

**April 2013 Groundwater Monitoring**

Former Irondale Iron and Steel Plant Site  
Irondale, Washington

*for*

**Washington State Department of Ecology**

December 5, 2014



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600 Stewart Street, Suite 1700  
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**April 2013 Groundwater Monitoring  
Former Irondale Iron and Steel Plant Site  
Irondale, Washington**

**File No. 0504-042-02**

**December 5, 2014**

Prepared for:

Washington State Department of Ecology  
Toxics Cleanup Program  
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Attention: Steve Teel

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## INTRODUCTION

This report summarizes the results of the April 2013 quarterly groundwater monitoring event (Round 2) at the Former Irondale Iron and Steel Plant Site (Site, also known as Irondale Beach Park) in Irondale, Washington. The Site is a 13-acre property located at 526 Moore Street in the town of Irondale, latitude 48° 2' 38" N longitude 122° 45' 60" W, approximately 5 miles south of Port Townsend, Washington (see Vicinity Map, Figure 1). The Site is owned by Jefferson County and is currently used as an undeveloped day-use park (Irondale Beach Park). It is bounded by Port Townsend Bay to the east, residential properties to the south, southwest and northwest, and parklands to the north. The Site includes both upland and aquatic land. The general site layout is shown on the attached Groundwater Monitoring Results – Dissolved Metals, Figure 2.

From 1881 to 1919, iron and steel were produced intermittently at the Site by various owners. Steel plant operations during this time resulted in metals, carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and/or petroleum contamination of soil, sediment and/or groundwater. Washington State Department of Ecology (Ecology) completed a cleanup action consisting of excavation of upland soil and marine sediment along the shoreline that contain chemicals of concern (COC) concentrations greater than Site-Specific cleanup levels, excavation of slag material outside of remedial excavations to facilitate shoreline habitat restoration, and installation of a multi-component environmental cap in two upland areas where surface soil exceeded Site-Specific cleanup levels. The cleanup action was completed in December 2012.

GeoEngineers, Inc. (GeoEngineers) has been providing site characterization, cleanup and groundwater monitoring services at the Site since 2007.

## SCOPE OF SERVICES

New wells (MW-6 through MW-9) were installed following completion of remedial excavation activities. An existing monitoring well MW-5 located outside of the remedial excavation footprint was also sampled as part of the post-construction groundwater monitoring. The purpose of the groundwater monitoring program is to evaluate the effectiveness of the cleanup action, with respect to protection of groundwater. As outlined in the Engineering Design Report (GeoEngineers, 2012), post-construction groundwater monitoring is being performed on a quarterly basis for a minimum of one year.

Our specific scope of services is as follows:

1. Measure the depths to groundwater in each well (MW-5 through MW-9). Estimate groundwater flow direction at the site based on the groundwater depths.
2. Purge approximately three well volumes of water from the wells prior to sampling. Obtain groundwater samples using low-flow methodology in accordance with the field procedures outlined in Appendix A from the five wells for chemical analysis.
3. Submit the groundwater samples to an Ecology-certified laboratory for chemical analysis of diesel- and heavy oil-range hydrocarbons by Ecology Method NWTPH-Dx, total carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by EPA Method SW 8270D-SIM, and dissolved metals by EPA Method 200.8. Ecology determined that the dissolved cPAH analyses was not required based on the chemical analytical results of January 2013 groundwater monitoring event.

4. Evaluate the chemical analytical results relative to Site-Specific groundwater cleanup levels consistent with MTCA requirements. Site-specific groundwater cleanup levels are presented in Table 2.

## **GROUNDWATER MONITORING RESULTS**

### **General**

Monitoring wells MW-5 through MW-9 were used to evaluate groundwater flow direction and obtain groundwater samples. Monitoring well MW-5 was installed prior to the cleanup action during the site characterization phase and is located outside of the cleanup action areas. Monitoring wells MW-6 through MW-8 were installed after cleanup action activities within the limits of petroleum- and metals-contaminated soil remedial excavation areas. Monitoring well MW-9 was installed after cleanup action activities within the limits of the metals-contaminated soil remedial excavation area. The approximate locations of the monitoring wells are shown in Figure 2. Groundwater level measurement and sampling procedures are described in Appendix A. Depth to groundwater measurements are presented in Table 1. Groundwater chemical analytical data is summarized in Table 2. A copy of the laboratory report for the April 2013 groundwater analyses is presented in Appendix B.

Monitoring wells MW-5 through MW-9 were surveyed by Van Aller Surveying during February 2013 for creating the “As-Built Map of the Irondale Iron and Steel Plant Cleanup Action.”

### **Groundwater Conditions**

Groundwater conditions beneath the Site were evaluated by measuring groundwater levels and obtaining groundwater samples from MW-5 through MW-9 on April 10, 2013. Groundwater depths ranged from approximately 3 to 5.5 feet below ground surface (bgs) in the monitoring wells. The shallow depths to water in the monitoring wells are attributed to the proximity of Port Townsend Bay located approximately 20 to 60 feet east from the monitoring wells. Based on site topography, the ground surface is relatively flat, though the ground surface elevation is slightly higher in the southern portion of the site (near MW-6 and MW-7) compared to the ground surface in the northern portion of the site (near MW-8 and MW-9). The groundwater flow direction beneath the site based on April 2013 groundwater levels is to the east toward Port Townsend Bay (see Figure 3).

### **Groundwater Sampling**

Groundwater samples from MW-5 through MW-9 were submitted to Analytical Resources, Inc. (ARI) an environmental laboratory in Tukwila, Washington for chemical analysis of diesel- and heavy oil-range hydrocarbons, cPAHs, and dissolved Copper and dissolved Nickel.

- Diesel- and Heavy Oil-range hydrocarbons were not detected in the samples obtained from MW-5, MW-6, MW-8, and MW-9. Diesel-range hydrocarbons were detected at a concentration less than the site-specific cleanup level in the sample obtained from monitoring well MW-7. Heavy oil-range hydrocarbons were not detected in MW-7. Dissolved copper was detected in the sample from MW-9 at a concentration (7 µg/L) greater than the site-specific cleanup level of 2.4 µg/L. Dissolved copper was detected in MW-5, MW-7, and MW-8 at concentrations less than the site-specific cleanup level. Dissolved copper was not detected in MW-6.

- Dissolved nickel was detected in the sample from MW-9 at a concentration (10 µg/L) greater than the site-specific cleanup level of 8.2 µg/L. Dissolved nickel was detected at concentrations less than the site-specific cleanup level in the samples from MW-5 through MW-8.
- cPAH constituents were not detected in any of the groundwater samples.

## CONCLUSIONS

Groundwater monitoring is being conducted at the former Irondale Iron and Steel Plant site to evaluate the post-construction effectiveness of the cleanup action as outlined in the Final Engineering Design Report (GeoEngineers, 2012). Groundwater samples obtained during the April 2013 sampling event were analyzed for diesel- and heavy oil-range hydrocarbons, cPAHs, and dissolved copper and dissolved nickel. Results for April 2013 (Round 2) were generally consistent with those from January 2013 (Round 1). Dissolved copper and nickel were the only constituents that exceeded site specific cleanup levels (MW-9 only, for both Rounds). The other constituents either were not detected or were detected at concentrations less than the site-specific cleanup levels.

The April 2013 groundwater monitoring event is the second of the four planned quarterly groundwater monitoring events.

## LIMITATIONS

We have prepared this report for use by the Washington State Department of Ecology. The information contained herein is not intended for use by others and it is not applicable to other sites. No other (third) party may rely on the product of our services unless we agree in advance and in writing to such reliance.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. The conclusions and opinions presented in this report are based on our professional knowledge, judgment and experience. No warranty or other conditions, express or implied, should be understood.

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Please refer to Appendix C titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

## REFERENCES

GeoEngineers, 2009, "Revised Draft Remedial Investigation/Feasibility Study Report, Irondale Iron and Steel Plant, Irondale, Washington, Ecology Facility/Site No. 95275518." GEI File No. 0504-042-01, August 13, 2009.

GeoEngineers, 2012, "Final Engineering Design Report, Irondale Iron and Steel Plant, Irondale, Washington." GEI File No. 0504-042-02, May 1, 2012.





**Table 1**  
**Summary of Groundwater Level Measurements**  
 Former Irondale Iron and Steel Plant Site  
 Irondale, Washington

Groundwater Monitoring Well <sup>1</sup>	Quarterly Groundwater Monitoring Event	Date Measured	Top of Casing Elevation <sup>2</sup> (feet)	Depth to Water from Top of Casing (feet)	Groundwater Elevation <sup>2</sup> (feet)
MW-5	Round 1	1/4/2013	13.97	5.01	8.96
	Round 2	4/10/2013		4.4	9.57
MW-6	Round 1	1/4/2013	17.04	3.23	13.81
	Round 2	4/10/2013		3.16	13.88
MW-7	Round 1	1/4/2013	15.98	5.08	10.90
	Round 2	4/10/2013		5.06	10.92
MW-8	Round 1	1/4/2013	11.93	4.00	7.93
	Round 2	4/10/2013		4.68	7.25
MW-9	Round 1	1/4/2013	11.77	4.83	6.94
	Round 2	4/10/2013		5.52	6.25

**Notes:**

<sup>1</sup>Monitoring well locations are shown on Figure 2.

<sup>2</sup>Elevation is referenced to Mean Lower Low Water (MLLW). Elevation measurements were obtained from "ASBUILT MAP" provided by Van Aller Surveying to Anderson Environmental Contracting, LLC dated February 2013. Top of casing elevations were estimated by subtracting the distance between the top of the monument and the top of the casing at each well.

**Table 2**  
**Summary of Groundwater Chemical Analytical Data - Petroleum Hydrocarbons, cPAHs and Dissolved Metals<sup>1</sup>**  
 Former Irondale Iron and Steel Plant Site  
 Irondale, Washington

Groundwater Sample Identification <sup>2</sup>	Quarterly Groundwater Monitoring Event	Sample Date	Petroleum Hydrocarbons <sup>3</sup>		Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) <sup>4</sup>									Dissolved Metals <sup>5</sup>		
			Diesel-Range	Heavy Oil-Range	Total or Dissolved cPAH	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-c,d)pyrene	Dibenz(a,h)anthracene	Total cPAH - TEQ <sup>4</sup>	Copper	Nickel	
MW05-130104	Round 1	1/4/2013	100 U	200 U	-	-	-	-	-	-	-	-	-	-	<b>1.3</b>	<b>5.6</b>
MW05-130410	Round 2	4/10/2013	100 U	200 U	-	-	-	-	-	-	-	-	-	-	<b>1.5</b>	<b>5.1</b>
MW06-130104 <sup>6</sup>	Round 1	1/4/2013	100 U	200 U	Total	0.010 U	<b>0.0066 J</b>	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	<b>0.00757 J</b>	<b>0.8</b>	<b>5.8</b>	
	Round 1	1/4/2013	-	-	Dissolved	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	-	-	
MW06-130410	Round 2	4/10/2013	100 U	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	0.5 U	<b>4.2</b>	
MW07-130104	Round 1	1/4/2013	100 U	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	<b>0.8</b>	<b>4.4</b>	
	Round 1	1/4/2013	-	-	Dissolved	0.010 U	<b>0.0072 J</b>	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	<b>0.00757 J</b>	-	-	
MW07-130410	Round 2	4/10/2013	<b>160</b>	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	<b>1.4</b>	<b>5.1</b>	
MW08-130104	Round 1	1/4/2013	100 U	200 U	Total	<b>0.0075 J</b>	<b>0.0094 J</b>	<b>0.0063 J</b>	0.010 U	<b>0.0078 J</b>	0.010 U	0.010 U	<b>0.0108 J</b>	0.5 U	<b>5</b>	
	Round 1	1/4/2013	-	-	Dissolved	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	-	-	
MW08-130410	Round 2	4/10/2013	100 U	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	<b>2.2</b>	<b>4.9</b>	
MW09-130104 <sup>6</sup>	Round 1	1/4/2013	100 U	200 U	-	-	-	-	-	-	-	-	-	<b>7</b>	<b>90</b>	
	Round 2	4/10/2013	100 U	200 U	-	-	-	-	-	-	-	-	-	<b>7</b>	<b>10</b>	
<b>Site-Specific Groundwater Cleanup Level<sup>7</sup></b>			500	500	-	see TEQ	see TEQ	see TEQ	see TEQ	see TEQ	see TEQ	see TEQ	0.018	2.4	8.2	

**Notes:**

<sup>1</sup>Reported results are in micrograms per liter (µg/L).

<sup>2</sup>Groundwater monitoring well locations are shown in Figure 2.

<sup>3</sup>Petroleum Hydrocarbons analyzed using NWTPH-Dx.

<sup>4</sup>cPAHs analyzed using EPA method 8270D-SIM. Total carcinogenic PAHs (cPAHs) calculated using toxic equivalent (TEQ) methodology relative to benzo(a)pyrene. cPAHs that were not detected were assigned a value of one half of the reporting limit for these calculations. Samples analyzed for dissolved cPAHs were laboratory filtered using a 0.7 µm borosilicate glass, binder free filter.

<sup>5</sup>Dissolved Metals analyzed using EPA method 200.8 (field filtered).

<sup>6</sup>A field duplicate groundwater sample was obtained from this monitoring well (diesel- and heavy oil-range and cPAHs for MW-6 and metals for MW-9). Higher of the two detected concentrations (parent and field duplicate) is reported for each of the analyte.

<sup>7</sup>Site-specific groundwater cleanup level is referenced from Table 1 of the Final Engineering Design Report (GeoEngineers, 2012).

MTCA = Model Toxics Control Act

-- = not analyzed. Monitoring wells are located in the area remediated due to metals contamination.

U = Laboratory qualifier indicating analyte not detected at level above listed reporting limit.

**Bold** indicates analyte was detected.

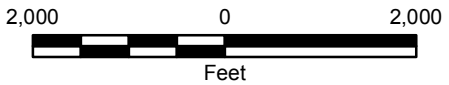
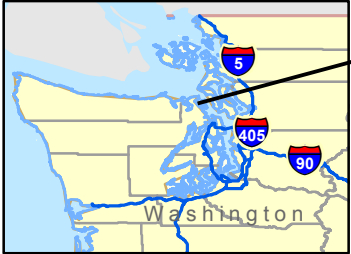
Chemical analyses performed by Analytical Resources, Inc., in Tukwila, Washington.

Shaded values represent concentrations greater than the Site-Specific cleanup level.



Map Revised: May 24, 2007

Office: SEA Path: P:\0\0504042\100\GIS\050404200 FIG-1.mxd



Notes:

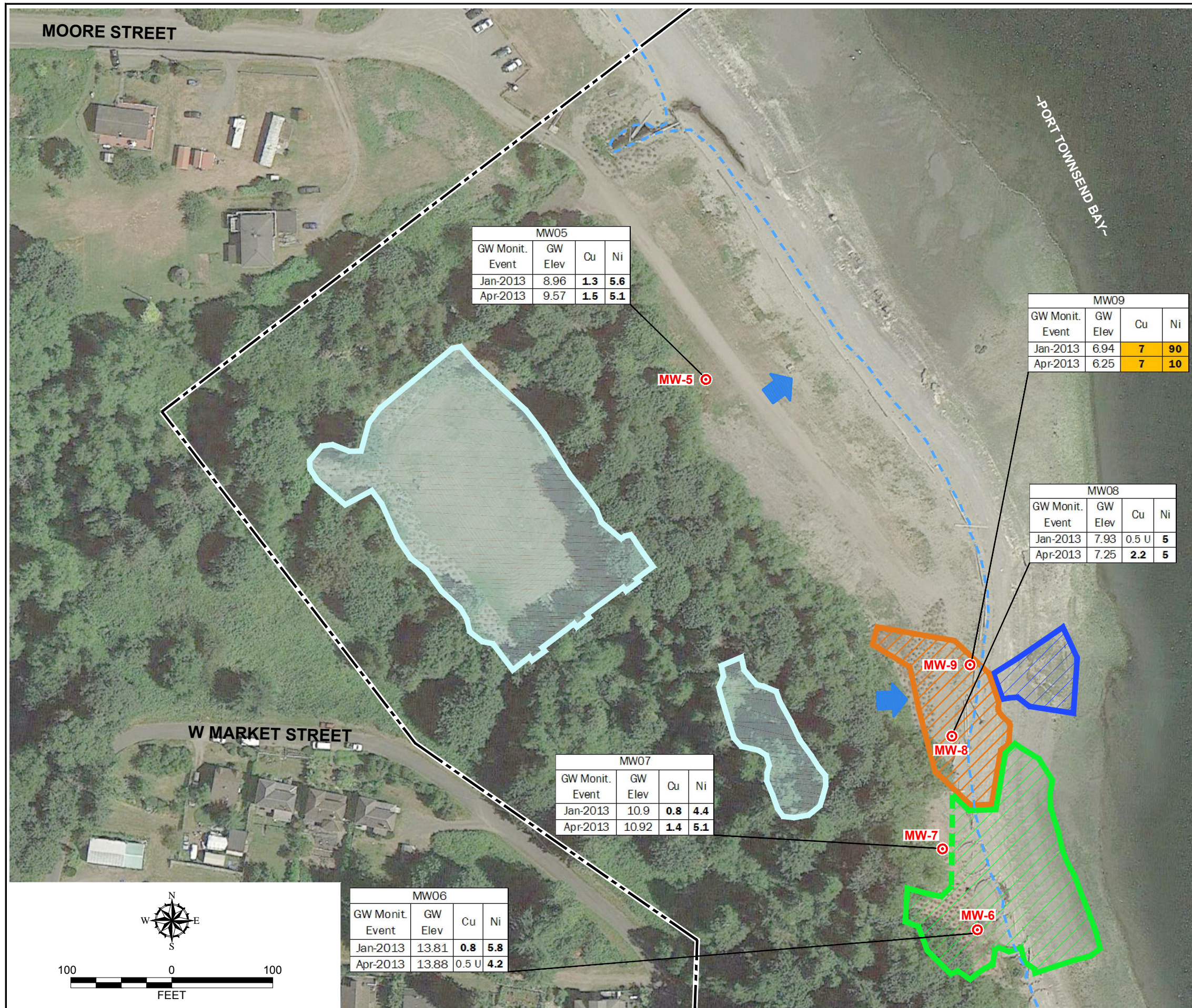
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Data Sources: ESRI Data & Maps, Street Maps 2005  
 Transverse Mercator, Zone 10 N North, North American Datum 1983  
 North arrow oriented to grid north

<b>Vicinity Map</b>	
Irondale Iron and Steel Plant Irondale, Washington	
	<b>Figure 1</b>



W:\SEATTLE\PROJECTS\1050404\2\02\CAD\050404\_202\_MONITORING\_PLAN\_10.5\_OHW\_02.DWG\TAB:FIG 2 MODIFIED BY MHRSCH ON DEC 02, 2013 - 13:06



MW05			
GW Monit. Event	GW Elev	Cu	Ni
Jan-2013	8.96	1.3	5.6
Apr-2013	9.57	1.5	5.1

MW09			
GW Monit. Event	GW Elev	Cu	Ni
Jan-2013	6.94	7	90
Apr-2013	6.25	7	10

MW08			
GW Monit. Event	GW Elev	Cu	Ni
Jan-2013	7.93	0.5 U	5
Apr-2013	7.25	2.2	5

MW07			
GW Monit. Event	GW Elev	Cu	Ni
Jan-2013	10.9	0.8	4.4
Apr-2013	10.92	1.4	5.1

MW06			
GW Monit. Event	GW Elev	Cu	Ni
Jan-2013	13.81	0.8	5.8
Apr-2013	13.88	0.5 U	4.2

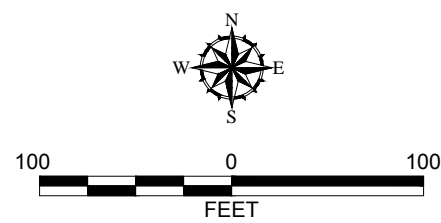
**Legend**

- Site Boundary
- Ordinary High Water (Estimated at Elevation 10.5 feet)
- Metals Area - Excavation
- Metals Area - Cap
- TPH Area - Excavation
- Slag Outcrop - Removal
- MW-1 Monitoring Well Location
- Assumed Groundwater Flow Direction

**Data Box Explanation:**  
 GW Monit. = Groundwater Monitoring  
 GW Elev = Groundwater Elevation in feet  
 Cu = Dissolved Copper  
 Ni = Dissolved Nickel  
 Exceedance of site-specific groundwater cleanup level (Cu = 2.4 µg/L; Ni = 8.2 µg/L)  
 U = Analyte not detected above method reporting limit  
 Groundwater results in µg/L

**Notes**

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3. Dissolved metals (Copper and Nickel) were analyzed using EPA Method 200.8. Samples were field filtered.
4. TPH and PAH results are presented in Table 2. Reference: Aerial photo (July 2013) from Google Earth Pro.



<b>Groundwater Monitoring Results - Dissolved Metals</b>	
Irondale Iron and Steel Plant Irondale, Washington	
	<b>Figure 2</b>



P:\10\0504\04\2\02\CAD\2013 GW ELEVATION CONTOUR FIGURES\APRIL 2013 GW ELEVATION CONTOURS.DWG\TAB:LAYOUT MODIFIED BY THICHAUD ON DEC 04, 2014 - 13:37



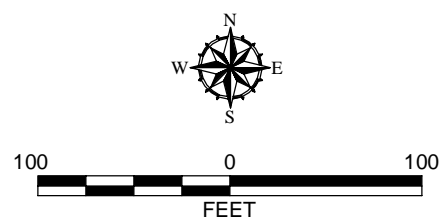
**Legend**

- Site Boundary
- Ordinary High Water (Estimated at Elevation 10.5 feet)
- MW-1 Monitoring Well Location
- (9.57) Groundwater Elevation (feet)
- 8 Groundwater Elevation Contour (feet)
- Groundwater Flow Direction

**Notes**

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Reference: Aerial photo (July 2013) from Google Earth Pro.

<b>April 2013</b>	
<b>Groundwater Elevation Contours</b>	
Former Irondale Iron and Steel Plant Irondale, Washington	
	<b>Figure 3</b>







## **APPENDIX A**

### **Field Procedures**



## **APPENDIX A FIELD PROCEDURES**

### **General**

Monitoring well MW-5 was constructed at the Former Irondale Iron and Steel Plant Site (Site) in June 2007 and MW-6 through MW-9 were constructed at the Site in December 2012 after remedial activities had been completed. The monitoring well construction details for MW-5 through MW-9 are presented in Appendix A of the January 2013 Groundwater Monitoring Report.

### **Depth to Groundwater Measurements**

The depth to groundwater was measured in the monitoring wells using an electric water level indicator. The depth to groundwater was measured relative to the top of the well casings. Water level measurement equipment was washed in a Liqui-Nox® solution, followed by a distilled water rinse prior to use in the well.

### **Groundwater Sample Collection and Handling**

Groundwater samples were obtained from monitoring wells MW-5 through MW-9 in April 2013.

Groundwater samples were obtained from monitoring wells using a peristaltic pump and disposable polyethylene tubing. Groundwater was pumped at approximately 0.5 liter per minute using a peristaltic pump through tubing placed within the screened interval. A Horiba U-22 water quality measuring system with flow-through cell was used to monitor the following water quality parameters during purging: electrical conductivity, dissolved oxygen, pH, salinity, total dissolved solids, turbidity, and temperature. Groundwater samples were obtained once ambient groundwater conditions were reached. Groundwater conditions were considered ambient once the measured parameters varied by less than 10 percent on three consecutive measurements taken approximately 3 minutes apart. The stabilized field measurements are documented in the attached Groundwater Sample Collection Forms.

Samples for dissolved metals analysis were field filtered by pumping water through a 0.45 micron filter directly into the sample container using a peristaltic pump. Groundwater samples obtained were transferred to laboratory-prepared sample jars. Sample containers were filled to minimize headspace. The samples were placed in a cooler with ice pending transport to the analytical laboratory. Samples requiring preservative (e.g., HCl for diesel- and oil-range hydrocarbon analyses) contained the proper preservative in the laboratory-prepared bottles. Chain-of-custody procedures were followed in transporting the samples to the laboratory.

### **Investigative Wastes**

Purged groundwater (approximately 3 gallons) removed from the monitoring well casings on April 10, 2013 prior to collecting groundwater samples was stored in a 5-gallon bucket. Purged groundwater generated during the well sampling activities was disposed in the sanitary sewer at GeoEngineers' office in Redmond, Washington in April 2013.

## GROUNDWATER SAMPLE COLLECTION FORM

Project FORMER IRVINGDALE IRON & STEEL PLANT Job No. 0504-042-02 Collector FK Casing Elevation 0.6 to RIM MW ID -5

### PURGE DATA

Well Condition: Secure  Yes  No Describe Damage None

(Padlock brand and number)

Depth to Water (from top of well casing) 4.40 ft

Depth to Base of Well 18.75 ft Height of Water Column

Well Casing Type/Diameter 1-inch

One Casing Volume (gal.)

Purge Method Pump (type) PERISTALTIC Bailor (type)

Gallons Purged ~1.0

(Remove minimum of 3 well volumes or until field parameters stabilize)

Purge Water Storage/Disposal 5-gal bucket

(Drum identification, sample analysis, sample results, storage location, etc.)

Diameter (in.)	OD	ID	Volume Gal./Linear Ft
2	2.375"	2.067"	0.17
3	3.500"	3.068"	0.38
4	4.500"	4.026"	0.66
6	6.625"	6.065"	1.5
8	8.625"	7.981"	2.6

### SAMPLING DATA

Date Collected (mo/dy/yr) 4/10/13

Sample Location and Depth MW-05 Time Collected 1730

Tidal Cycle NA High Tide at 7:00 p.m Low Tide at 11:00 a.m Weather SUNNY

Sample type (Groundwater, Product, Other) GW

Sample Collected with  Bailor  Pump  Other

Made of  Stainless Steel  PVC  Teflon  Disposable LDPE  Other

Sampler Decon Procedure - Disposable Tubing & ALONOX w/DISTILLED

Sample Description (color, free product thickness, odor, turbidity, etc.) - NONE - WATER

### FIELD PARAMETERS

Time	Purge Volume (liter) <u>ml</u>	pH	Conductivity (MS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	Salinity (ppt)	TDS (g/l)	Sea Water Potential	ORP (mV)	pH <sub>mw</sub>
1705		7.25	0.585	21	26.82	11.94	0.3	0.374	0.0	17	-102
1710	500	7.22	0.611	14	7.29	11.77	0.3	0.392	0.0	6	-100
1715	500	7.17	0.621	8	7.76	11.51	0.3	0.398	0.0	5	-97
1720	500	7.10	0.647	5	7.11	11.01	0.3	0.396	0.0	7	-93

Meters Used for Measurement HORIBA U-53

pH/Con./DO Instrument Calibration  Yes  No Spectrophotometer  E-Tape

### ADDITIONAL INFORMATION

Samples Composited Overtime, Distance

Analyses, Number and Volume of Sample Containers MW-05-130410

Duplicate Sample Number(s) - No. -

Signature [Signature] Date 4/10/13 Page 1 of 1

Check if additional information on back

## GROUNDWATER SAMPLE COLLECTION FORM

Project FORMER IRON & STEEL PLANT IRONDALE Job No. 0504-042 -02 Collector FK Casing Elevation 0.48 ft MW ID -6

### PURGE DATA

Well Condition: Secure  Yes  No Describe Damage None

(Padlock brand and number)

Depth to Water (from top of well casing) 3.16 ft

Depth to Base of Well 11.25 ft Height of Water Column \_\_\_\_\_

Well Casing Type/Diameter 1-INCH

One Casing Volume (gal.) \_\_\_\_\_

Purge Method Pump (type) PERISTALTIC Bailer (type) \_\_\_\_\_

Gallons Purged ~1.0

(Remove minimum of 3 well volumes or until field parameters stabilize)

Purge Water Storage/Disposal 5-gallon bucket

(Drum identification, sample analysis, sample results, storage location, etc.)

Diameter (in.)	OD	ID	Volume Gal./ Linear Ft
2	2.375"	2.067"	0.17
3	3.500"	3.068"	0.38
4	4.500"	4.026"	0.66
6	6.625"	6.065"	1.5
8	8.625"	7.981"	2.6

### SAMPLING DATA

Date Collected (mo/dy/yr) 4/10/13

Sample Location and Depth GEI-MW-6-4/10/2013

Time Collected 1230

Tidal Cycle NA  High Tide at 7 p.m.

Low Tide at 11:00 a.m. Weather SUNNY

Sample type (Groundwater, Product, Other)

Sample Collected with  Bailer  Pump  Other

Made of  Stainless Steel  PVC  Teflon  Disposable LDPE  Other

Sampler Decon Procedure DISPOSABLE TUBING & ALLOX w/ DISTILLED

Sample Description (color, free product thickness, odor, turbidity, etc.) -NONE- WATER

### FIELD PARAMETERS

Time	Purge Volume mL (liter)	pH	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (°C)	Salinity (%)	TDS (g/l)	Sea Water Potential	ORP (mV)	PH <sub>mw</sub>
1205		7.83	0.512	36	2.77	16.21	0.22	0.328	0.0	-148	-132
1210	500	7.76	0.461	21	1.35	16.22	0.20	0.30	0.0	-157	-131
1215	500	7.6	0.446	10	1.77	16.18	0.20	0.29	0.0	-161	-122
1220	500	7.26	0.431	5	1.72	16.11	0.2	0.28	0.0	-164	-103
1225	500	7.52	0.419	4	1.98	16.01	0.2	0.27	0.0	-169	-117
<del>1230</del>											
<del>1235</del>											

Meters Used for Measurement HORIBA U-53

pH/Con./DO Instrument Calibration  Yes  No

Spectrophotometer \_\_\_\_\_ E-Tape

### ADDITIONAL INFORMATION

Samples Composited Overtime, Distance \_\_\_\_\_

Analyses, Number and Volume of Sample Containers MW-06-130410

Duplicate Sample Number(s) \_\_\_\_\_

MW-06-130410-DUP for TPH &

Signature [Signature]

Date 4/10/13

Page 1 of 1

Check if additional information on back

## GROUNDWATER SAMPLE COLLECTION FORM

Project FORMER IRONDALE IRON & STEEL PLANT Job No. 0504-042-02 Collector FK Casing Elevation 0.485 MW ID -7

### PURGE DATA

Well Condition: Secure  Yes  No Describe Damage None  
(Padlock brand and number)

Depth to Water (from top of well casing) 5.06

Depth to Base of Well 11.75 ft Height of Water Column \_\_\_\_\_

Well Casing Type/Diameter 1-INCH

One Casing Volume (gal.) \_\_\_\_\_

Purge Method Pump (type) PERISTALTIC Bailer (type) \_\_\_\_\_

Gallons Purged 20.5

(Remove minimum of 3 well volumes or until field parameters stabilize)

Purge Water Storage/Disposal 5-gal bucket

(Drum identification, sample analysis, sample results, storage location, etc.)

Diameter (in.)	OD	ID	Volume Gal./Linear Ft
2	2.375"	2.067"	0.17
3	3.500"	3.068"	0.38
4	4.500"	4.026"	0.66
6	6.625"	6.065"	1.5
8	8.625"	7.981"	2.6

### SAMPLING DATA

Date Collected (mo/dy/yr) 4/10/13

Sample Location and Depth MW-07

Time Collected 1335

Tidal Cycle NA High Tide at 7:00 p.m. Low Tide at 11:00 a.m. Weather SUNNY

Sample type (Groundwater, Product, Other) GW

Sample Collected with  Bailer  Pump  Other \_\_\_\_\_

Made of  Stainless Steel  PVC  Teflon  Disposable LDPE  Other \_\_\_\_\_

Sampler Decon Procedure DISPOSABLE TUBING & ALCONOX w/ DISINFECTANT

Sample Description (color, free product thickness, odor, turbidity, etc.) WATER

### FIELD PARAMETERS

Time	Purge Volume ml (liter)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temperature (F/C)	Salinity (%)	TDS (g/l)	Sea Water Potential	ORP (mV)	pH <sub>mV</sub>
1320		7.42	0.232	33	17.88	16.21	0.1	0.168	0.0	-52	-712
1325	500 ml	7.03	0.1166	16	7.83	15.97	0.1	0.109	0.0	-107	-89
1330	500 ml	6.84	0.154	9	7.39	15.77	0.1	0.101	0.0	-116	-78
1335	500 ml	6.58	0.155	7	7.08	15.51	0.1	0.105	0.0	-117	-63

Meters Used for Measurement HORIBA U-53

pH/Con./DO Instrument Calibration  Yes  No Spectrophotometer \_\_\_\_\_ E-Tape

### ADDITIONAL INFORMATION

Samples Composited Overtime, Distance \_\_\_\_\_

Analyses, Number and Volume of Sample Containers MW-07-130410

Duplicate Sample Number(s) \_\_\_\_\_

-NO-

Signature [Signature] Date 4/10/13 Page 1 of 1

Check if additional information on back

## GROUNDWATER SAMPLE COLLECTION FORM

Project FORMER IRONDANE IRON & STEEL PLANT Job No. 0504-042 -02 Collector FK Casing Elevation 0.35 ft MW ID -8

### PURGE DATA

Well Condition: Secure  Yes  No Describe Damage None  
 (Padlock brand and number) \_\_\_\_\_  
 Depth to Water (from top of well casing) 4.68 ft  
 Depth to Base of Well 12.15 ft Height of Water Column \_\_\_\_\_  
 Well Casing Type/Diameter 1-inch  
 One Casing Volume (gal.) \_\_\_\_\_  
 Purge Method Pump (type) PERISTALTIC Bailer (type) \_\_\_\_\_  
 Gallons Purged NO.5  
 (Remove minimum of 3 well volumes or until field parameters stabilize)  
 Purge Water Storage/Disposal 5-GALLON BUCKET  
 (Drum identification, sample analysis, sample results, storage location, etc.)

Diameter (in.)	OD	ID	Volume Gal./ Linear Ft
2	2.375"	2.067"	0.17
3	3.500"	3.068"	0.38
4	4.500"	4.026"	0.66
6	6.625"	6.065"	1.5
8	8.625"	7.981"	2.6

### SAMPLING DATA

Date Collected (mo/dy/yr) 4/10/13  
 Sample Location and Depth MW-08 Time Collected 1540  
 Tidal Cycle NA High Tide at 7:00 am Low Tide at 11:00 am Weather SUNNY  
 Sample type (Groundwater, Product, Other) GW  
 Sample Collected with  Bailer  Pump  Other \_\_\_\_\_  
 Made of  Stainless Steel  PVC  Teflon  Disposable LDPE  Other \_\_\_\_\_  
 Sampler Decon Procedure DISPOSABLE TUBING & ALCONOX w/DISTILLED WATER  
 Sample Description (color, free product thickness, odor, turbidity, etc.) SOME IRON OXIDE IN PURGED WATER

### FIELD PARAMETERS

Time	Purge Volume M.L (liter)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (%)	Temperature (°F/C)	Salinity (%)	TDS (g/l)	Sea Water Potential	ORP (mV)	PH <sub>uv</sub>
1515		7.26	0.405	250	5.25	14.7	0.2	0.263	0.0	-101	-102
1520	500	6.86	0.325	111	1.96	14.32	0.2	0.207	0.0	-157	-79
1525	500	6.77	0.339	76	1.84	14.13	0.12	0.223	0.0	-164	-74
1530	500	6.70	0.319	30	2.36	13.87	0.2	0.208	0.0	-174	-71
1535	500	6.61	0.306	12	2.21	13.67	0.1	0.201	0.0	-173	-65
1540	500	6.60	0.312	7	2.40	13.51	0.1	0.202	0.0	-172	-65

Meters Used for Measurement HORIBA U-53  
 pH/Con./DO Instrument Calibration  Yes  No Spectrophotometer \_\_\_\_\_ E-Tape

### ADDITIONAL INFORMATION

Samples Composited Overtime, Distance \_\_\_\_\_  
 Analyses, Number and Volume of Sample Containers MW-07-130410  
 Duplicate Sample Number(s) -NO-

Signature [Signature] Date 4/10/13 Page 1 of 1

Check if additional information on back

## GROUNDWATER SAMPLE COLLECTION FORM

Project IRONDALE FOR Job No. 0504-042-02 Collector FK Casing Elevation 0.51 MW ID 9

### PURGE DATA

Well Condition: Secure  Yes  No Describe Damage NONE  
(Padlock brand and number)

Depth to Water (from top of well casing) 5.52 ft

Depth to Base of Well 17.05 ft Height of Water Column \_\_\_\_\_

Well Casing Type/Diameter 1-INCH

One Casing Volume (gal.) \_\_\_\_\_

Purge Method Pump (type) PERISTALTIC Bailer (type) \_\_\_\_\_

Gallons Purged 21.0

(Remove minimum of 3 well volumes or until field parameters stabilize)

Purge Water Storage/Disposal 5-gal bucket

(Drum identification, sample analysis, sample results, storage location, etc.)

Diameter (in.)	OD	ID	Volume Gal./Linear Ft
2	2.375"	2.067"	0.17
3	3.500"	3.068"	0.38
4	4.500"	4.026"	0.66
6	6.625"	6.065"	1.5
8	8.625"	7.981"	2.6

### SAMPLING DATA

Date Collected (mo/dy/yr) 4/10/13

Sample Location and Depth MW-09

Time Collected 1130 a.m.

Tidal Cycle NA High Tide at 7:00 p.m. Low Tide at 11:00 a.m.

Weather BUNNY

Sample type (Groundwater, Product, Other) GW

Sample Collected with  Bailer  Pump  Other

Made of  Stainless Steel  PVC  Teflon  Disposable LDPE  Other

Sampler Decon Procedure DISPOSABLE TUBING & ALCONOK w/ DISTILLED WATER

Sample Description (color, free product thickness, odor, turbidity, etc.) SIGNIFICANT IRON OXIDE PRECIPITATE IN

### FIELD PARAMETERS

PURGED WATER

Time	Purge Volume ml (liter)	pH	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (%)	Temperature (°C)	Salinity (‰ ppt)	TDS (g/l)	Sea Water Potential	ORP (mV)	plmV
1045		7.3	21.4	300	17.23	11.65	12.7	13.3	7.4	100	-60
1055	500	6.54	18.3	240	9.82	13.2	10.5	11.4	7.6	105	-61
1100	500	6.47	16.4	181	8.63	13.90	9.5	10.2	6.7	93	-58
1105	500	6.32	15.1	75	8.41	13.92	8.7	9.36	6.0	85	-49
1110	500	6.60	13.2	43	8.25	14.51	7.5	8.13	5.1	65	-65
1115	500	7.14	13.1	25	8.11	14.52	8.7	8.82	5.01	27	-96
1120	500	7.01	13.01	11	8.01	14.50	8.2	8.28	5.12	-26	-92

Meters Used for Measurement 7.13 13.12 8 8.16 14.48 8.0 8.12 5.0 -28 -99

pH/Con./DO Instrument Calibration 7.4 13.01 7 8.12 14.28 8.02 8.01 5.13 -27 -98

Yes  No Spectrophotometer \_\_\_\_\_ E-Tape \_\_\_\_\_

HORIBA U-53

### ADDITIONAL INFORMATION

Samples Composited Overtime, Distance \_\_\_\_\_

Analyses, Number and Volume of Sample Containers MW-09-130410

Duplicate Sample Number(s) \_\_\_\_\_

DUPLICATE FOR METALS (DISSOLVED)  
MW-09-130410-DUP

Signature [Signature]

Date 4/10/13

Page 1 of 1

Check if additional information on back

**APPENDIX B**  
**Data Validation Memorandum and**  
**Chemical Analytical Results**

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**Project:** Irondale Remedial Cleanup Action, Quarterly Groundwater Monitoring (Round 2)  
**File:** 0504-042-02  
**Date:** June 21, 2013  
**Lab Report:** WL62 (ARI)

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This report presents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2A validation (USEPA Document 540-R-08-005; USEPA, 2009) of analytical data from the analyses of five groundwater samples obtained from the Post-Construction Quarterly Groundwater Monitoring Event (Round 2) at the former Irondale Iron and Steel Plant site in Irondale, Washington. Samples obtained were submitted to Analytical Resources Incorporated (ARI) of Tukwila, Washington for chemical analysis of diesel- and heavy oil-range petroleum hydrocarbons (NWTPH-Dx), dissolved and total carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and dissolved metals (copper and nickel).

The objective of the data quality assessment was to review laboratory analytical procedures and QC results to evaluate whether the samples were analyzed using well-defined and acceptable methods that provide quantitation limits below applicable regulatory criteria, the precision and accuracy of the data are well defined and sufficient to provide defensible data, and the quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

The ARI Sample Delivery Group (SDG; noted above) was reviewed for the following quality control (QC) elements:

- Chain of Custody
- Holding Times
- Surrogates/Labeled Compounds
- Method and Equipment Rinsate Blanks
- Laboratory Control Samples/Ongoing Precision and Recovery Samples
- Matrix Spikes/Matrix Spike Duplicates
- Laboratory and Field Duplicates

## **DATA QUALITY ASSESSMENT SUMMARY**

The results for each of the QC elements are summarized below. The data assessment was performed using guidance in two USEPA documents: USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA, 2010) and USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 2008).

### **Chain-of-Custody Documentation**

Chain-of-custody forms were provided with the laboratory analytical reports. No transcription errors were found, and the appropriate signatures were applied. There were no anomalies mentioned in the sample



receipt forms, as the samples were transported to the laboratory at the appropriate temperatures of between 2 and 6 degrees Celsius.

### **Holding Times**

The holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses.

### **Surrogate Recoveries**

A surrogate compound is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added at a known concentration and percent recoveries are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits.

### **Method Blanks**

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. Method blanks were analyzed with each batch of samples, at a frequency of one per twenty samples. For all sample batches, method blanks for all applicable methods were analyzed at the required frequency. None of the analytes of interest were detected above the contract required quantitation limits.

### **Matrix Spikes/Matrix Spike Duplicates**

Because the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike (MS) analysis. One aliquot of sample is analyzed in the normal manner, and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a %R is calculated. Matrix spike duplicates (MSD) analyses are generally performed for organic analyses as a precision check. For some organic analytical methods, such as NWTPH-Dx, a laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) sample set is performed in lieu of a MS/MSD analysis.

For inorganics methods, the matrix spike (referred to as a "spiked sample") is typically followed by a post spike sample if any element recoveries were outside the control limits in the "spike sample".

Matrix spike analyses should be performed once per analytical batch or every twenty field samples, whichever is more frequent. The recovery criteria for matrix spikes and laboratory control samples are specified in the laboratory documents as are the relative percent difference (RPD) values. The frequency requirements were met for all analyses and the %R/RPD values were within the proper control limits.

### **Laboratory Control Samples**

A laboratory control sample is essentially a blank sample that is spiked with a known amount of analyte concentration and analyzed. It is to be treated much like a matrix spike, without the possibility for matrix interference. As there is no actual sample matrix in the analysis, the analytical expectations for accuracy and

precision are usually more rigorous and qualification would apply to all samples in the batch, instead of the parent sample only.

Laboratory control sample analyses should be performed once per analytical batch or every twenty field samples, whichever is more frequent. The recovery criteria for laboratory control samples are specified in the laboratory documents as are the RPD values. The frequency requirements were met for all analyses, and the %R/RPD values were within the proper control limits.

#### **Laboratory Duplicates (Metals and Fuels only)**

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory, and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration greater than five times the reporting limit for that sample, the absolute difference is used instead of the RPD.

Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met in all cases.

#### **Field Replicates/Duplicates**

Field duplicate samples were collected and analyzed along with the reviewed sample batches. The duplicate samples were analyzed for the same parameters as the associated parent samples. As mentioned above for the laboratory duplicates the RPD is used as the criteria for assessing precision, unless one or more of the samples used has a concentration greater than five times the reporting limit for that sample. In this case, the absolute difference is used instead of the RPD.

The following field duplicate sample sets were collected for this sampling event:

- MW06-130410/MW06-130410-DUP and MW09-130410/MW09-130410-DUP

The RPD/absolute difference value for the field duplicate sample sets were within their respective control limits.

### **OVERALL ASSESSMENT**

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogates, LCS/LCSD, and MS/MSD %R values. Precision was acceptable, as demonstrated by the field duplicate, laboratory duplicate, LCS/LCSD and MS/MSD RPD and absolute difference values.

Based on the data quality review, it is our opinion that the analytical data, including data qualified as noted above, are of acceptable quality for their intended use.

## REFERENCES

- U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review," OSWER 9240.1-51, EPA 540-R-10-011. January 2010.
- U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review," EPA-540-R-08-01. June 2008.
- U.S. Environmental Protection Agency (USEPA). "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use," EPA-540-R-08-005. January 2009.



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

April 25, 2013

Neil Morton  
GeoEngineers, Inc.  
Plaza 600 Building  
600 Stewart Street, Suite 1700  
Seattle, WA 98101

**RE: Client Project: Former Irondale Iron & Steel Plant, 0542-042-01**  
**ARI Job No.: WL62**

Dear Neil:

Please find enclosed the Chain of Custody record (COC), sample receipt documentation, and the final data package for samples from the project referenced above.

Sample receipt and details of these analyses are discussed in the Case Narrative.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

Cheronne Oreiro  
Project Manager  
(206) 695-6214  
[cheronneo@arilabs.com](mailto:cheronneo@arilabs.com)  
[www.arilabs.com](http://www.arilabs.com)

cc: eFile: WL62

Enclosures

**Chain of Custody Documentation**

**ARI Job ID: WL62**

# Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)



Page: 1 of 1  
 Date: 4/11/13  
 Ice Present? YES  
 No. of Coolers: 1  
 Cooler Temps: 5.1

ARI Assigned Number: WLO2  
 Turn-around Requested: STANDARD  
 ARI Client Company: GEOENGINEERS 206.728.2624  
 Phone: 206.728.2624  
 Client Contact: NEIL MORTON  
 Client Project Name: FORMER IRONDALE IRON & STEEL PLANT  
 Client Project #: [Blank]  
 Samplers: [Blank]

Analysis Requested		Analysis Requested	
NW TPH-DX	TOTAL TPHS	DISOLVED Cu, Ni	Notes/Comments
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	NO SILICA GEL
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CLEAN UP
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	FOR DX
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	ANALYSIS
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Sample ID	Date	Time	Matrix	No. Containers
MW-05-130410	4/10/13	1720	W	3
MW-06-130410	1	1220	1	95
MW-07-130410	1	1335	1	5
MW-08-130410	1	1540	1	5
MW-09-130410	1	1120	1	3
MW-06-130410-DUP	1	1220	1	5
MW-09-130410-DUP	1	1120	1	1

Comments/Special Instructions	Relinquished by: [Signature]	Received by: [Signature]
	Printed Name: FASIM KHAN	Printed Name: Tayle Streete
	Company: GET	Company: ARI
	Date & Time: 4/11/13, 1345	Date & Time: 4-11-13 1345

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



# Cooler Receipt Form

ARI Client: Geo Eng  
 COC No(s): \_\_\_\_\_ (NA)  
 Assigned ARI Job No: WL62

Project Name: Former Irondale Steam plant  
 Delivered by: Fed-Ex UPS Courier Hand Delivered Other: \_\_\_\_\_  
 Tracking No: \_\_\_\_\_ (NA)

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES  NO   
 Were custody papers included with the cooler? ..... YES  NO   
 Were custody papers properly filled out (ink, signed, etc.) ..... YES  NO   
 Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) ..... 5.1  
 If cooler temperature is out of compliance fill out form 00070F  
 Cooler Accepted by: TS Date: 4-11-13 Time: 1345 Temp Gun ID#: 90877932

**Complete custody forms and attach all shipping documents**

**Log-In Phase:**

Was a temperature blank included in the cooler? ..... YES  NO   
 What kind of packing material was used? ... Bubble Wrap  Wet Ice  Gel Packs  Baggies  Foam Block  Paper  Other: \_\_\_\_\_  
 Was sufficient ice used (if appropriate)? ..... NA  YES  NO   
 Were all bottles sealed in individual plastic bags? ..... YES  NO   
 Did all bottles arrive in good condition (unbroken)? ..... YES  NO   
 Were all bottle labels complete and legible? ..... YES  NO   
 Did the number of containers listed on COC match with the number of containers received? ..... YES  NO   
 Did all bottle labels and tags agree with custody papers? ..... YES  NO   
 Were all bottles used correct for the requested analyses? ..... YES  NO   
 Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... NA  YES  NO   
 Were all VOC vials free of air bubbles? ..... NA  YES  NO   
 Was sufficient amount of sample sent in each bottle? ..... YES  NO   
 Date VOC Trip Blank was made at ARI..... NA   
 Was Sample Split by ARI:  YES Date/Time: \_\_\_\_\_ Equipment: \_\_\_\_\_ Split by: \_\_\_\_\_

Samples Logged by: AV Date: 4/11/13 Time: 1440

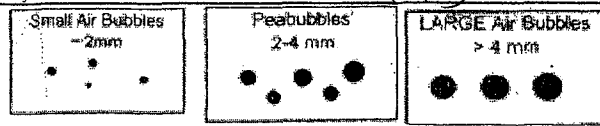
**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

**Additional Notes, Discrepancies, & Resolutions:**

MW-06-130410-0UP has 4 bottles = 4 500ml ambers

By: AV Date: 4/11/13



Small → "sm"  
 Peabubbles → "pb"  
 Large → "lg"  
 Headspace → "hs"

**PRESERVATION VERIFICATION 04/11/13**

Page 1 of 1

Inquiry Number: NONE  
 Analysis Requested: 04/11/13  
 Contact: Morton, Neil  
 Client: Geoenigneers  
 Logged by: AV  
 Sample Set Used: Yes-481  
 Validatable Package: Lv4  
 Deliverables:



ARI Job No: **WL62**  
 PC: Cheronne  
 VTSR: 04/11/13

Project #:   
 Project: Former Irondale Iron & Steel Plant  
 Sample Site:  
 SDG No:  
 Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	TPHD <2	Fe2+ <2	DMET DOC FLT FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
13-7770 <b>WL62A</b>	MW-05-130410						DIS									Y					
13-7771 <b>WL62B</b>	MW-06-130410						DIS									Y					
13-7772 <b>WL62C</b>	MW-07-130410						DIS									Y					
13-7773 <b>WL62D</b>	MW-08-130410						DIS									Y					
13-7774 <b>WL62E</b>	MW-09-130410						DIS									Y					
13-7775 <b>WL62F</b>	MW-06-130410-DUP																				
13-7776 <b>WL62G</b>	MW-09-130410-DUP						DIS									Y					

*F=Pass*

FILED : 000005

Checked By AV Date 4/11/13



**Case Narrative, Data Qualifiers, Control Limits**

**ARI Job ID: WL62**



## **Case Narrative**

**Client: GeoEngineers, Inc.**

**Project: Former Irondale Iron & Steel Plant, 0542-042-01**

**ARI Job No.: WL62**

### **Sample Receipt**

Seven water samples were received on April 11, 2013 under ARI job WL62. The cooler temperature measured by IR thermometer following ARI SOP was 5.1°C. For further details regarding sample receipt, please refer to the Cooler Receipt Form.

### **Low-Level SIM PAHs by SW8270**

The samples were extracted and analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limits. The LCS and LCSD percent recoveries were within control limits.

### **NWTPH-Dx**

The samples were extracted and analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limits. The LCS and LCSD percent recoveries were within control limits.

### **Dissolved Metals by Method 200.8**

The samples and associated laboratory QC were digested and analyzed within recommended holding times.

The method blank was clean at the reporting limits. The LCS percent recoveries were within control limits.

The matrix spike percent recoveries and duplicate RPDs were within control limits.

# Sample ID Cross Reference Report



ARI Job No: WL62  
Client: Geoengineers  
Project Event: N/A  
Project Name: Former Irondale Iron & Steel Plant

Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1. MW-05-130410	WL62A	13-7770	Water	04/10/13 17:20	04/11/13 13:45
2. MW-06-130410	WL62B	13-7771	Water	04/10/13 12:20	04/11/13 13:45
3. MW-07-130410	WL62C	13-7772	Water	04/10/13 13:35	04/11/13 13:45
4. MW-08-130410	WL62D	13-7773	Water	04/10/13 15:40	04/11/13 13:45
5. MW-09-130410	WL62E	13-7774	Water	04/10/13 11:20	04/11/13 13:45
6. MW-06-130410-DUP	WL62F	13-7775	Water	04/10/13 12:20	04/11/13 13:45
7. MW-09-130410-DUP	WL62G	13-7776	Water	04/10/13 11:20	04/11/13 13:45



## Data Reporting Qualifiers

Effective 2/14/2011

### Inorganic Data

- U Indicates that the target analyte was not detected at the reported concentration
- \* Duplicate RPD is not within established control limits
- B Reported value is less than the CRDL but  $\geq$  the Reporting Limit
- N Matrix Spike recovery not within established control limits
- NA Not Applicable, analyte not spiked
- H The natural concentration of the spiked element is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
- L Analyte concentration is  $\leq 5$  times the Reporting Limit and the replicate control limit defaults to  $\pm 1$  RL instead of the normal 20% RPD

### Organic Data

- U Indicates that the target analyte was not detected at the reported concentration
- \* Flagged value is not within established control limits
- B Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.
- J Estimated concentration when the value is less than ARI's established reporting limits
- D The spiked compound was not detected due to sample extract dilution
- E Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
- Q Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria ( $< 20\%$  RSD,  $< 20\%$  Drift or minimum RRF).



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- S Indicates an analyte response that has saturated the detector. The calculated concentration is not valid; a dilution is required to obtain valid quantification of the analyte
- NA The flagged analyte was not analyzed for
- NR Spiked compound recovery is not reported due to chromatographic interference
- NS The flagged analyte was not spiked into the sample
- M Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses
- M2 The sample contains PCB congeners that do not match any standard Aroclor pattern. The PCBs are identified and quantified as the Aroclor whose pattern most closely matches that of the sample. The reported value is an estimate.
- N The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification"
- Y The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.
- EMPC Estimated Maximum Possible Concentration (EMPC) defined in EPA Statement of Work DLM02.2 as a value "calculated for 2,3,7,8-substituted isomers for which the quantitation and /or confirmation ion(s) has signal to noise in excess of 2.5, but does not meet identification criteria"  
**(Dioxin/Furan analysis only)**
- C The analyte was positively identified on only one of two chromatographic columns. Chromatographic interference prevented a positive identification on the second column
- P The analyte was detected on both chromatographic columns but the quantified values differ by  $\geq 40\%$  RPD with no obvious chromatographic interference
- X Analyte signal includes interference from polychlorinated diphenyl ethers.  
**(Dioxin/Furan analysis only)**
- Z Analyte signal includes interference from the sample matrix or perfluorokerosene ions. **(Dioxin/Furan analysis only)**



### **Geotechnical Data**

- A The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
- F Samples were frozen prior to particle size determination
- SM Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
- SS Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis
- W Weight of sample in some pipette aliquots was below the level required for accurate weighting



**LOD<sup>1</sup>, LOQ<sup>2</sup> and Control Limits Summary**  
**Analysis of Water Samples for Low Concentration PNA**  
**EPA Method 8270 – SIM**  
**ARI Analysis: PNLWSL**

Separatory Funnel Extraction (EPA Method 3510C) using 500 mL sample with extract concentrated to 0.5 mL final volume. Silica gel cleanup performed on extract prior to analysis. ARI bench Sheet 3071F

DL, LOD & LOQ units are nanograms per liter (ng/L) = parts-per-trillion (ppt). LOD Spike level = LOQ

Analyte	DL <sup>1</sup> ng/L	LOD <sup>1</sup> ng/L	LOQ <sup>1</sup> ng/L	LCS Control Limit <sup>2</sup>	Replicate RPD <sup>3</sup>
Naphthalene	0.85	5	10	37 – 90	≤ 40
2-Methylnaphthalene	0.72	5	10	39 – 90	≤ 40
Acenaphthylene	0.81	5	10	35 – 95	≤ 40
Acenaphthene	0.83	5	10	38 – 94	≤ 40
Dibenzofuran	0.94	5	10	36 – 94	≤ 40
Fluorene	1.41	5	10	41 – 102	≤ 40
Phenanthrene	1.01	5	10	41 – 101	≤ 40
Anthracene	0.58	5	10	28 – 101	≤ 40
Fluoranthene	0.92	5	10	49 – 114	≤ 40
Pyrene	0.70	5	10	42 - 114	≤ 40
Benzo(a)anthracene	1.27	5	10	42 – 111	≤ 40
Chrysene	1.57	5	10	46 – 106	≤ 40
Benzo(b)fluoranthene	2.54	5	10	39 – 119	≤ 40
Benzo(k)fluoranthene	0.85	5	10	50 – 117	≤ 40
Benzo(j)fluoranthene	1.65	5	10	30 – 160 <sup>4</sup>	≤ 40
Benzo(a)pyrene	1.14	5	10	20 – 99	≤ 40
Indeno(1,2,3-cd)pyrene	1.82	5	10	32 – 113	≤ 40
Dibenz(a,h)anthracene	0.97	5	10	30 – 113	≤ 40
Benzo(g,h,i)perylene	1.87	5	10	27 – 113	≤ 40
1-Methylnaphthalene	0.88	5	10	38 – 95	≤ 40
Perylene	3.21	5	10	30 – 160 <sup>4</sup>	≤ 40
<b>Surrogate Standard Recovery</b>			<b>MB / LCS</b>	<b>Samples</b>	<b>RPD</b>
2-Methylnaphthalene-d <sub>10</sub>			40 – 93	35 – 94	≤ 40
Dibenzo(a,h)anthracene-d <sub>14</sub>			31 – 115	26 – 115	≤ 40

(1) Detection Limit (DL), Limit of Detection (LOD) and Limit of Quantitation (LOQ) are defined in ARI SOP 1018S

(2) Control limits calculated using data from all samples prepared between 4/1/11 through 3/31/12.

(3) Relative Percent Difference between analytes in replicate analyzes. If C<sub>O</sub> and C<sub>D</sub> are the concentrations of the original and duplicate respectively then

$$RPD = \frac{|C_o - C_D|}{\frac{C_o + C_D}{2}} \times 100$$

(4) Default limits pending generation of historic limits for Benzo(j)fluoranthene.



**Quality Control Parameters for Metals Analysis ICP-MS EPA  
Methods 200.8 or 6020A**

Analyte	Mass	Aqueous Samples <sup>2</sup>			Spike Recovery		RPD <sup>3</sup>	Solids <sup>2</sup>
		DL <sup>1</sup> µg/L	LOD <sup>1</sup> µg/L	LOQ <sup>1</sup> µg/L	Matrix Spike	LCS		LOQ <sup>1</sup> mg/kg
Aluminum	27	1.601	10	20.0	75 – 125	80 – 120	≤ 20	20.0
Antimony	121	0.010	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
	123	0.011	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
Arsenic #1	75	0.048	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
Arsenic #2	75	0.092	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
Barium	135	0.020	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
	137	0.019	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
Beryllium	9	0.021	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
Cadmium	111	0.010	0.05	0.1	75 – 125	80 – 120	≤ 20	0.1
	114	0.005	0.05	0.1	75 – 125	80 – 120	≤ 20	0.1
Calcium	43	3.983	25	50.0	75 – 125	80 – 120	≤ 20	50.0
Chromium	52	0.045	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
	53	0.118	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
Cobalt	59	0.011	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
Copper	63	0.158	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
	65	0.236	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
Iron	54	5.753	10	20.0	75 – 125	80 – 120	≤ 20	20.0
	57	3.876	10	20.0	75 – 125	80 – 120	≤ 20	20.0
Lead	208	0.046	0.05	0.1	75 – 125	80 – 120	≤ 20	0.1
Magnesium	24	0.297	10	20.0	75 – 125	80 – 120	≤ 20	20.0
Manganese	55	0.022	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
Molybdenum	98	0.013	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
Nickel	60	0.079	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
	62	0.089	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
Potassium	39	2.944	10	20.0	75 – 125	80 – 120	≤ 20	20.0
Selenium	82	0.127	0.25	0.5	75 – 125	80 – 120	≤ 20	0.5
	78	0.324	0.25	2.0	75 – 125	80 – 120	≤ 20	2.0
Silver	107	0.008	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
Sodium	23	2.833	50	100.0	75 – 125	80 – 120	≤ 20	100.0
Thorium <sup>4</sup>	232	0.013	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
Thallium	205	0.004	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
Uranium <sup>4</sup>	238	0.003	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
Vanadium	51	0.043	0.1	0.2	75 – 125	80 – 120	≤ 20	0.2
Zinc	66	0.497	2	4.0	75 – 125	80 – 120	≤ 20	4.0
	67	0.531	2	4.0	75 – 125	80 – 120	≤ 20	4.0
	68	0.524	2	4.0	75 – 125	80 – 120	≤ 20	4.0

(1) Detection Limit (DL), Limit of Detection Limit (LOD) and Limit of Quantitation (LOQ) as defined in ARI SOP 1018S  
 (2) 50 mL sample and 50 mL final volume Solids LOQ based on 100% solids using 1.0 g sample 100 mL final volume.

(3) Relative Percent Difference in replicate analyzes.  $RPD = \frac{|C_o - C_D|}{\frac{C_o + C_D}{2}} \times 100$  where C<sub>o</sub>=Original, C<sub>D</sub>=Duplicate

(4) ARI has no accreditation for these elements.





Analysis Code	Analyte <sup>5</sup>	DL <sup>1</sup> ppm	LOD <sup>1</sup> ppm	LOQ <sup>2</sup> ppm	Spike % Recovery Control Limits <sup>3</sup>			RPD <sup>4</sup>
					LCS	MB/LCS Surrogate	Sample Surrogate	
HCIWVX	NWTPH-HCID – Water Samples	--	--	0.50 <sup>7</sup>	--	--	50-150	≤ 40
HCISVX	NWTPH-HCID – Solid Samples	--	--	50 <sup>7</sup>	--	--	50-150	
<b>Aqueous Samples – No Extract Clean-up – Separatory Funnel Extraction – 500 to 1.0 mL</b>								
DIESWI	DRO – NWTPH-Dext (C <sub>12</sub> -C <sub>24</sub> )	0.022	0.05	0.1	64-112	50-150	50-150	≤ 40
AK2WSI	DRO – AK102 (C <sub>10</sub> -C <sub>25</sub> )	0.022	0.05	0.1	75-125 <sup>6</sup>	60-120	50-150	
OILWSI	RRO – NWTPH-Dext (C <sub>24</sub> -C <sub>38</sub> )	0.044	0.1	0.2	60 – 130 <sup>8</sup>	50-150	50-150	
AK3WSI	RRO – AK103 (C <sub>25</sub> -C <sub>36</sub> )	0.030 <sup>9</sup>	0.1	0.2	60-120 <sup>6</sup>	60-120	50-150	
<b>Aqueous Samples – With Acid and/or Silica Gel Clean-up – Separatory Funnel Extraction – 500 to 1.0 mL</b>								
DIESWI	DRO – NWTPH-Dext (C <sub>12</sub> -C <sub>24</sub> )	0.039	0.05	0.1	61-104	50-150	50-150	≤ 40
AK2WSI	DRO – AK102 (C <sub>10</sub> -C <sub>25</sub> )	0.042	0.05	0.1	75-125 <sup>6</sup>	60-120	50-150	
OILWSI	RRO – NWTPH-Dext (C <sub>24</sub> -C <sub>38</sub> )	0.010	0.1	0.2	60 – 130 <sup>8</sup>	50-150	50-150	
AK3WSI	RRO – AK103 (C <sub>25</sub> -C <sub>36</sub> )	0.030 <sup>8</sup>	0.1	0.2	60-120 <sup>6</sup>	60-120	50-150	
<b>Solid Matrix Samples – No Extract Clean-up – Microwave Extraction – 10 g to 1 mL</b>								
DIESMI	DRO – NWTPH-Dext (C <sub>12</sub> -C <sub>24</sub> )	1.35	2.5	5	62-119	50-150	50-150	≤ 40
DIESMI	DRO – NWTPH-Dext Jet A	2.22 <sup>11</sup>	2.5	5	60 – 130 <sup>8</sup>	50-150	50-150	
AK2SMI	DRO – AK102 (C <sub>10</sub> -C <sub>25</sub> )	2.43	2.5	5	75-125 <sup>6</sup>	60-120	50-150	
OILSMI	RRO – NWTPH-Dext (C <sub>24</sub> -C <sub>38</sub> )	2.48	5	10	60 – 130 <sup>8</sup>	50-150	50-150	
AK3SMI	RRO – AK103 (C <sub>25</sub> -C <sub>36</sub> )	0.665 <sup>9</sup>	5	10	60-120 <sup>6</sup>	60-120	50-150	
<b>Solid Matrix Samples – With Acid and/or Silica Gel Clean-up – Microwave Extraction – 10 g to 1 mL</b>								
DIESMI	DRO – NWTPH-Dext (C <sub>12</sub> -C <sub>24</sub> )	1.28	2.5	5	60-108	50-150	50-150	≤ 40
AK2SMI	DRO – AK102 (C <sub>10</sub> -C <sub>25</sub> )	2.06	2.5	5	75-125 <sup>6</sup>	60-120	50-150	
OILSMI	RRO – NWTPH-Dext (C <sub>24</sub> -C <sub>38</sub> )	1.57	5	10	60 – 130 <sup>8</sup>	50-150	50-150	
AK3SMI	RRO – AK103 (C <sub>25</sub> -C <sub>36</sub> )	0.665 <sup>10</sup>	5	10	60-120 <sup>6</sup>	60-120	50-150	

(1) DL (Detection Limit) and LOD (Limit of Detection) as defined in ARI SOP 1018S.

(2) Limit of Quantitation as defined in ARI SOP 1018S. The spike concentration used to determine the DL and the concentration of the lowest standard used to calibrate the GC-FID instrument.

(3) All surrogate recovery limits are specified in the published methods (AK102, AK103 & NWTPH-Dext). The surrogate standard is *o*-Terphenyl.

(4) Acceptance criteria for the relative percent difference (RPD) between analytes in replicate analyzes. If C<sub>O</sub> and C<sub>D</sub> are the concentrations of the original and duplicate respectively then

$$RPD = \frac{|C_O - C_D|}{\frac{C_O + C_D}{2}} \times 100$$

(5) DRO = Diesel Range Organics and RRO = Residual Range Organics as defined in the methods referenced in footnote 3.

(6) Method specified LCS acceptance limits.

(7) Method specified reporting limits

(8) Default LCS control limits pending calculation of historic limits

(9) MDL study QD55 completed 2/12/10

(10) MDL study QD35 completed 1/29/10

(11) LOD Study UI44 completed 2/28/12

**SIM PAH Analysis  
Report and Summary QC Forms**

**ARI Job ID: WL62**

**ORGANICS ANALYSIS DATA SHEET**  
**PNA's by Low Level SW8270D-SIM GC/MS**  
**Extraction Method: SW3510C**  
 Page 1 of 1

**Sample ID: MW-06-130410**  
**SAMPLE**

Lab Sample ID: WL62B  
 LIMS ID: 13-7771  
 Matrix: Water  
 Data Release Authorized: *MMW*  
 Reported: 04/23/13

QC Report No: WL62-Geoengineers  
 Project: Former Irondale Iron & Steel Plant  
 Event: NA  
 Date Sampled: 04/10/13  
 Date Received: 04/11/13

Date Extracted: 04/15/13  
 Date Analyzed: 04/19/13 17:53  
 Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL  
 Final Extract Volume: 0.5 mL  
 Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
205-99-2	Benzo(b)fluoranthene	0.010	< 0.010 U
207-08-9	Benzo(k)fluoranthene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

**SIM Semivolatile Surrogate Recovery**

d10-2-Methylnaphthalene 57.0%  
 d14-Dibenzo(a,h)anthracene 62.7%

**ORGANICS ANALYSIS DATA SHEET**  
**PNAs by Low Level SW8270D-SIM GC/MS**  
**Extraction Method: SW3510C**  
 Page 1 of 1

**Sample ID: MW-07-130410**  
**SAMPLE**

Lab Sample ID: WL62C  
 LIMS ID: 13-7772  
 Matrix: Water  
 Data Release Authorized: *WVW*  
 Reported: 04/23/13

QC Report No: WL62-Geoengineers  
 Project: Former Irondale Iron & Steel Plant  
 Event: NA  
 Date Sampled: 04/10/13  
 Date Received: 04/11/13

Date Extracted: 04/15/13  
 Date Analyzed: 04/19/13 18:22  
 Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL  
 Final Extract Volume: 0.5 mL  
 Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
205-99-2	Benzo(b)fluoranthene	0.010	< 0.010 U
207-08-9	Benzo(k)fluoranthene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

**SIM Semivolatile Surrogate Recovery**

d10-2-Methylnaphthalene 74.3%  
 d14-Dibenzo(a,h)anthracene 76.7%

**ORGANICS ANALYSIS DATA SHEET**  
**PNA's by Low Level SW8270D-SIM GC/MS**  
**Extraction Method: SW3510C**  
 Page 1 of 1

**Sample ID: MW-08-130410**  
**SAMPLE**

Lab Sample ID: WL62D  
 LIMS ID: 13-7773  
 Matrix: Water  
 Data Release Authorized: *mmw*  
 Reported: 04/23/13

QC Report No: WL62-Geoengineers  
 Project: Former Irondale Iron & Steel Plant  
 Event: NA  
 Date Sampled: 04/10/13  
 Date Received: 04/11/13

Date Extracted: 04/15/13  
 Date Analyzed: 04/19/13 18:51  
 Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL  
 Final Extract Volume: 0.5 mL  
 Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
205-99-2	Benzo(b)fluoranthene	0.010	< 0.010 U
207-08-9	Benzo(k)fluoranthene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

**SIM Semivolatile Surrogate Recovery**

d10-2-Methylnaphthalene 69.3%  
 d14-Dibenzo(a,h)anthracene 68.3%

**ORGANICS ANALYSIS DATA SHEET**  
**PNAs by Low Level SW8270D-SIM GC/MS**  
**Extraction Method: SW3510C**  
 Page 1 of 1

**Sample ID: MW-06-130410-DUP**  
**SAMPLE**

Lab Sample ID: WL62F  
 LIMS ID: 13-7775  
 Matrix: Water  
 Data Release Authorized: *mmw*  
 Reported: 04/23/13

QC Report No: WL62-Geoengineers  
 Project: Former Irondale Iron & Steel Plant  
 Event: NA  
 Date Sampled: 04/10/13  
 Date Received: 04/11/13

Date Extracted: 04/15/13  
 Date Analyzed: 04/19/13 19:20  
 Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL  
 Final Extract Volume: 0.5 mL  
 Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
205-99-2	Benzo(b)fluoranthene	0.010	< 0.010 U
207-08-9	Benzo(k)fluoranthene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

**SIM Semivolatile Surrogate Recovery**

d10-2-Methylnaphthalene 66.3%  
 d14-Dibenzo(a,h)anthracene 68.0%

**SIM SW8270 SURROGATE RECOVERY SUMMARY**

Matrix: Water

QC Report No: WL62-Geoengineers  
Project: Former Irondale Iron & Steel Plant

<u>Client ID</u>	<u>MNP</u>	<u>DBA</u>	<u>TOT OUT</u>
MB-041513	71.3%	74.0%	0
LCS-041513	71.0%	73.0%	0
LCSD-041513	68.3%	74.7%	0
MW-06-130410	57.0%	62.7%	0
MW-07-130410	74.3%	76.7%	0
MW-08-130410	69.3%	68.3%	0
MW-06-130410-DUP	66.3%	68.0%	0

**LCS/MB LIMITS      QC LIMITS**

(MNP) = d10-2-Methylnaphthalene      (40-93)      (35-94)  
(DBA) = d14-Dibenzo(a,h)anthracene      (31-115)      (26-115)

Prep Method: SW3510C  
Log Number Range: 13-7771 to 13-7775

**ORGANICS ANALYSIS DATA SHEET**

**PNA's by Low Level SW8270D-SIM GC/MS**

Page 1 of 1

**Sample ID: LCS-041513**

**LAB CONTROL SAMPLE**

Lab Sample ID: LCS-041513

LIMS ID: 13-7771

Matrix: Water

Data Release Authorized: *MW*

Reported: 04/23/13

QC Report No: WL62-Geoengineers

Project: Former Irondale Iron & Steel Plant

Event: NA

Date Sampled: NA

Date Received: NA

Date Extracted LCS/LCSD: 04/15/13

Sample Amount LCS: 500 mL

LCSD: 500 mL

Date Analyzed LCS: 04/19/13 16:55

Final Extract Volume LCS: 0.50 mL

LCSD: 04/19/13 17:24

LCSD: 0.50 mL

Instrument/Analyst LCS: NT11/VTS

Dilution Factor LCS: 1.00

LCSD: NT11/VTS

LCSD: 1.00

Analyte	LCS	Spike		LCS Recovery	LCSD	Spike		LCSD Recovery	RPD
		Added-LCS	Added-LCSD			Added-LCS	Added-LCSD		
Benzo(a)anthracene	0.212	0.300	70.7%	0.215	0.300	71.7%	1.4%		
Chrysene	0.208	0.300	69.3%	0.216	0.300	72.0%	3.8%		
Benzo(b)fluoranthene	0.201	0.300	67.0%	0.214	0.300	71.3%	6.3%		
Benzo(k)fluoranthene	0.204	0.300	68.0%	0.213	0.300	71.0%	4.3%		
Benzo(a)pyrene	0.170	0.300	56.7%	0.172	0.300	57.3%	1.2%		
Indeno(1,2,3-cd)pyrene	0.209	0.300	69.7%	0.219	0.300	73.0%	4.7%		
Dibenz(a,h)anthracene	0.205	0.300	68.3%	0.215	0.300	71.7%	4.8%		
Total Benzofluoranthenes	0.609	0.900	67.7%	0.638	0.900	70.9%	4.7%		

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

**SIM Semivolatile Surrogate Recovery**

	LCS	LCSD
d10-2-Methylnaphthalene	71.0%	68.3%
d14-Dibenzo(a,h)anthracene	73.0%	74.7%



4B  
SEMIVOLATILE METHOD BLANK SUMMARY

BLANK NO.

WL62MBW1
----------

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

ARI Job No: WL62

Project: FORMER IRONDALE IRON

Lab File ID: WL62MB

Date Extracted: 04/15/13

Instrument ID: NT11

Date Analyzed: 04/19/13

Matrix: LIQUID

Time Analyzed: 1626

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS and MSD:

	CLIENT SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	WL62LCSW1	WL62LCSW1	WL62SB	04/19/13
02	WL62LCSDW1	WL62LCSDW1	WL62SBD	04/19/13
03	MW-06-130410	WL62B	WL62B	04/19/13
04	MW-07-130410	WL62C	WL62C	04/19/13
05	MW-08-130410	WL62D	WL62D	04/19/13
06	MW-06-130410-DUP	WL62F	WL62F	04/19/13
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**ORGANICS ANALYSIS DATA SHEET**  
**PNA's by Low Level SW8270D-SIM GC/MS**  
**Extraction Method: SW3510C**  
 Page 1 of 1

**Sample ID: MB-041513**  
**METHOD BLANK**

Lab Sample ID: MB-041513  
 LIMS ID: 13-7771  
 Matrix: Water  
 Data Release Authorized: *mmw*  
 Reported: 04/23/13

QC Report No: WL62-Geoengineers  
 Project: Former Irondale Iron & Steel Plant  
 Event: NA  
 Date Sampled: NA  
 Date Received: NA

Date Extracted: 04/15/13  
 Date Analyzed: 04/19/13 16:26  
 Instrument/Analyst: NT11/VTS

Sample Amount: 500 mL  
 Final Extract Volume: 0.5 mL  
 Dilution Factor: 1.00

CAS Number	Analyte	RL	Result
56-55-3	Benzo(a)anthracene	0.010	< 0.010 U
218-01-9	Chrysene	0.010	< 0.010 U
205-99-2	Benzo(b)fluoranthene	0.010	< 0.010 U
207-08-9	Benzo(k)fluoranthene	0.010	< 0.010 U
50-32-8	Benzo(a)pyrene	0.010	< 0.010 U
193-39-5	Indeno(1,2,3-cd)pyrene	0.010	< 0.010 U
53-70-3	Dibenz(a,h)anthracene	0.010	< 0.010 U
TOTBFA	Total Benzofluoranthenes	0.020	< 0.020 U

Reported in µg/L (ppb)

**SIM Semivolatile Surrogate Recovery**

d10-2-Methylnaphthalene 71.3%  
 d14-Dibenzo(a,h)anthracene 74.0%

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK  
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

Instrument ID: NT11

Project: FORMER IRONDALE

DFTPP Injection Date: 02/23/13

DFTPP Injection Time: 0936

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	10.0 - 80.0% of mass 198	32.0
68	Less than 2.0% of mass 69	0.0 ( 0.0)1
69	Mass 69 relative abundance	37.1
70	Less than 2.0% of mass 69	0.2 ( 0.5)1
127	10.0 - 80.0% of mass 198	48.3
197	Less than 2.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	6.9
275	10.0 - 60.0% of mass 198	23.6
365	Greater than 1.0% of mass 198	2.90
441	0.0 - 24.0% of mass 442	13.0 ( 14.7)2
442	50.0 - 200.0% of mass 198	88.6
443	15.0 - 24.0% of mass 442	17.0 ( 19.1)2

1-Value is % mass 69

2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	CLIENT SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01		SIM 250	IC0223A	02/23/13	0951
02		SIM 1000	IC0223B	02/23/13	1020
03		SIM 10	IC0223C	02/23/13	1050
04		SIM 500	IC0223D	02/23/13	1119
05		SIM 50	IC0223E	02/23/13	1148
06		SIM 100	IC0223F	02/23/13	1217
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5B  
SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK  
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

Instrument ID: NT11

Project: FORMER IRONDALE

DFTPP Injection Date: 04/19/13

DFTPP Injection Time: 1510

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	10.0 - 80.0% of mass 198	33.6
68	Less than 2.0% of mass 69	0.0 ( 0.0) 1
69	Mass 69 relative abundance	40.3
70	Less than 2.0% of mass 69	0.3 ( 0.7) 1
127	10.0 - 80.0% of mass 198	49.5
197	Less than 2.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	6.6
275	10.0 - 60.0% of mass 198	24.6
365	Greater than 1.0% of mass 198	3.01
441	0.0 - 24.0% of mass 442	13.0 ( 14.7) 2
442	50.0 - 200.0% of mass 198	88.4
443	15.0 - 24.0% of mass 442	17.4 ( 19.7) 2

1-Value is % mass 69

2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	CLIENT SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01		SIM 250	CC0419	04/19/13	1526
02	WL62MBW1	WL62MBW1	WL62MB	04/19/13	1626
03	WL62LCSW1	WL62LCSW1	WL62SB	04/19/13	1655
04	WL62LCSDW1	WL62LCSDW1	WL62SBD	04/19/13	1724
05	MW-06-130410	WL62B	WL62B	04/19/13	1753
06	MW-07-130410	WL62C	WL62C	04/19/13	1822
07	MW-08-130410	WL62D	WL62D	04/19/13	1851
08	MW-06-130410-DUP	WL62F	WL62F	04/19/13	1920
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## SEMIVOLATILE 8270-D CONTINUING CALIBRATION CHECK

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

ARI Job No: WL62

Project: FORMER IRONDALE

Instrument ID: NT11

Cont. Calib. Date: 04/19/13

Init. Calib. Date: 02/23/13

Cont. Calib. Time: 1526

COMPOUND	CalAmt or ARF	CC Amt or RF	MIN RRF	CURVE TYPE	%D or Drift
Naphthalene	1.095	1.030	0.700	AVRG	-5.9
2-Methylnaphthalene	0.685	0.644	0.400	AVRG	-6.0
Acenaphthylene	1.786	1.711	0.900	AVRG	-4.2
Acenaphthene	1.179	1.093	0.900	AVRG	-7.3
Dibenzofuran	1.717	1.548	0.800	AVRG	-9.8
Fluorene	1.282	1.227	0.900	AVRG	-4.3
Phenanthrene	1.235	1.116	0.700	AVRG	-9.6
Anthracene	1.159	1.091	0.700	AVRG	-5.9
Fluoranthene	1.221	1.193	0.600	AVRG	-2.3
Pyrene	1.675	1.500	0.600	AVRG	-10.4
Benzo(a)anthracene	1.384	1.281	0.800	AVRG	-7.4
Chrysene	1.430	1.282	0.700	AVRG	-10.3
Benzo(b)fluoranthene	1.585	1.347	0.700	AVRG	-15.0
Benzo(k)fluoranthene	1.724	1.564	0.700	AVRG	-9.3
Benzo(j)fluoranthene	1.749	1.546	0.010	AVRG	-11.6
Benzo(a)pyrene	1.338	1.210	0.700	AVRG	-9.6
Indeno(1,2,3-cd)pyrene	1.646	1.534	0.500	AVRG	-6.8
Dibenzo(a,h)anthracene	1.324	1.217	0.400	AVRG	-8.1
Benzo(g,h,i)perylene	1.473	1.317	0.500	AVRG	-10.6
1-methylnaphthalene	0.689	0.638	0.010	AVRG	-7.4
Perylene	1.524	1.337	0.010	AVRG	-12.3
2-Methylnaphthalene-d10	0.633	0.596	0.010	AVRG	-5.8
Dibenzo(a,h)anthracene-d14	1.143	1.058	0.010	AVRG	-7.4
Fluoranthene-d10	1.037	1.013	0.010	AVRG	-2.3

&lt;- Exceeds QC limit of 20% D

\* RF less than minimum RF

## SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

ARI Job No: WL62

Project: FORMER IRONDALE

Ical Midpoint ID: IC0223A

Ical Date: 02/23/13

Instrument ID: NT11

Cont. Cal Date: 04/19/13

	IS1 (NPT) AREA #	RT #	IS2 (ANT) AREA #	RT #	IS3 (PHN) AREA #	RT #
=====	=====	=====	=====	=====	=====	=====
ICAL MIDPT	255285	6.13	142891	9.11	220853	11.76
UPPER LIMIT	510570		285782		441706	
LOWER LIMIT	127642		71446		110426	
=====	=====	=====	=====	=====	=====	=====
CCAL	221636	6.19	126615	9.16	207851	11.81
UPPER LIMIT		6.69		9.66		12.31
LOWER LIMIT		5.69		8.66		11.31
01 WL62MBW1	216319	6.19	122810	9.16	203960	11.82
02 WL62LCSW1	217333	6.19	127416	9.16	209207	11.81
03 WL62LCSDW1	217401	6.19	126884	9.16	209496	11.81
04 MW-06-130410	218861	6.19	128256	9.16	213884	11.81
05 MW-07-130410	218650	6.19	125036	9.16	204538	11.81
06 MW-08-130410	222717	6.19	130476	9.16	213752	11.81
07 MW-06-130410	220894	6.19	129335	9.16	216936	11.81
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IS1 = Naphthalene-d8

IS2 = Acenaphthene-d10

IS3 = Phenanthrene-d10

AREA UPPER LIMIT = +100% of internal standard area from Ical midpoint

AREA LOWER LIMIT = - 50% of internal standard area from Ical midpoint

RT UPPER LIMIT = + 0.50 minutes of internal standard RT from Cont. Cal

RT LOWER LIMIT = - 0.50 minutes of internal standard RT from Cont. Cal

\* Values outside of QC limits.

## SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

ARI Job No: WL62

Project: FORMER IRONDALE

Ical Midpoint ID: IC0223A

Ical Date: 02/23/13

Instrument ID: NT11

Cont. Cal Date: 04/19/13

	IS4 (CRY) AREA #	RT #	IS5 (PRY) AREA #	RT #	AREA #	RT #
=====	=====	=====	=====	=====	=====	=====
ICAL MIDPT	162525	16.47	139028	19.06		
UPPER LIMIT	325050		278056			
LOWER LIMIT	81262		69514			
=====	=====	=====	=====	=====	=====	=====
CCAL	163937	16.52	143004	19.13		
UPPER LIMIT		17.02		19.63		
LOWER LIMIT		16.02		18.63		
01 WL62MBW1	162533	16.52	140454	19.14		
02 WL62LCSW1	164185	16.52	143352	19.13		
03 WL62LCSDW1	159374	16.52	136632	19.13		
04 MW-06-130410	157086	16.52	135145	19.13		
05 MW-07-130410	156486	16.52	136312	19.13		
06 MW-08-130410	164096	16.52	142137	19.13		
07 MW-06-130410	160632	16.52	139815	19.13		
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IS4 = Chrysene-d12

IS5 = Perylene-d12

AREA UPPER LIMIT = +100% of internal standard area from Ical midpoint

AREA LOWER LIMIT = - 50% of internal standard area from Ical midpoint

RT UPPER LIMIT = + 0.50 minutes of internal standard RT from Cont. Cal

RT LOWER LIMIT = - 0.50 minutes of internal standard RT from Cont. Cal

\* Values outside of QC limits.



**TPHD Analysis  
Report and Summary QC Forms**

**ARI Job ID: WL62**

**ORGANICS ANALYSIS DATA SHEET  
TOTAL DIESEL RANGE HYDROCARBONS**

NWTPHD by GC/FID  
Extraction Method: SW3510C  
Page 1 of 1

QC Report No: WL62-Geoengineers  
Project: Former Irondale Iron & Steel P

Matrix: Water

Date Received: 04/11/13

Data Release Authorized: *MW*  
Reported: 04/22/13

ARI ID	Sample ID	Extraction Date	Analysis Date	EFV DF	Range/Surrogate	RL	Result
MB-041513 13-7770	Method Blank HC ID: ---	04/15/13	04/18/13 FID3B	1.00 1.0	Diesel Range Motor Oil Range o-Terphenyl	0.10 0.20	< 0.10 U < 0.20 U 104%
WL62A 13-7770	MW-05-130410 HC ID: ---	04/15/13	04/18/13 FID3B	1.00 1.0	Diesel Range Motor Oil Range o-Terphenyl	0.10 0.20	< 0.10 U < 0.20 U 99.6%
WL62B 13-7771	MW-06-130410 HC ID: ---	04/15/13	04/18/13 FID3B	1.00 1.0	Diesel Range Motor Oil Range o-Terphenyl	0.10 0.20	< 0.10 U < 0.20 U 101%
WL62C 13-7772	MW-07-130410 HC ID: <b>DIESEL</b>	04/15/13	04/18/13 FID3B	1.00 1.0	<b>Diesel Range</b> Motor Oil Range o-Terphenyl	<b>0.10</b> 0.20	<b>0.16</b> < 0.20 U 104%
WL62D 13-7773	MW-08-130410 HC ID: ---	04/15/13	04/18/13 FID3B	1.00 1.0	Diesel Range Motor Oil Range o-Terphenyl	0.10 0.20	< 0.10 U < 0.20 U 105%
WL62E 13-7774	MW-09-130410 HC ID: ---	04/15/13	04/18/13 FID3B	1.00 1.0	Diesel Range Motor Oil Range o-Terphenyl	0.10 0.20	< 0.10 U < 0.20 U 105%
WL62F 13-7775	MW-06-130410-DUP HC ID: ---	04/15/13	04/18/13 FID3B	1.00 1.0	Diesel Range Motor Oil Range o-Terphenyl	0.10 0.20	< 0.10 U < 0.20 U 93.8%

Reported in mg/L (ppm)

EFV-Effective Final Volume in mL.  
DL-Dilution of extract prior to analysis.  
RL-Reporting limit.

Diesel range quantitation on total peaks in the range from C12 to C24.  
Motor Oil range quantitation on total peaks in the range from C24 to C38.  
HC ID: DRO/RRO indicates results of organics or additional hydrocarbons in ranges are not identifiable.

**TPHD SURROGATE RECOVERY SUMMARY**

Matrix: Water

QC Report No: WL62-Geoengineers  
Project: Former Irondale Iron & Steel Plant

<u>Client ID</u>	<u>OTER</u>	<u>TOT OUT</u>
MB-041513	104%	0
LCS-041513	106%	0
LCSD-041513	102%	0
MW-05-130410	99.6%	0
MW-06-130410	101%	0
MW-07-130410	104%	0
MW-08-130410	105%	0
MW-09-130410	105%	0
MW-06-130410-DUP	93.8%	0

**LCS/MB LIMITS      QC LIMITS**

(OTER) = o-Terphenyl

(50-150)

(50-150)

Prep Method: SW3510C  
Log Number Range: 13-7770 to 13-7775

**ORGANICS ANALYSIS DATA SHEET**

NWTPHD by GC/FID

Page 1 of 1

Sample ID: LCS-041513

LCS/LCSD

Lab Sample ID: LCS-041513

LIMS ID: 13-7770

Matrix: Water

Data Release Authorized: *MW*

Reported: 04/22/13

QC Report No: WL62-Geoengineers

Project: Former Irondale Iron & Steel Plant

Date Sampled: NA

Date Received: NA

Date Extracted LCS/LCSD: 04/15/13

Sample Amount LCS: 500 mL

LCSD: 500 mL

Date Analyzed LCS: 04/18/13 03:05

Final Extract Volume LCS: 1.0 mL

LCSD: 04/18/13 03:23

LCSD: 1.0 mL

Instrument/Analyst LCS: FID3B/JLW

Dilution Factor LCS: 1.00

LCSD: FID3B/JLW

LCSD: 1.00

Range	LCS	Spike Added-LCS	LCS Recovery	LCSD	Spike Added-LCSD	LCSD Recovery	RPD
Diesel	2.87	3.00	95.7%	2.66	3.00	88.7%	7.6%

**TPHD Surrogate Recovery**

	LCS	LCSD
o-Terphenyl	106%	102%

Results reported in mg/L

RPD calculated using sample concentrations per SW846.

**TOTAL DIESEL RANGE HYDROCARBONS-EXTRACTION REPORT**

Matrix: Water  
Date Received: 04/11/13

ARI Job: WL62  
Project: Former Irondale Iron & Steel Plant

ARI ID	Client ID	Samp Amt	Final Vol	Prep Date
13-7770-041513MB1	Method Blank	500 mL	1.00 mL	04/15/13
13-7770-041513LCS1	Lab Control	500 mL	1.00 mL	04/15/13
13-7770-041513LCSD1	Lab Control Dup	500 mL	1.00 mL	04/15/13
13-7770-WL62A	MW-05-130410	500 mL	1.00 mL	04/15/13
13-7771-WL62B	MW-06-130410	500 mL	1.00 mL	04/15/13
13-7772-WL62C	MW-07-130410	500 mL	1.00 mL	04/15/13
13-7773-WL62D	MW-08-130410	500 mL	1.00 mL	04/15/13
13-7774-WL62E	MW-09-130410	500 mL	1.00 mL	04/15/13
13-7775-WL62F	MW-06-130410-DUP	500 mL	1.00 mL	04/15/13

4  
TPH METHOD BLANK SUMMARY

BLANK NO.

WL67MBS1

Lab Name: ANALYTICAL RESOURCES INC      Client: GEOENGINEERS  
 SDG No.: WL62      Project No.: FORMER IRONDALE  
 Date Extracted: 04/15/13      Matrix: SOLID  
 Date Analyzed : 04/17/13      Instrument ID : FID3B  
 Time Analyzed : 1158

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS, and MSD:

	CLIENT SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED
	=====	=====	=====
01	IDW-SOIL	WK89I	04/17/13
02	WL67LCSS1	WL67LCSS1	04/17/13
03	GR-CB-07-201	WL67A	04/17/13
04	GR-CB-07-201	WL67AMS	04/17/13
05	GR-CB-07-201	WL67AMSD	04/17/13
06	GR-WS-05-201	WL67B	04/17/13
07	GR-CB-07-201	WL67A	04/17/13
08	GR-CB-07-201	WL67AMS	04/17/13
09	GR-CB-07-201	WL67AMSD	04/17/13
10	MW-05-130410	WL62A	04/18/13
11	MW-06-130410	WL62B	04/18/13
12	MW-07-130410	WL62C	04/18/13
13	MW-08-130410	WL62D	04/18/13
14	MW-09-130410	WL62E	04/18/13
15	MW-06-130410	WL62F	04/18/13
16	NWES-MW11	WL71A	04/18/13
17	NWES-MW8	WL71B	04/18/13
18	NWES-MW20	WL71C	04/18/13
19	NWES-MW9	WL71D	04/18/13
20	NWES-MW4R	WL71E	04/18/13
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6a  
DIESEL INITIAL CALIBRATION

Lab Name: ANALYTICAL RESOURCES, INC.

Client: GEOENGINEERS

Instrument: FID3B.I

Project: FORMER IRONDALE

Calibration Date: 22-MAR-2013

SDG No.: WL62

Diesel Range	RF1 50	RF2 100	RF3 250	RF4 500	RF5 1000	RF6 2500	Ave RF	%RSD
WA Diesel	11942	11745	11577	11280	10897	10565	11334	4.6
AK Diesel	14741	14402	14061	13657	13217	12780	13810	5.3
OR Diesel	14785	14452	14109	13705	13264	12828	13857	5.3
Cal Diesel	14721	14382	14041	13635	13196	12760	13789	5.3
o-Terph	15493	15300	15046	14446	14040	12750	14512	7.0

<- Indicates %RSD outside limits  
Surrogate areas are not included in Diesel RF calculation.

Quant Ranges :   WA Diesel   C12-C24 (3.112-5.835)  
                  AK Diesel   C10-C25 (2.342-6.010)  
                  OR Diesel   C10-C28 (2.342-6.502)  
                  Cal Diesel   C10-C24 (2.342-5.835)

Calibration Files      Analysis Time

0322b005.d	22-MAR-2013 12:48
0322b006.d	22-MAR-2013 13:07
0322b007.d	22-MAR-2013 13:27
0322b008.d	22-MAR-2013 13:46
0322b009.d	22-MAR-2013 14:05
0322b010.d	22-MAR-2013 14:25

p1 of 1

FORM VI-Diesel

WL52:00007



## NW MOTOR OIL RANGE INITIAL CALIBRATION

Lab Name: ANALYTICAL RESOURCES, INC.

Client: GEOENGINEERS

Instrument: FID3B.I

Project: FORMER IRONDALE

Calibration Date: 13-APR-2013

SDG No.: WL62

Product Range	RF1 100	RF2 250	RF3 500	RF4 1000	RF5 2500	RF6 5000	Ave RF	%RSD
WA M.Oil C24-C38	11213	11384	11352	11114	10744	10361	11028	3.6
Triac Surr	15652	15497	15248	15442	15268	14582	15281	2.4

<- Indicates %RSD outside limits  
 Surrogate areas are not included in Motor Oil RF calculation.

Calibration Files	Analysis Time
-------------------	---------------

0413b006.d	13-APR-2013 11:55
0413b007.d	13-APR-2013 12:13
0413b008.d	13-APR-2013 12:32
0413b009.d	13-APR-2013 12:51
0413b010.d	13-APR-2013 13:11
0413b011.d	13-APR-2013 13:30

## DIESEL CONTINUING CALIBRATION VERIFICATION

Lab Name: ANALYTICAL RESOURCES, INC.

Client: GEOENGINEERS

ICal Date: 22-MAR-2013

Project: FORMER IRONDALE

CCal Date: 18-APR-2013

SDG No.: WL62

Analysis Time: 02:09

Lab ID: DIESEL#5

Instrument: FID3B.I

Lab File Name: 0417b051.d

Diesel Range	Area*	CalcAmt	NomAmt	% D
WADies (C12-C24)	2932749	258.6	250	3.4
AK102 (C10-C25)	3455501	250.5	250	0.2
ITDIES (C10-C24)	3447908	250.0	250	0.0
Terphenyl	745834	51.4	45	14.2

\* Surrogate areas are subtracted from range areas  
 <- Indicates a %D outside QC limits

Quant Ranges :   WA Diesel   C12-C24  
                   AK Diesel   C10-C25  
                   IT Diesel   C10-C24

## MOTOR OIL CONTINUING CALIBRATION VERIFICATION

Lab Name: ANALYTICAL RESOURCES, INC.

Client: GEOENGINEERS

ICal Date: 13-APR-2013

Project: FORMER IRONDALE

CCal Date: 18-APR-2013

SDG No.: WL62

Analysis Time: 02:27

Lab ID: MOIL#5

Instrument: FID3B.I

Lab File Name: 0417b052.d

M.oil Range	Area*	CalcAmnt	NomAmnt	% D
WAMoil (C24-C38)	4928304	446.9	500	-10.6
AK103 (C25-C36)	4404236	601.9	500	20.4
n-Triacontane	714169	46.7	45	3.9

\* Surrogate areas are subtracted from range areas  
 <- Indicates a %D outside QC limits

Quant Ranges : WA M.Oil C24-C38  
 AK M.Oil C25-C36

## DIESEL CONTINUING CALIBRATION VERIFICATION

Lab Name: ANALYTICAL RESOURCES, INC.

Client: GEOENGINEERS

ICal Date: 22-MAR-2013

Project: FORMER IRONDALE

CCal Date: 18-APR-2013

SDG No.: WL62

Analysis Time: 05:32

Lab ID: DIESEL#6

Instrument: FID3B.I

Lab File Name: 0417b062.d

Diesel Range	Area*	CalcAmnt	NomAmnt	% D
WADies (C12-C24)	2930474	258.4	250	3.4
AK102 (C10-C25)	3463259	251.1	250	0.4
ITDIES (C10-C24)	3455159	250.6	250	0.2
Terphenyl	743196	51.2	45	13.8

\* Surrogate areas are subtracted from range areas  
 <- Indicates a %D outside QC limits

Quant Ranges :   WA Diesel   C12-C24  
                   AK Diesel   C10-C25  
                   IT Diesel   C10-C24

## MOTOR OIL CONTINUING CALIBRATION VERIFICATION

Lab Name: ANALYTICAL RESOURCES, INC.

Client: GEOENGINEERS

ICal Date: 13-APR-2013

Project: FORMER IRONDALE

CCal Date: 18-APR-2013

SDG No.: WL62

Analysis Time: 05:51

Lab ID: MOIL#6

Instrument: FID3B.I

Lab File Name: 0417b063.d

M.oil Range	Area*	CalcAmnt	NomAmnt	% D
WAMoil (C24-C38)	4873478	441.9	500	-11.6
AK103 (C25-C36)	4368171	597.0	500	19.4
n-Triacontane	728015	47.6	45	5.9

\* Surrogate areas are subtracted from range areas  
 <- Indicates a %D outside QC limits

Quant Ranges :   WA M.Oil    C24-C38  
                   AK M.Oil    C25-C36

## TPH ANALYTICAL SEQUENCE

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

SDG No.: WL62

Project: FORMER IRONDALE

Instrument ID: FID3B

GC Column: RTX-1

THE ANALYTICAL SEQUENCE OF BLANKS, SAMPLES, AND STANDARDS,  
IS GIVEN BELOW:

SURROGATE RT FROM DAILY STANDARD					
		TERPH: 4.76	TRIAC: 6.79		
CLIENT SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	TERPH RT #	TRIAC RT #
=====	=====	=====	=====	=====	=====
01	RINSE	03/22/13	1131	4.76	6.80
02	RINSE	03/22/13	1150	4.76	6.80
03	RT0322	03/22/13	1209	4.76	6.79
04	IB0322	03/22/13	1229	4.75	6.78
05	DIESEL50	03/22/13	1248	4.74	6.79
06	DIESEL100	03/22/13	1307	4.74	6.79
07	DIESEL250	03/22/13	1327	4.74	6.79
08	DIESEL500	03/22/13	1346	4.75	6.80
09	DIESEL1000	03/22/13	1405	4.76	6.79
10	DIESEL2500	03/22/13	1425	4.78	6.79
11	DIESELICV250	03/22/13	1444	4.74	6.79
12	MOIL100	03/22/13	1504	4.78	6.78
13	MOIL250	03/22/13	1523	4.78	6.78
14	MOIL500	03/22/13	1543	4.78	6.78
15	MOIL1000	03/22/13	1602	4.77	6.79
16	MOIL2500	03/22/13	1622	4.78	6.81
17	MOIL5000	03/22/13	1641	4.78	6.83
18	MOILICV500	03/22/13	1701	4.78	6.79

## QC LIMITS

TERPH = o-terph

(+/- 0.05 MINUTES)

TRIAC = Triacon Surr

(+/- 0.05 MINUTES)

\* Values outside of QC limits.

## TPH ANALYTICAL SEQUENCE

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

SDG No.: WL62

Project: FORMER IRONDALE

Instrument ID: FID3B

GC Column: RTX-1

THE ANALYTICAL SEQUENCE OF BLANKS, SAMPLES, AND STANDARDS,  
IS GIVEN BELOW:

SURROGATE RT FROM DAILY STANDARD					
		TERPH: 4.67	TRIAC: 6.76		
CLIENT SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	TERPH RT #	TRIAC RT #
01	RINSE	04/13/13	0944	4.67	6.72
02	RT0413	04/13/13	1002	4.68	6.73
03	IB0413	04/13/13	1021	4.68	6.73
04	DIESEL#1	04/13/13	1040	4.68	6.73
05	MOIL#1	04/13/13	1059	4.67	6.73
06	MOIL100	04/13/13	1155	4.68	6.72
07	MOIL250	04/13/13	1213	4.68	6.72
08	MOIL500	04/13/13	1232	4.69	6.73
09	MOIL1000	04/13/13	1251	4.68	6.74
10	MOIL2500	04/13/13	1311	4.68	6.76
11	MOIL5000	04/13/13	1330	4.67	6.76
12	MOILICV500	04/13/13	1349	4.67	6.73

TERPH = o-terph  
TRIAC = Triacon Surr

QC LIMITS  
(+/- 0.05 MINUTES)  
(+/- 0.05 MINUTES)

\* Values outside of QC limits.

TPH ANALYTICAL SEQUENCE

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

SDG No.: WL62

Project: FORMER IRONDALE

Instrument ID: FID3B

GC Column: RTX-1

THE ANALYTICAL SEQUENCE OF BLANKS, SAMPLES, AND STANDARDS,  
IS GIVEN BELOW:

SURROGATE RT FROM DAILY STANDARD						
		TERPH: 4.69		TRIAC: 6.73		
CLIENT	LAB	DATE	TIME	TERPH	TRIAC	
SAMPLE NO.	SAMPLE ID	ANALYZED	ANALYZED	RT	RT	#
=====	=====	=====	=====	=====	=====	=====
01	RT0417	04/17/13	1007	4.69	6.73	
02	ZZZZZ	04/17/13	1026	4.69	6.73	
03	ZZZZZ	04/17/13	1045	4.69	6.74	
04	ZZZZZ	04/17/13	1105	4.69	6.73	
05	ZZZZZ	04/17/13	1138	4.68	6.72	
06	ZZZZZ	04/17/13	1158	4.69	6.73	
07	ZZZZZ	04/17/13	1217	4.69	6.73	
08	ZZZZZ	04/17/13	1237	4.69	6.73	
09	ZZZZZ	04/17/13	1257	4.69	6.73	
10	ZZZZZ	04/17/13	1317	4.69	6.74	
11	ZZZZZ	04/17/13	1338	4.68		
12	ZZZZZ	04/17/13	1358	4.68		
13	ZZZZZ	04/17/13	1418	4.68		
14	ZZZZZ	04/17/13	1438	4.68		
15	ZZZZZ	04/17/13	1458	4.69	6.72	
16	ZZZZZ	04/17/13	1517	4.68	6.74	
17	ZZZZZ	04/17/13	1537	4.69	6.73	
18	ZZZZZ	04/17/13	1557	4.69	6.73	
19	ZZZZZ	04/17/13	1617	4.69	6.74	
20	ZZZZZ	04/17/13	1636	4.69	6.74	
21	ZZZZZ	04/17/13	1656	4.68	6.73	
22	ZZZZZ	04/17/13	1716	4.69	6.73	
23	ZZZZZ	04/17/13	1736	4.69	6.73	
24	ZZZZZ	04/17/13	1755	4.69	6.74	
25	ZZZZZ	04/17/13	1814	4.68	6.74	
26	ZZZZZ	04/17/13	1834	4.69	6.74	
27	ZZZZZ	04/17/13	1853	4.69	6.74	
28	ZZZZZ	04/17/13	1913	4.69	6.73	
29	ZZZZZ	04/17/13	1932	4.69	6.73	
30	ZZZZZ	04/17/13	1952	4.69	6.73	
31	ZZZZZ	04/17/13	2011	4.69	6.73	
32	ZZZZZ	04/17/13	2030	4.69	6.73	

QC LIMITS

TERPH = o-terph (+/- 0.05 MINUTES)  
 TRIAC = Triacon Surr (+/- 0.05 MINUTES)

\* Values outside of QC limits.



TPH ANALYTICAL SEQUENCE

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

SDG No.: WL62

Project: FORMER IRONDALE

Instrument ID: FID3B

GC Column: RTX-1

THE ANALYTICAL SEQUENCE OF BLANKS, SAMPLES, AND STANDARDS,  
IS GIVEN BELOW:

SURROGATE RT FROM DAILY STANDARD						
			TERPH: 4.69		TRIAC: 6.73	
CLIENT	LAB	DATE	TIME	TERPH	TRIAC	
SAMPLE NO.	SAMPLE ID	ANALYZED	ANALYZED	RT	RT	#
=====	=====	=====	=====	=====	=====	=====
01	ZZZZZ	04/17/13	2049	4.69	6.73	
02	ZZZZZ	04/17/13	2108	4.69	6.73	
03	ZZZZZ	04/17/13	2127	4.69	6.73	
04	ZZZZZ	04/17/13	2146	4.69	6.74	
05	ZZZZZ	04/17/13	2205	4.69	6.73	
06	ZZZZZ	04/17/13	2224	4.69	6.73	
07	ZZZZZ	04/17/13	2243	4.69	6.73	
08	ZZZZZ	04/17/13	2302	4.68	6.74	
09	ZZZZZ	04/17/13	2320	4.69	6.74	
10	ZZZZZ	04/17/13	2339	4.69	6.73	
11	ZZZZZ	04/17/13	2358	4.69	6.74	
12	ZZZZZ	04/18/13	0017	4.69	6.73	
13	ZZZZZ	04/18/13	0035	4.69	6.73	
14	ZZZZZ	04/18/13	0054	4.69	6.73	
15	ZZZZZ	04/18/13	0113	4.69	6.73	
16	ZZZZZ	04/18/13	0131	4.69	6.73	
17	ZZZZZ	04/18/13	0150	4.69	6.73	
18	FORMER IROND	DIESEL#5	04/18/13	0209	4.69	6.74
19	FORMER IROND	MOIL#5	04/18/13	0227	4.68	6.74
20	ZZZZZ	ZZZZZ	04/18/13	0246	4.69	6.73
21	ZZZZZ	ZZZZZ	04/18/13	0305	4.69	6.74
22	ZZZZZ	ZZZZZ	04/18/13	0323	4.69	6.73
23	MW-05-130410	WL62A	04/18/13	0342	4.69	6.73
24	MW-06-130410	WL62B	04/18/13	0400	4.69	6.73
25	MW-07-130410	WL62C	04/18/13	0419	4.69	6.73
26	MW-08-130410	WL62D	04/18/13	0437	4.69	6.73
27	MW-09-130410	WL62E	04/18/13	0456	4.69	6.73
28	MW-06-130410	WL62F	04/18/13	0514	4.69	6.73
29	FORMER IROND	DIESEL#6	04/18/13	0532	4.69	6.72
30	FORMER IROND	MOIL#6	04/18/13	0551	4.68	6.74
31	ZZZZZ	ZZZZZ	04/18/13	0609	4.69	6.73
32	ZZZZZ	ZZZZZ	04/18/13	0628	4.69	6.73

QC LIMITS

TERPH = o-terph (+/- 0.05 MINUTES)  
 TRIAC = Triacon Surr (+/- 0.05 MINUTES)

\* Values outside of QC limits.

TPH ANALYTICAL SEQUENCE

Lab Name: ANALYTICAL RESOURCES INC

Client: GEOENGINEERS

SDG No.: WL62

Project: FORMER IRONDALE

Instrument ID: FID3B

GC Column: RTX-1

THE ANALYTICAL SEQUENCE OF BLANKS, SAMPLES, AND STANDARDS,  
IS GIVEN BELOW:

SURROGATE RT FROM DAILY STANDARD						
		TERPH: 4.69		TRIAC: 6.73		
CLIENT SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	TERPH RT #	TRIAC RT #	
=====	=====	=====	=====	=====	=====	=====
01	ZZZZZ	ZZZZZ	04/18/13	0646	4.69	6.73
02	ZZZZZ	ZZZZZ	04/18/13	0705	4.69	6.74
03	ZZZZZ	ZZZZZ	04/18/13	0724	4.69	6.74
04	ZZZZZ	ZZZZZ	04/18/13	0743	4.69	6.73
05	ZZZZZ	ZZZZZ	04/18/13	0802	4.69	6.74
06	ZZZZZ	ZZZZZ	04/18/13	0822	4.69	6.74
07	ZZZZZ	ZZZZZ	04/18/13	0841	4.69	6.74
08	ZZZZZ	ZZZZZ	04/18/13	0901	4.69	6.74
09	FUEL FARM SA	DIESEL#7	04/18/13	0921	4.69	6.72
10	ZZZZZ	ZZZZZ	04/18/13	0940	4.68	6.74

TERPH = o-terph  
TRIAC = Triacon Surr

QC LIMITS  
(+/- 0.05 MINUTES)  
(+/- 0.05 MINUTES)

\* Values outside of QC limits.

**Metals Analysis  
Report and Summary QC Forms**

**ARI Job ID: WL62**

# Cover Page

## INORGANIC ANALYSIS DATA PACKAGE



CLIENT: Geoengineers

PROJECT: Former Irondale Iron

SDG: WL62

CLIENT ID	ARI ID	ARI LIMS ID	REPREP
MW-05-130410	WL62A	13-7770	
MW-05-130410D	WL62ADUP	13-7770	
MW-05-130410S	WL62ASPK	13-7770	
MW-06-130410	WL62B	13-7771	
PBW	WL62MB1	13-7771	
LCSW	WL62MB1SPK	13-7771	
MW-07-130410	WL62C	13-7772	
MW-08-130410	WL62D	13-7773	
MW-09-130410	WL62E	13-7774	
MW-09-130410-DUP	WL62G	13-7776	

Were ICP interelement corrections applied ? Yes/No YES

Were ICP background corrections applied ? Yes/No YES

If yes - were raw data generated before application of background corrections ? Yes/No NO

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

THIS DATA PACKAGE HAS BEEN REVIEWED AND AUTHORIZED FOR RELEASE BY:

Signature: Jay Kuhn Name: Jay Kuhn

Date: 4/18/13 Title: Inorganics Director

COVER PAGE

WL62 : 00049

**INORGANICS ANALYSIS DATA SHEET**

**DISSOLVED METALS**

Page 1 of 1


Sample ID: MW-05-130410

SAMPLE

Lab Sample ID: WL62A

LIMS ID: 13-7770

Matrix: Water

Data Release Authorized: 

Reported: 04/18/13

QC Report No: WL62-Geoengineers

Project: Former Irondale Iron & Steel Plant

Date Sampled: 04/10/13

Date Received: 04/11/13


Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	04/15/13	200.8	04/17/13	7440-50-8	Copper	0.5	1.5	
200.8	04/15/13	200.8	04/17/13	7440-02-0	Nickel	0.5	5.1	

U-Analyte undetected at given RL

RL-Reporting Limit

**INORGANICS ANALYSIS DATA SHEET**  
**DISSOLVED METALS**  
Page 1 of 1

Sample ID: MW-06-130410  
SAMPLE

Lab Sample ID: WL62B  
LIMS ID: 13-7771  
Matrix: Water  
Data Release Authorized:   
Reported: 04/18/13

QC Report No: WL62-Geoengineers  
Project: Former Irondale Iron & Steel Plant  
Date Sampled: 04/10/13  
Date Received: 04/11/13

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	04/15/13	200.8	04/17/13	7440-50-8	Copper	0.5	0.5	U
200.8	04/15/13	200.8	04/17/13	7440-02-0	Nickel	0.5	4.2	


U-Analyte undetected at given RL  
RL-Reporting Limit

**INORGANICS ANALYSIS DATA SHEET**

**DISSOLVED METALS**

Page 1 of 1

Sample ID: MW-07-130410  
SAMPLE

Lab Sample ID: WL62C  
LIMS ID: 13-7772  
Matrix: Water  
Data Release Authorized:   
Reported: 04/18/13


QC Report No: WL62-Geoengineers  
Project: Former Irondale Iron & Steel Plant  
Date Sampled: 04/10/13  
Date Received: 04/11/13

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	04/15/13	200.8	04/17/13	7440-50-8	Copper	0.5	1.4	
200.8	04/15/13	200.8	04/17/13	7440-02-0	Nickel	0.5	5.1	

U-Analyte undetected at given RL  
RL-Reporting Limit

**INORGANICS ANALYSIS DATA SHEET**  
**DISSOLVED METALS**  
Page 1 of 1

Sample ID: MW-08-130410  
SAMPLE

Lab Sample ID: WL62D  
LIMS ID: 13-7773  
Matrix: Water  
Data Release Authorized:   
Reported: 04/18/13

QC Report No: WL62-Geoengineers  
Project: Former Irondale Iron & Steel Plant  
Date Sampled: 04/10/13  
Date Received: 04/11/13

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	04/15/13	200.8	04/17/13	7440-50-8	Copper	0.5	2.2	
200.8	04/15/13	200.8	04/17/13	7440-02-0	Nickel	0.5	4.9	

U-Analyte undetected at given RL  
RL-Reporting Limit



**INORGANICS ANALYSIS DATA SHEET**

**DISSOLVED METALS**

Page 1 of 1


Sample ID: MW-09-130410

**SAMPLE**

Lab Sample ID: WL62E

LIMS ID: 13-7774

Matrix: Water

Data Release Authorized: 

Reported: 04/18/13

QC Report No: WL62-Geoengineers

Project: Former Irondale Iron & Steel Plant

Date Sampled: 04/10/13

Date Received: 04/11/13

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	04/15/13	200.8	04/17/13	7440-50-8	Copper	5	7	
200.8	04/15/13	200.8	04/17/13	7440-02-0	Nickel	5	10	

U-Analyte undetected at given RL

RL-Reporting Limit

**INORGANICS ANALYSIS DATA SHEET**

**DISSOLVED METALS**

Page 1 of 1


Sample ID: MW-09-130410-DUP

SAMPLE

Lab Sample ID: WL62G

LIMS ID: 13-7776

Matrix: Water

Data Release Authorized: 

Reported: 04/18/13

QC Report No: WL62-Geoengineers

Project: Former Irondale Iron & Steel Plant

Date Sampled: 04/10/13

Date Received: 04/11/13

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	04/15/13	200.8	04/17/13	7440-50-8	Copper	5	7	
200.8	04/15/13	200.8	04/17/13	7440-02-0	Nickel	5	10	

U-Analyte undetected at given RL  
RL-Reporting Limit

**INORGANICS ANALYSIS DATA SHEET**  
**DISSOLVED METALS**  
Page 1 of 1

Sample ID: MW-05-130410  
MATRIX SPIKE

Lab Sample ID: WL62A  
LIMS ID: 13-7770  
Matrix: Water  
Data Release Authorized:  
Reported: 04/18/13

QC Report No: WL62-Geoengineers  
Project: Former Irondale Iron & Steel Plant  
Date Sampled: 04/10/13  
Date Received: 04/11/13



**MATRIX SPIKE QUALITY CONTROL REPORT**

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Copper	200.8	1.5	26.4	25.0	99.6%	
Nickel	200.8	5.1	30.8	25.0	103%	

Reported in µg/L

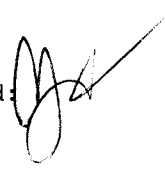
N-Control Limit Not Met  
H-% Recovery Not Applicable, Sample Concentration Too High  
NA-Not Applicable, Analyte Not Spiked

Percent Recovery Limits: 75-125%

**INORGANICS ANALYSIS DATA SHEET**  
**DISSOLVED METALS**  
Page 1 of 1

**Sample ID: MW-05-130410**  
**DUPLICATE**

Lab Sample ID: WL62A  
LIMS ID: 13-7770  
Matrix: Water  
Data Release Authorized:  
Reported: 04/18/13



QC Report No: WL62-Geoengineers  
Project: Former Irondale Iron & Steel Plant  
Date Sampled: 04/10/13  
Date Received: 04/11/13

**MATRIX DUPLICATE QUALITY CONTROL REPORT**

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Copper	200.8	1.5	1.4	6.9%	+/- 0.5	L
Nickel	200.8	5.1	5.1	0.0%	+/- 20%	

Reported in µg/L

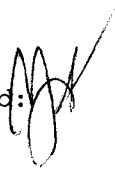
\*-Control Limit Not Met  
L-RPD Invalid, Limit = Detection Limit

**INORGANICS ANALYSIS DATA SHEET**

**Sample ID: LAB CONTROL**

**DISSOLVED METALS**

Page 1 of 1

Lab Sample ID: WL62LCS  
 LIMS ID: 13-7771  
 Matrix: Water  
 Data Release Authorized:   
 Reported: 04/18/13

QC Report No: WL62-Geoengineers  
 Project: Former Irondale Iron & Steel Plant  
 Date Sampled: NA  
 Date Received: NA

**BLANK SPIKE QUALITY CONTROL REPORT**

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Copper	200.8	27.2	25.0	109%	
Nickel	200.8	26.8	25.0	107%	


Reported in µg/L

N-Control limit not met  
 Control Limits: 80-120%

**INORGANICS ANALYSIS DATA SHEET  
DISSOLVED METALS**

**Sample ID: METHOD BLANK**

Page 1 of 1

Lab Sample ID: WL62MB  
LIMS ID: 13-7771  
Matrix: Water  
Data Release Authorized:   
Reported: 04/18/13

QC Report No: WL62-Geoengineers  
Project: Former Irondale Iron & Steel Plant  
Date Sampled: NA  
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	µg/L	Q
200.8	04/15/13	200.8	04/17/13	7440-50-8	Copper	0.5	0.5	U
200.8	04/15/13	200.8	04/17/13	7440-02-0	Nickel	0.5	0.5	U

U-Analyte undetected at given RL  
RL-Reporting Limit

# Calibration Verification

CLIENT: Geoenigneers

PROJECT: Former Irondale Iron

SDG: WL62



UNITS: ug/L

ANALYTE	EL	M	RUN	ICVTV	ICV	%R	CCVTV	CCV1	%R	CCV2	%R	CCV3	%R	CCV4	%R	CCV5	%R
Copper	CU	PMS	MS041711	50.0	52.50	105.0	50.0	49.69	99.4	52.18	104.4	51.11	102.2	51.09	102.2		
Nickel	NI	PMS	MS041711	50.0	51.58	103.2	50.0	50.97	101.9	51.38	102.8	52.46	104.9	51.31	102.6		

Control Limits: Mercury 80-120; Other Metals 90-110

# CRDL Standard

CLIENT: Geoenigneers

PROJECT: Former Irondale Iron

SDG: WL62



UNITS: ug/L

ANALYTE	EL	M	RUN	CRA/I	TV	CR-1	%R	CR-2	%R	CR-3	%R	CR-4	%R	CR-5	%R	CR-6	%R
Copper	CU	PMS	MS041711	0.5	0.53	106.0											
Nickel	NI	PMS	MS041711	0.5	0.51	102.0											

Control Limits: no control limits have been established by the EPA at this time.



# Calibration Blanks

CLIENT: Geoengineers

PROJECT: Former Irondale Iron

SDG: WL62



UNITS: ug/L

ANALYTE	EL	METH	RUN	CRDL	IDL	ICB	C	CCB1	C	CCB2	C	CCB3	C	CCB4	C	CCB5	C
Copper	CU	PMS	MS041711	25.0	0.5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Nickel	NI	PMS	MS041711	40.0	0.5	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

WL62 : 00002

# ICP Interference Check Sample



CLIENT: Geoenigneers  
 PROJECT: Former Irondale Iron  
 SDG: WL62

ICS SOURCE: I.V.

RUNID: MS041711

INSTRUMENT ID: NEXION 300D

UNITS: ug/L

ANALYTE	ICSA TV	ICSAB TV	ICSA1	ICSAB1	%R	ICSA2	ICSAB2	%R	ICSA3	ICSAB3	%R
Antimony			0.1	0.1	0.1						
Arsenic		20	0.1	19.5	97.5						
Cadmium		20	0.1	19.5	97.5						
Chromium		20	0.5	19.9	99.5						
Cobalt		20	0.0	19.8	99.0						
Copper		20	0.7	20.5	102.5						
Manganese		20	0.1	18.8	94.0						
Molybdenum	400	400	453.3	459.3	114.8						
Nickel		20	0.3	20.1	100.5						
Selenium			-0.2	-0.1							
Silver		20	0.0	20.6	103.0						
Zinc		20	0.9	19.4	97.0						

WL62 : 00000

# IDLs and ICP Linear Ranges

ANALYTICAL  
RESOURCES   
INCORPORATED

CLIENT: Geoengineers

PROJECT: Former Irondale Iron

SDG: WL62

UNITS: ug/L

ANALYTE	EL	METH	INSTRUMENT	WAVELENGTH (nm)	GFA BACK- GROUND	CLP CRDL	RL	RL DATE	ICP LINEAR RANGE (ug/L)	ICP LR DATE
Copper	CU	PMS	NEXION 300D MS	0.00		25	0.5	4/1/2012		
Nickel	NI	PMS	NEXION 300D MS	0.00		40	0.5	4/1/2012		

# Preparation Log



CLIENT: Geoengineers

ANALYSIS METHOD: PMS

PROJECT: Former Irondale Iron

ARI PREP CODE: REN

SDG: WL62

PREPDATE: 4/15/2013

CLIENT ID	ARI ID	MASS (g)	INITIAL VOLUME (mL)	FINAL VOLUME (mL)
MW-05-130410	WL62A	0.000	50.0	25.0
MW-05-130410D	WL62ADUP	0.000	50.0	25.0
MW-05-130410S	WL62ASPK	0.000	50.0	25.0
MW-06-130410	WL62B	0.000	50.0	25.0
MW-07-130410	WL62C	0.000	50.0	25.0
MW-08-130410	WL62D	0.000	50.0	25.0
MW-09-130410	WL62E	0.000	50.0	25.0
MW-09-130410-DUP	WL62G	0.000	50.0	25.0
PBW	WL62MB1	0.000	50.0	25.0
LCSW	WL62MB1SPK	0.000	50.0	25.0



# Analysis Run Log



CLIENT: Geoenigneers

PROJECT: Former Irondale Iron

INSTRUMENT ID: NEXION 300D MS

START DATE: 4/17/2013

SDG: WL62

RUNID: MS041711

METHOD: PMS

END DATE: 4/17/2013

CLIENT ID	ARI ID	DIL.	TIME	%R	AG	AL	AS	B	BA	BE	CA	CD	CO	CR	CU	FE	HG	K	MG	MN	MO	NA	NI	PB	SB	SE	SI	SN	TI	TL	U	V	ZN			
ZZZZZZ	WL35ADUP	2.00	12090																																	
ZZZZZZ	WL35A	2.00	12130																																	
ZZZZZZ	WL35ASPK	2.00	12170																																	
MW-09-130410	WL62E	20.00	12210																																	
MW-09-130410-DUP	WL62G	20.00	12260																																	
ZZZZZZ	WL35MB1SPK	2.00	12300																																	
CCV	MCCV4	1.00	12340																																	
CCB	CCB4	1.00	12410																																	

WL62: 00067

**APPENDIX C**  
**Report Limitations and Guidelines for Use**

## **APPENDIX C REPORT LIMITATIONS AND GUIDELINES FOR USE<sup>1</sup>**

This Appendix provides information to help you manage your risks with respect to the use of this report.

### **Read These Provisions Closely**

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering, geology and environmental science) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory “limitations” provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these “Report Limitations and Guidelines for Use” apply to your project or site.

### **Environmental Services Are Performed For Specific Purposes, Persons And Projects**

This report has been prepared for the exclusive use by the Washington Department of Ecology. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, an environmental site assessment study conducted for a property owner may not fulfill the needs of a prospective purchaser of the same property. Because each environmental study is unique, each environmental report is unique, prepared solely for the specific client and project site. This report should not be applied for any purpose or project except the one originally contemplated.

### **This Environmental Report Is Based On A Unique Set Of Project-Specific Factors**

This report has been prepared for the former Irondale Iron and Steel Plant site at the intersection of East Moore Street and 1<sup>st</sup> Avenue in Irondale, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

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<sup>1</sup> Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; [www.asfe.org](http://www.asfe.org).



### **Reliance Conditions For Third Parties**

No other party may rely on the product of our services unless we agree in advance and in writing to such reliance. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted environmental practices in this area at the time this report was prepared.

### **Environmental Regulations Are Always Evolving**

Some substances may be present in the site vicinity in quantities or under conditions that may have led, or may lead, to contamination of the subject site, but are not included in current local, state or federal regulatory definitions of hazardous substances or do not otherwise present current potential liability. GeoEngineers cannot be responsible if the standards for appropriate inquiry, or regulatory definitions of hazardous substance change, or if more stringent environmental standards are developed in the future.

### **Uncertainty May Remain Even After This Study Is Completed**

No environmental assessment can wholly eliminate uncertainty regarding the potential for contamination in connection with a property. Our interpretation of subsurface conditions in this study is based on field observations and chemical analytical data from widely-spaced sampling locations. It is always possible that contamination exists in areas that were not explored, sampled or analyzed.

### **Subsurface Conditions Can Change**

This environmental report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, by new releases of hazardous substances, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying this report to determine if it is still applicable.

### **Soil And Groundwater End Use**

The cleanup levels referenced in this report are site- and situation-specific. The cleanup levels may not be applicable for other sites or for other on-site uses of the affected media (soil and/or groundwater). Note that hazardous substances may be present in some of the site soil and/or groundwater at detectable concentrations that are less than the referenced cleanup levels. GeoEngineers should be contacted prior to the export of soil or groundwater from the subject site or reuse of the affected media on site to evaluate the potential for associated environmental liabilities. We cannot be responsible for potential environmental liability arising out of the transfer of soil and/or groundwater from the subject site to another location or its reuse on site in instances that we were not aware of or could not control.

### **Most Environmental Findings Are Professional Opinions**

Our interpretations of subsurface conditions are based on field observations and chemical analytical data from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ – sometimes significantly – from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Have we delivered World Class Client Service?

Please let us know by visiting [www.geoengineers.com/feedback](http://www.geoengineers.com/feedback).

