NR	Resume Pumping.
9/28/2013	1250	484.87	2525	19.86	7.41	580.0	8.60	0.58	180	97	
9/28/2013	1255	484.95	2655	NR	7.41	585.7	3.19	0.52	172	63	
9/28/2013	1300	484.98	2785	19.83	7.42	583.0	3.06	0.51	176	35	
9/28/2013	1305	483.21	2905	19.82	7.40	582.7	1.82	0.54	180	71	Stop Pumping.
9/28/2013	1349	484.60	2905	NR	NR	NR	NR	NR	NR	NR	Resume Pumping. Pump lowered an additional 10 ft.
9/28/2013	1355	484.76	3055	19.87	7.42	568.4	198.0	0.36	164	38	
9/28/2013	1400	484.82	3190	19.82	7.45	580.1	50.3	0.46	184	28	
9/28/2013	1405	484.85	3305	19.81	7.42	581.6	17.1	0.50	174	29	
9/28/2013	1409	483.16	3400	NR	NR	NR	NR	NR	NR	NR	Stop Pumping.
9/28/2013	1449	484.65	3400	NR	NR	NR	NR	NR	NR	NR	Resume Pumping.
9/28/2013	1455	484.81	3575	19.90	7.43	580.0	5.46	0.57	176	81	

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

Shaw Shaw Environmental, Inc.

Well Development Record

Project: KAFB BFF

Well No: KAFB-106157

Project Number: 140705

Geologist: V. Bracht

Date: 9/27/13

Checked By:

Time Start: 1015, 9/27/13

Time Finish: 0901, 9/29/13

Field Chemistry (cont'd)

Date	Time	Water Level (ft. Below TOC)	Volume Removed (gal.)	Temp.°C	pH	Conductivity (ms/cm)	Turbidity (N.T.U.)	DO (mg/L)	Alkalinity (mg/L as CaCO3)	ORP (mV)	Comments
9/28/2013	1500	484.86	3710	19.80	7.43	582.9	7.08	0.57	184	93	
9/28/2013	1505	484.89	3820	19.83	7.43	581.5	3.15	0.56	192	77	
9/28/2013	1508	483.19	3900	NR	NR	NR	NR	NR	NR	NR	Stop Pumping.
9/28/2013	1604	484.57	3900	NR	NR	NR	NR	NR	NR	NR	Resume Pumping.
9/28/2013	1610	484.73	4066	20.04	7.44	577.8	393.0	0.63	172	8	
9/28/2013	1615	484.77	4214	19.81	7.45	582.1	80.4	0.76	180	-2	
9/28/2013	1620	484.80	4342	19.82	7.44	581.5	41.0	0.73	172	-15	
9/28/2013	1623	483.15	4395	NR	NR	NR	NR	NR	NR	NR	Stop Pumping.
9/29/2013	0800	484.71	4395	NR	NR	NR	NR	NR	NR	NR	Resume Pumping.
9/29/2013	0809	484.69	4640	19.33	7.18	597.5	4.17	0.46	178	183	
9/29/2013	0813	484.73	4725	19.11	7.39	600.8	2.79	0.53	184	89	
9/29/2013	0816	483.67	4805	18.88	7.42	599.0	2.84	0.60	184	65	
9/29/2013	0818	483.17	4850	18.49	7.44	596.7	2.52	0.61	176	62	Stop Pumping.
9/29/2013	0847	484.23	4865	18.39	7.40	595.0	4.66	1.11	172	82	Resume Pumping.
9/29/2013	0849	484.56	4930	19.11	7.46	585.5	3.21	0.70	180	58	
9/29/2013	0852	484.69	5000	19.54	7.44	588.9	3.66	0.74	172	49	
9/29/2013	0855	484.74	5065	19.55	7.44	593.1	2.46	0.76	184	25	Parameters have stabilized.
9/29/2013	0901	483.42	5190	NR	NR	NR	NR	NR	NR	NR	Stop Pump. Purge is Complete.

Was well sampled after development? YES NO X

Sample Method: N/A

Sample Name: N/A

Analyses: N/A

APPENDIX B

Well:	KAFB106157 (POST WELL DEVELOPMENT)		
Sample ID:	106157-D-1		
Sample Date:	9/30/2013		
Parameter	**Method**	**Sample Result (mg/L)**	**Permit Limit (mg/L)**
Flow		Totalizing flow meter	+/-10%
TRC	EPA330.5	0.1	NA
pH	SM4500HB	7.87	6 to 9
CBOD5	SM5210B	3.48	15
Total coliform (TC)	SM9223B	1	23 orgs/100ml
Total Dissolved Solids (TDS)	SM2540C	445	1000.0
Nitrate (NO3-N)	EPA300	<0.2	see total N
Total Kjeldahl Nitrogen (TKN)	EPA351.2	<1.5	see total N
Total Nitrogen (TKN + NO3-N)	Calculation	ND	10.0
Turbidity			5 NTU
Chloride (Cl^-)	EPA300	51.9	250.0
Fluoride (F^-)	EPA300	0.212	1.6
Sulfate ($SO4^{-2)}$	EPA300	66	600.0
Cyanide (CN)	EPA335.4	<0.01	0.2
Metals			
Aluminum	EPA200.8	0.3	5.0
Arsenic	EPA200.8	<0.01	0.1
Barium	EPA200.8	0.27	1.0
Boron	EPA200.8	0.061	0.75
Cadmium	EPA200.8	0.00029	0.01
Chromium	EPA200.8	<0.01	0.05
Cobalt	EPA200.8	0.0023	0.05
Copper	EPA200.8	0.0031	1.0
Iron	EPA200.8	1.1	1.0
Lead	EPA200.8	0.00065	0.05
Manganese	EPA200.8	1.3	0.2
Total Mercury	EPA245,1	<0.0002	0.002
Molybdenum	EPA200.8	0.007	1.0
Nickel	EPA200.8	0.024	0.2
Selenium	EPA200.8	<0.005	0.1
Silver	EPA200.8	<0.002	0.05
Uranium	EPA200.8	0.0026	0.03
Zinc	EPA200.8	0.23	10.0
Radioactivity			
Radium 226		NA	30 pC/L
Radium 228		NA	
Organics - Volatiles			
Benzene	SW8260B	0.0113	0.01
Carbon tetrachloride	SW8260B	<0.002	0.01
Chloroform	SW8260B	<0.002	0.10
1,1-Dichloroethane	SW8260B	<0.002	0.025
1,2-Dichloroethane	SW8260B	0.00254	0.01

Well:	KAFB106157 (POST WELL DEVELOPMENT)		
Sample ID:	106157-D-1		
Sample Date:	9/30/2013		
Parameter	Method	Sample Result (mg/L)	Permit Limit (mg/L)
1-1-Dichloroethylene	SW8260B	<0.002	0.005
Ethylbenzene	SW8260B	0.0504	0.75
Ethylene dibromide (EDB)	SW8011	0.000463	0.0001
Methylene chloride	SW8260B	0.00114	0.10
1,1,2,2-tetrachloroethane	SW8260B	<0.002	0.02
Tolulene	SW8260B	0.00118	0.75
1,1,1-Trichloroethane	SW8260B	<0.002	0.06
1,1,2-Trichloroethane	SW8260B	<0.002	0.01
Trichloroethylene	SW8260B	<0.002	0.005
Vinyl chloride	SW8260B	<0.001	0.001
Xylenes	SW8260B	<0.006	0.62
Organics - Semivolatiles			
Benzo(a)pyrene	SW8270D	<0.000192	0.0007
Napthalene + monomethylnaphthalenes	SW8270D	0.00819	0.03
Phenols	SW8270D	ND	0.005
Organics - Pesticides/PCBs			
Polychlorinated biphenyls	SW8082	<0.000463	0.001

Note
Metals data pending, dilution is needed.
Naphthalene and monomethylnaphthalenes include naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene
Phenol compounds consist of following

4-chloro-3-methylphenol	<0.00481	LOQ	
2-Chlorophenol	<0.00481	LOQ	
2,4-Dimethylphenol	<0.00481	DL	positive results down to the DL , no hits
2,4-Dinitrophenol	<0.00801	DL	positive results down to the DL , no hits
3-methylphenol/4-methylphenol	<0.00481	LOQ	
pentachlorophenol	<0.00481	DL	positive results down to the DL , no hits
Phenol	<0.00481	LOQ	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-3933-1
Client Project/Site: Metals Analysis

For:
Empirical Laboratories, LLC
621 Mainstream Drive
Suite 270
Nashville, Tennessee 37228

Attn: Ms. Delia Weber

Authorized for release by:
10/9/2013 11:47:19 AM

Erika Gish, Project Manager I
(314)298-8566
erika.gish@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 160-3933-1

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Empirical Laboratories, LLC

Project: Metals Analysis

Report Number: 160-3933-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The sample was received on 10/1/2013 9:10 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.0° C.

METALS (ICP/MS)

Sample 106157-D-3 (160-3933-1) was analyzed for Metals (ICP/MS) in accordance with EPA Method 200.8. The samples were prepared on 10/02/2013 and analyzed on 10/07/2013 and 10/08/2013.

Analytical Batch 77010

Due to recent changes in the concentrations of the standards the LDR has been lowered for molybdenum (1000 ppb). The LCS/MS/MSD were above the LDR. The LCS and MS/MSD's were within acceptable QC limits. The MS/MSD is reported as an estimated value. (160-3933-1 MS), (160-3933-1 MSD), (LCS 160-75811/2-A)

Analytical Batch 77684

Due to recent changes in the concentrations of the standards, the LDR has been lowered for following element: Selenium (1000ppb). The

Job ID: 160-3933-1 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

LCS/MS/MSD were above the LDR. The LCS and MS/MSD's were within acceptable QC limits. The MS/MSD is reported as an estimated value. (160-3933-1 MS), (160-3933-1 MSD), (LCS 160-75811/2-A)

No difficulties were encountered during the Metals analysis.

All quality control parameters were within the acceptance limits.

MERCURY

Sample 106157-D-3 (160-3933-1) was analyzed for mercury in accordance with EPA Method 245.1. The samples were prepared and analyzed on 10/08/2013.

No difficulties were encountered during the mercury analysis.

All quality control parameters were within the acceptance limits.

Shaw Environmental and Infrastructure Inc., a CB&I Co.

CHAIN OF CUSTODY

cR130

Reference Document # 140705-GW - 106157

Page 1 of 1

PERMIT GW Sampling

Project Number: 140705
Project Name / Location: Kirtland AFB
Purchase Order #: (bill to Empirical, Brian Richard, 615-345-1115)
Shipment Date: 9/30/13
FedEx Number: 516511936886 80

Project Manager: Tom Cooper
Send Report To: Susan Huang
Phone/Fax Number: 925-288-2099
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520
susan.huang@cbifederalservices.com

Lab Destination: Test America St. Louis Lab
Mon-Sat DELIVERY
13715 Rider Trail North
St. Louis, MO ~~63135~~ 63045
Lab Contact Name:
Phone #: 314-298-8566

Sampler's Name(s):

Sample ID Number	Location	Date	Time	Method	Matrix	# of containers	Preservative	Analyses Requested: Metals: EPA 200.7/EPA 245.1
							Container	
							Preservative	HNO3
							Container	250 ml HDPE
Temperature Blank								
106157-D-3	KAFB-106157	9/30/13	1645	G	GW	1		X

Special Instructions: Please provide draft data in 1 week.

Turnaround Time: Standard 21 Day ☐ 24-hr ☐ 48-hr ☐ 3-day ◀ 5-day for Ura

Level Of QC Required: I II (III) IV Project Specific: unless IV requested

Relinquished By:	Date:	Received By:	Date:
[signature]	9/30/13	[signature]	10-1-13
	Time: 1900		Time: 0910
Relinquished By:	Date:	Received By:	Date:
	Time:		Time:

Method Codes
CS = Composite
G = Grab

Matrix Codes
GW = Groundwater

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10/9/2013

Login Sample Receipt Checklist

Client: Empirical Laboratories, LLC

Job Number: 160-3933-1

Login Number: 3933
List Number: 1
Creator: Clarke, Jill C

List Source: TestAmerica St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Not requested on COC.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Empirical Laboratories, LLC
Project/Site: Metals Analysis

TestAmerica Job ID: 160-3933-1

Method	Method Description	Protocol	Laboratory
200.8	Metals (ICP/MS)	EPA	TAL SL
245.1	Mercury (CVAA)	EPA	TAL SL

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Empirical Laboratories, LLC
Project/Site: Metals Analysis

TestAmerica Job ID: 160-3933-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-3933-1	106157-D-3	Water	09/30/13 16:45	10/01/13 09:10

Detection Summary

Client: Empirical Laboratories, LLC
Project/Site: Metals Analysis

TestAmerica Job ID: 160-3933-1

Client Sample ID: 106157-D-3

Lab Sample ID: 160-3933-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.65	J	3.0	0.17	ug/L	1		200.8	Total/NA
Aluminum	300		30	13	ug/L	1		200.8	Total/NA
Boron	61		50	10	ug/L	1		200.8	Total/NA
Barium	270		2.0	0.22	ug/L	1		200.8	Total/NA
Cadmium	0.29	J	0.50	0.10	ug/L	1		200.8	Total/NA
Cobalt	2.3		2.0	0.22	ug/L	1		200.8	Total/NA
Copper	3.1		3.0	0.45	ug/L	1		200.8	Total/NA
Iron	1100		50	20	ug/L	1		200.8	Total/NA
Manganese	1300		2.0	0.25	ug/L	1		200.8	Total/NA
Molybdenum	7.0		5.0	1.0	ug/L	1		200.8	Total/NA
Nickel	24		5.0	0.40	ug/L	1		200.8	Total/NA
Uranium	2.6		1.0	0.23	ug/L	1		200.8	Total/NA
Zinc	230		10	8.3	ug/L	1		200.8	Total/NA

This Detection Summary does not include radiochemical test results.

Client: Empirical Laboratories, LLC
Project/Site: Metals Analysis

TestAmerica Job ID: 160-3933-1

Client Sample ID: 106157-D-3
Date Collected: 09/30/13 16:45
Date Received: 10/01/13 09:10

Lab Sample ID: 160-3933-1
Matrix: Water

Method: 200.8 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.65	J	3.0	0.17	ug/L		10/02/13 12:19	10/07/13 21:47	1
Silver	ND		2.0	0.77	ug/L		10/02/13 12:19	10/07/13 21:47	1
Aluminum	300		30	13	ug/L		10/02/13 12:19	10/07/13 21:47	1
Arsenic	ND		10	1.2	ug/L		10/02/13 12:19	10/07/13 21:47	1
Boron	61		50	10	ug/L		10/02/13 12:19	10/08/13 19:59	1
Barium	270		2.0	0.22	ug/L		10/02/13 12:19	10/07/13 21:47	1
Cadmium	0.29	J	0.50	0.10	ug/L		10/02/13 12:19	10/07/13 21:47	1
Cobalt	2.3		2.0	0.22	ug/L		10/02/13 12:19	10/07/13 21:47	1
Chromium	ND		10	3.3	ug/L		10/02/13 12:19	10/07/13 21:47	1
Copper	3.1		3.0	0.45	ug/L		10/02/13 12:19	10/07/13 21:47	1
Iron	1100		50	20	ug/L		10/02/13 12:19	10/07/13 21:47	1
Manganese	1300		2.0	0.25	ug/L		10/02/13 12:19	10/07/13 21:47	1
Molybdenum	7.0		5.0	1.0	ug/L		10/02/13 12:19	10/07/13 21:47	1
Nickel	24		5.0	0.40	ug/L		10/02/13 12:19	10/07/13 21:47	1
Selenium	ND		5.0	1.6	ug/L		10/02/13 12:19	10/08/13 19:59	1
Uranium	2.6		1.0	0.23	ug/L		10/02/13 12:19	10/07/13 21:47	1
Zinc	230		10	8.3	ug/L		10/02/13 12:19	10/07/13 21:47	1

Method: 245.1 - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.050	ug/L		10/08/13 11:29	10/08/13 12:18	1

Method: 200.8 - Metals (ICP/MS)

Lab Sample ID: MB 160-75811/1-A
Matrix: Water
Analysis Batch: 77010

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 75811

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		3.0	0.17	ug/L		10/02/13 12:19	10/07/13 21:34	1
Silver	ND		2.0	0.77	ug/L		10/02/13 12:19	10/07/13 21:34	1
Aluminum	ND		30	13	ug/L		10/02/13 12:19	10/07/13 21:34	1
Arsenic	ND		10	1.2	ug/L		10/02/13 12:19	10/07/13 21:34	1
Barium	ND		2.0	0.22	ug/L		10/02/13 12:19	10/07/13 21:34	1
Cadmium	ND		0.50	0.10	ug/L		10/02/13 12:19	10/07/13 21:34	1
Cobalt	ND		2.0	0.22	ug/L		10/02/13 12:19	10/07/13 21:34	1
Chromium	ND		10	3.3	ug/L		10/02/13 12:19	10/07/13 21:34	1
Copper	ND		3.0	0.45	ug/L		10/02/13 12:19	10/07/13 21:34	1
Iron	ND		50	20	ug/L		10/02/13 12:19	10/07/13 21:34	1
Manganese	ND		2.0	0.25	ug/L		10/02/13 12:19	10/07/13 21:34	1
Molybdenum	ND		5.0	1.0	ug/L		10/02/13 12:19	10/07/13 21:34	1
Nickel	ND		5.0	0.40	ug/L		10/02/13 12:19	10/07/13 21:34	1
Uranium	ND		1.0	0.23	ug/L		10/02/13 12:19	10/07/13 21:34	1
Zinc	ND		10	8.3	ug/L		10/02/13 12:19	10/07/13 21:34	1

Lab Sample ID: MB 160-75811/1-A
Matrix: Water
Analysis Batch: 77684

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 75811

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Boron	ND		50	10	ug/L		10/02/13 12:19	10/08/13 19:46	1
Selenium	ND		5.0	1.6	ug/L		10/02/13 12:19	10/08/13 19:46	1

Lab Sample ID: LCS 160-75811/2-A
Matrix: Water
Analysis Batch: 77010

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 75811

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	1000	990		ug/L		99	85 - 115
Silver	100	96.3		ug/L		96	85 - 115
Aluminum	10000	9440		ug/L		94	85 - 115
Arsenic	1000	1010		ug/L		101	85 - 115
Barium	1000	1040		ug/L		104	85 - 115
Cadmium	1000	1000		ug/L		100	85 - 115
Cobalt	1000	1020		ug/L		102	85 - 115
Chromium	1000	1010		ug/L		101	85 - 115
Copper	1000	1000		ug/L		100	85 - 115
Iron	10000	10100		ug/L		101	85 - 115
Manganese	1000	1010		ug/L		101	85 - 115
Molybdenum	1000	1080		ug/L		108	85 - 115
Nickel	1000	1030		ug/L		103	85 - 115
Uranium	1000	992		ug/L		99	85 - 115
Zinc	1000	1020		ug/L		102	85 - 115

Method: 200.8 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 160-75811/2-A
Matrix: Water
Analysis Batch: 77684

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 75811

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	1000	1040		ug/L		104	85 - 115
Selenium	1000	1040		ug/L		104	85 - 115

Lab Sample ID: 160-3933-1 MS
Matrix: Water
Analysis Batch: 77010

Client Sample ID: 106157-D-3
Prep Type: Total/NA
Prep Batch: 75811

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	0.65	J	1000	986		ug/L		99	70 - 130
Silver	ND		100	96.1		ug/L		96	70 - 130
Aluminum	300		10000	9650		ug/L		93	70 - 130
Arsenic	ND		1000	1010		ug/L		101	70 - 130
Barium	270		1000	1300		ug/L		104	70 - 130
Cadmium	0.29	J	1000	996		ug/L		100	70 - 130
Cobalt	2.3		1000	1000		ug/L		100	70 - 130
Chromium	ND		1000	1020		ug/L		102	70 - 130
Copper	3.1		1000	958		ug/L		95	70 - 130
Iron	1100		10000	10900		ug/L		98	70 - 130
Manganese	1300		1000	2330		ug/L		102	70 - 130
Molybdenum	7.0		1000	1070		ug/L		106	70 - 130
Nickel	24		1000	1020		ug/L		99	70 - 130
Uranium	2.6		1000	1020		ug/L		101	70 - 130
Zinc	230		1000	1210		ug/L		98	70 - 130

Lab Sample ID: 160-3933-1 MS
Matrix: Water
Analysis Batch: 77684

Client Sample ID: 106157-D-3
Prep Type: Total/NA
Prep Batch: 75811

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Boron	61		1000	1090		ug/L		103	70 - 130
Selenium	ND		1000	1010		ug/L		101	70 - 130

Lab Sample ID: 160-3933-1 MSD
Matrix: Water
Analysis Batch: 77010

Client Sample ID: 106157-D-3
Prep Type: Total/NA
Prep Batch: 75811

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lead	0.65	J	1000	992		ug/L		99	70 - 130	1	20
Silver	ND		100	96.4		ug/L		96	70 - 130	0	20
Aluminum	300		10000	9510		ug/L		92	70 - 130	1	20
Arsenic	ND		1000	992		ug/L		99	70 - 130	2	20
Barium	270		1000	1300		ug/L		103	70 - 130	0	20
Cadmium	0.29	J	1000	993		ug/L		99	70 - 130	0	20
Cobalt	2.3		1000	972		ug/L		97	70 - 130	3	20
Chromium	ND		1000	995		ug/L		99	70 - 130	3	20
Copper	3.1		1000	941		ug/L		94	70 - 130	2	20
Iron	1100		10000	10600		ug/L		95	70 - 130	3	20
Manganese	1300		1000	2280		ug/L		98	70 - 130	2	20
Molybdenum	7.0		1000	1060		ug/L		105	70 - 130	1	20

Method: 200.8 - Metals (ICP/MS) (Continued)

Lab Sample ID: 160-3933-1 MSD
Matrix: Water
Analysis Batch: 77010

Client Sample ID: 106157-D-3
Prep Type: Total/NA
Prep Batch: 75811

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nickel	24		1000	991		ug/L		97	70 - 130	2	20
Uranium	2.6		1000	1020		ug/L		102	70 - 130	0	20
Zinc	230		1000	1180		ug/L		95	70 - 130	2	20

Lab Sample ID: 160-3933-1 MSD
Matrix: Water
Analysis Batch: 77684

Client Sample ID: 106157-D-3
Prep Type: Total/NA
Prep Batch: 75811

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Boron	61		1000	1120		ug/L		106	70 - 130	3	20
Selenium	ND		1000	1020		ug/L		102	70 - 130	1	20

Method: 245.1 - Mercury (CVAA)

Lab Sample ID: MB 160-76982/1-A
Matrix: Water
Analysis Batch: 77049

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 76982

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.20	0.050	ug/L		10/08/13 11:29	10/08/13 12:15	1

Lab Sample ID: LCS 160-76982/2-A
Matrix: Water
Analysis Batch: 77049

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 76982

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	5.00	4.96		ug/L		99	85 - 115

Lab Sample ID: 160-3933-1 MS
Matrix: Water
Analysis Batch: 77049

Client Sample ID: 106157-D-3
Prep Type: Total/NA
Prep Batch: 76982

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		5.00	4.81		ug/L		96	70 - 130

Lab Sample ID: 160-3933-1 MSD
Matrix: Water
Analysis Batch: 77049

Client Sample ID: 106157-D-3
Prep Type: Total/NA
Prep Batch: 76982

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		5.00	4.95		ug/L		99	70 - 130	3	20

QC Association Summary

Client: Empirical Laboratories, LLC
Project/Site: Metals Analysis

TestAmerica Job ID: 160-3933-1

Metals

Prep Batch: 75811

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-3933-1	106157-D-3	Total/NA	Water	200.7/200.8	
160-3933-1 MS	106157-D-3	Total/NA	Water	200.7/200.8	
160-3933-1 MSD	106157-D-3	Total/NA	Water	200.7/200.8	
LCS 160-75811/2-A	Lab Control Sample	Total/NA	Water	200.7/200.8	
MB 160-75811/1-A	Method Blank	Total/NA	Water	200.7/200.8	

Prep Batch: 76982

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-3933-1	106157-D-3	Total/NA	Water	245.1	
160-3933-1 MS	106157-D-3	Total/NA	Water	245.1	
160-3933-1 MSD	106157-D-3	Total/NA	Water	245.1	
LCS 160-76982/2-A	Lab Control Sample	Total/NA	Water	245.1	
MB 160-76982/1-A	Method Blank	Total/NA	Water	245.1	

Analysis Batch: 77010

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-3933-1	106157-D-3	Total/NA	Water	200.8	75811
160-3933-1 MS	106157-D-3	Total/NA	Water	200.8	75811
160-3933-1 MSD	106157-D-3	Total/NA	Water	200.8	75811
LCS 160-75811/2-A	Lab Control Sample	Total/NA	Water	200.8	75811
MB 160-75811/1-A	Method Blank	Total/NA	Water	200.8	75811

Analysis Batch: 77049

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-3933-1	106157-D-3	Total/NA	Water	245.1	76982
160-3933-1 MS	106157-D-3	Total/NA	Water	245.1	76982
160-3933-1 MSD	106157-D-3	Total/NA	Water	245.1	76982
LCS 160-76982/2-A	Lab Control Sample	Total/NA	Water	245.1	76982
MB 160-76982/1-A	Method Blank	Total/NA	Water	245.1	76982

Analysis Batch: 77684

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-3933-1	106157-D-3	Total/NA	Water	200.8	75811
160-3933-1 MS	106157-D-3	Total/NA	Water	200.8	75811
160-3933-1 MSD	106157-D-3	Total/NA	Water	200.8	75811
LCS 160-75811/2-A	Lab Control Sample	Total/NA	Water	200.8	75811
MB 160-75811/1-A	Method Blank	Total/NA	Water	200.8	75811